

'Social Transformation Through Dynamic Education'



**BHARATI VIDYAPEETH**  
(Deemed to be University), Pune, India

# **YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE-38**

Accredited with 'A+' Grade (3rd cycle) by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC

**PROSPECTUS-CUM-HANDBOOK**

**2020-2021**

**SENIOR COLLEGE**

**(Under Graduate & Post Graduate Courses)**





## **BHARATI VIDYAPEETH** (Deemed to be University), Pune, India



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- Pune
- New Delhi
- Kolhapur
- Karad
- Satara (Panchgani)
- Navi Mumbai
- Sangli
- Solapur
- Jawhar
- Jat

*“Social Transformation Through Dynamic Education”*



**BHARATI VIDYAPEETH**

(Deemed to be University), Pune, India

**YASHWANTRAO MOHITE COLLEGE OF  
ARTS, SCIENCE & COMMERCE**

Erandwane, Pune- 411 038

*Accredited with 'A+' Grade (2017) by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC*

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(Established in 1978)

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**PROSPECTUS-CUM-HANDBOOK**

**2020 - 2021**

**SENIOR COLLEGE**

**(Under Graduate & Post Graduate Courses)**

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA**  
**YASHWANTRAO MOHITE COLLEGE OF**  
**ARTS, SCIENCE & COMMERCE**

Erandwane, Pune- 411 038

**VISION, MISSION & OBJECTIVES / GOALS OF THE COLLEGE**

**Vision:**

- ‘To be a World Class University for Social Transformation through Dynamic Education’

**Mission:**

- To provide inclusive borderless access to higher education and vocational education based on merit;
- To offer varied professional, technical, vocational and general education programmes to meet the changing and diverse needs of society in a global context;
- To provide quality higher education for liberation of mind and empowerment of hands;
- To promote quality research in diverse areas of development and engage in application of knowledge for community development;
- To develop national and international networks with industry, service sector and other academic and research institutions to meet the expectations of various stakeholders;
- To promote extensive use of ICT for enrichment of teaching, learning and for effective governance;
- To make quality an integral part of all University operations by promoting innovative practices.

**Objectives / Goals :**

- To inculcate a **Value System** among students related to non-violence, truth, and tolerance for religion, secularism, social justice, environmental awareness, scientific temper and like.
- To generate employment opportunities for the youth by fostering **Global Competencies** among them.
- To develop scientific attitude, technology orientation and practical skills among the students through the extensive **Use of Technology**.
- To contribute to **National Development** by creating social and economic equality through upliftment of the weaker section of the society.
- To promote **Quest for Excellence** by creating just challenges before the young talent.

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# 1: INTRODUCTION

## BHARATI VIDYAPEETH

**Bharati Vidyapeeth**, the parent body of **Bharati Vidyapeeth (Deemed to be University)** was established on 10<sup>th</sup> May, 1964 by **Dr. Patangrao Kadam** with the objective of bringing about intellectual awakening and allround development of the people of our country through education.

Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing within a short span of 53 years or so 180 educational institutions imparting education from the pre-primary stage to post graduate stage. Our colleges and institutions of higher education impart education in different disciplines including Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environmental Science, Architecture, Hotel Management and Catering Technology, Physical Education, Computer Science, Library Science, Information Technology, Biotechnology & Agriculture, Performing Arts etc.

These educational institutions which have achieved an acclaimed academic excellence cater to the educational needs of thousands of students coming from different parts of India and also abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchgani, Jawhar and New Delhi. The spectacular success achieved by Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Vidyapeeth, **Dr. Patangrao Kadam**. It has been our constant endeavour to impart high quality education and training to our students and therefore it is no wonder that our institutions have become nationally known for their academic excellence. In recognition of the academic merit achieved by its institutions and potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to Bharati Vidyapeeth with its twenty nine constituent units.

Besides these 180 educational institutions, Bharati Vidyapeeth has also been successfully running a Co-operative Bank, Co-operative Consumer Stores, Co-operative Poultry, Co-operative Sugar Factory, Co-operative Spinning Mill, Charitable Hospitals and Medical Research Centre and the like.

## **1.2 : BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA**

*Accredited (3<sup>rd</sup> cycle) with 'A+' Grade by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC*

Bharati Vidyapeeth (Deemed to be University) came into existence in April, 1996, when the Ministry of Human Resource Development, Government of India, in exercise of the powers under section 3 of the University Grants Commission Act conferred the status of University to 12 institutions of Bharati Vidyapeeth on the advice of the University Grants Commission, the apex body concerned with higher education in India which made assessment of the academic excellence achieved by the institutions through a committee of experts. Subsequent to that, the Government of India, vide its various notifications brought several other institutions of Bharati Vidyapeeth under the ambit of this University. As on today the University is having 29 constituent units conducting study programmes in different disciplines, including Modern Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environment Science, Architecture, Hotel Management Tourism and Catering Technology, Physical Education, Computer Science, Library Science and Information Technology etc.

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established in May, 1964 by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and all round development of people of our country through education. Bharati Vidyapeeth is now a leading educational institution in the country, which has created history by establishing within a span of 50 years, 180 educational institutions imparting education from the pre-primary to the post graduate stage.

These educational institutions which have achieved an acclaimed academic excellence cater to the educational needs of thousands of students coming from different parts of India and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchagani, Jawhar and New Delhi. The spectacular success achieved by Vidyapeeth is mainly the result of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavour to impart high quality education and training to our students and we have achieved success in these pursuits so that our institutions have earned reputation and high acclaim for their high academic standard.

The University was accredited by the National Assessment and Accreditation Council (NAAC) with the prestigious 'A' grade in 2004. Once again the university is reaccredited with 'A' grade in 2011. In March 2017, under the third cycle of assessment, the university is accredited with 'A+' grade by NAAC. The Ministry of HRD Govt. of India has awarded 'A' Grade status to the University. Besides, the Institute of Management and Research, New Delhi, Poona College of Pharmacy, Pune and College of Engineering, Pune have received accreditation for their various courses by the National Board of Accreditation.

One of the distinctive features of this University is that it has three self-financing research institutes, which are involved in sophisticated researches in health related sciences, pharmaceutical sciences and social sciences.

The University has established its academic reputation so much that it is being preferred for admission by the students not only from India, but from abroad. At present there are about 734 overseas students coming from 45 countries.

It had been a long standing dream of our founder to get the status of a University to Bharati Vidyapeeth. That dream was realised when the Ministry of Human Resource Development (Department of Education, Government of India) on the recommendations of the University Grants Commission, New Delhi through their notification No. F.9-15/95-U.3 dated 26th April, 1996 declared a cluster of institutions of Bharati Vidyapeeth at Pune as Deemed to be University.

#### Present Constituent Colleges of the University

1. Medical College, Pune
2. Dental College & Hospital, Pune
3. College of Ayurved, Pune
4. Homoeopathic Medical College, Pune
5. College of Nursing, Pune
6. Yashwantrao Mohite College of Arts, Science and Commerce, Pune
7. New Law College, Pune
8. Social Sciences Centre (M.S.W.), Pune
9. Yashwantrao Chavan Institute of Social Science Studies & Research, Pune
10. Research and Development Centre in Pharmaceutical Sciences & Applied Chemistry, Pune
11. College of Physical Education, Pune
12. Institute of Environment Education & Research, Pune
13. College of Engineering, Pune
14. Poona College of Pharmacy, Pune
15. Institute of Management & Entrepreneurship Development, Pune.
16. Rajiv Gandhi Institute of Information Technology & Bio-Technology, Pune



17. Interactive Research School for Health Affairs, Pune.
18. Medical College & Hospital, Sangli.
19. Dental College & Hospital, Navi Mumbai.
20. Institute of Management & Research, New Delhi;
21. College of Architecture, Pune;
22. Institute of Hotel Management & Catering Technology, Pune;
23. Yashwantrao Mohite Institute of Management, Karad;
24. Institute of Management, Kolhapur;
25. Institute of Management & Rural Development Administration, Sangli.
26. Abhijit Kadam Institute of Management and Social Sciences, Solapur.
27. Dental College & Hospital, Sangli
28. College of Nursing, Sangli
29. College of Nursing, Navi Mumbai.

Thus, there are 29 institutions which are the constituent units of Bharati Vidyapeeth Deemed University.

As is widely known, the Central Govt. had constituted a high power Task Force consisting of very eminent and experienced academicians to evaluate the academic performance of deemed universities in the country. The Task Force appreciated the report submitted by the University and also the presentation made by Prof. Dr. Shivajirao Kadam Vice Chancellor. The Task Force noted the University's excellent performance with regard to teaching-learning process, research, scientific publications by faculty and their impact and potential, innovative academic programmes, enriched infrastructure and recommended to the Ministry of Human Resources Development, Govt. of India to award 'A' Grade status. The Central Government has accepted the recommendation of the Task Force and awarded 'A' Grade status to this University.

Ours is the only University established under section 3 of the U.G.C. Act having under its umbrella institutions of diverse disciplines of professional, technical and traditional categories such as Medicine, Dentistry, Physical Education, Natural and Physical Sciences, Social Sciences, Commerce, Law and Humanities, Pharmaceutical Sciences, Management Studies, Engineering and Technology. The UGC has recognised this University u/s 12 'B' of UGC Act.

This University is a Member of Association of Indian Universities and also a member of Association of Commonwealth Universities.

### 1.3 : YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE

Bharati Vidyapeeth, the parent institution has created a landmark in the history of higher education by establishing three institutes in June 1978 and Yashwantrao Mohite College is first of them. At present, the college is one of the constituent units of Bharati Vidyapeeth Deemed University. We have pleasure to introduce ourselves as one of the very few colleges in India which has been accredited in 2004 and re- accredited in 2011 with 'A' grade and accredited (3rd cycle) with 'A+' grade in 2017 by the National Assessment and Accreditation Council, Bangalore.

The college offers under graduate and post graduate programmes in various disciplines of Arts, Science, Commerce and Computer Science leading to B.A., B.Lib & I.Sc., B.Sc., B.Sc. (Computer Science), B.Com., M.A. (English), M.A. (Economics), M.Lib & I.Sc, M.Sc. (Physics), M.Sc. (Analytical Chemistry), M.Sc. (Organic Chemistry), M.Sc. (Microbiology), M.Sc. (Computer Science) and M.Com. degrees. The college is recognised Research Centre for Ph.D. degrees in English, Economics, Physics, Chemistry, Botany, Microbiology, Computer Science and Commerce.

The special feature of the college is that along with degree courses, the College also conducts two diploma programmes: (1) Diploma in Banking and (2) Diploma in Marketing, which have proved of great help to the students for their placements.

The college promotes national integration by admitting the students from 29 states and has attained international status by accommodating the students from 24 countries. The welfare of the students is always the prime concern of the college. Several activities are organized to support and enhance the capabilities of the students. Publication of the annual number Yashobharati, arranging Cultural Festival '*Sanskriti*' and conducting National Level General Knowledge Test, as well as organization of National / International Seminars and workshops every year are some of the features of the college.

The college is honoured with 'Best NSS UNIT Award' and the Programme Officer received 'Best NSS Programme Officer Award' as well as 5 students with 'Best NSS Volunteer Award' by Government of Maharashtra. The sports department of the college has created landmarks in the history. Sixteen of our students are felicitated with the highest honour in the field of sports offered by the state government i. e. 'Shiv Chhatrapati Sports Award' and the college has contributed to several National teams by participation of the students.

The college also provides the hostel facilities to both **boys and girls** students. The facilities like state-of-art laboratories, excellent library, health care centre, seminar hall, English language laboratory, Commerce laboratory, indoor and outdoor game facilities and gymnasium are provided to the students.

## **2 : ADMISSION TO THE COLLEGE (UG)**

- 1) A student seeking admission to the college in the first year of the B.A./B.Lib & I.Sc/B.Com./B.Sc./B.Sc. (Computer Sc.) course will have to apply to the college in the prescribed form immediately after the declaration of H.S.C. examination result.
- 2) Students who were in the college during the previous year will have to apply for admission to the college within six days from the declaration of the results of the university examination.
- 3) Applications received after the prescribed date for admission will not be considered.
- 4) International students seeking admission to the college will have to apply in the prescribed form alongwith the provisional Eligibility Certificate issued by the Registrar, Bharati Vidyapeeth Deemed University, Pune and NO OBJECTION CERTIFICATE from the Central Government alongwith visa & pass port.
- 5) Students from other universities in India seeking admission to the college will have to apply in the prescribed form. They will have to apply for Eligibility Certificate to the Registrar, Bharati Vidyapeeth Deemed University in the prescribed form. They will have to submit the following documents alongwith the application for Eligibility Certificate.
  - a) Migration Certificate
  - b) Passing Certificate
  - c) Attendance Certificate
  - d) Transfer Certificate
  - e) Statement of Marks of previous examination
  - f) Character Certificate
  - g) Medical and H.I.V. Test (for international students)
- 6) Admission will be provisional till the student produces final eligibility certificate from Bharati Vidyapeeth Deemed University.
- 7) Please retain a set of xerox copies you are submitting to college.

## **2.1 : ELIGIBILITY FOR ADMISSION TO FIRST YEAR**

### **B.A. / B.Com. / B.Sc. / B.Sc. (Computer Science)**

#### **1. Eligibility for admission to B.A. degree programme:**

A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or an equivalent examination of any other statutory Board or University with English as a passing subject will be admitted to the first year of this course.

#### **2. Eligibility for admission to B.Lib. & I.Sc. Course:**

Any graduate of this University or any other recognized University shall be admitted to B.Lib & I.Sc. Course.

#### **3. Eligibility for admission to B.Com. degree programme:**

A candidate who has passed the Higher Secondary School Certificate Examination in Commerce or Science of the Maharashtra State Secondary and Higher Secondary Board or an equivalent of any other Statutory Board or University with English as a passing subject will be admitted to the first year of this course.

#### **4. Eligibility for admission to B.Sc. degree programme:**

- Higher Secondary School Certificate Examination (10+2) of the Maharashtra State Board or its equivalent examination of any other statutory Board/University with English and with any three Science subjects such as (i) Physics (ii) Chemistry (iii) Biology (iv) Mathematics (v) Geography (vi) Geology etc
- Higher Secondary School Certificate Examination (10+2) with English and with any one of the following vocational subjects in technical group of +2 levels.
- Diploma in Pharmacy, Diploma in Engineering (polytechnic) or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

<b>Subject code</b>	<b>Subject</b>
79	Auto Electrical
A1	Electrical Maintenance
A2	Mechanical Maintenance
A4	General Civil Engg.
C2	Electronics
C3	Chemical Plant Operation
C5	Elementary Laboratory Technology

<b>Subject code</b>	<b>Subject</b>
D9	Computer Science
J1/J2/J3	Electronics Technology
J4/J5/J6	Maintenance & Repairs of Electrical Domestic Appliances
K1/K2/K3	Auto Engg. Technician
P1/P2/P3	Medical Lab. Technician
P4/P5/P6	X-ray Technician
P7/P8/P9	Ophthalmic Technician
T1/T2/T3	Repair, Maintenance & Rewinding of Electrical Motors.

**5. Eligibility for admission to B.Sc. Computer Science degree programme:**

- A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or Higher Secondary Examination of its equivalent of any other statutory Board or University and has passed in English and in two Science subjects (i) Physics (ii) Mathematics shall be eligible for admission to the First year B.Sc. (Computer Science) Degree course.
- Candidate who has passed H.S.C. examination (10+2) with English and any one of the following vocational subjects is also eligible for admission to the F.Y.B.Sc. (Computer Science) course.

<b>Subject code</b>	<b>Subject</b>
97	Information Technology
D9	Computer Science
C2	Electronics
J1/J2/J3	Electronics Technology

- Also student who has completed Diploma course in Engineering (Polytechnic) Computer Science, Electronics and Information Technology or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

### **3 : COURSE STRUCTURE (UG PROGRAMME)**

**(CBCS 2018 COURSE)**

**(To be implemented from June 2018)**

#### **3.1 : Bachelor of Arts (B.A.)**

##### **Course Structure and scheme of credits of B.A. Course**

The B.A. programme will be of three years duration consisting of six semesters and of minimum 150 Credits: Semester I (24 Credits), Semester II (26 Credits), Semester III (26 Credits), and Semester IV (24 Credits) Semester V (26 Credits), and Semester VI (24 Credits). In all six Semesters, there will be six theory courses (Core and Elective Courses) of 04 credits each and one theory course (Ability Enhancement course OR Skill Enhancement course) in Semester II, Semester III and Semester V of 02 credits each. All 36 Core and Elective Courses papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. The Ability Enhancement courses OR Skill Enhancement Courses will have 50 marks each out of which 20 marks will be for Internal Assessment and 30 marks for University Examination. Thus B.A. degree examination, six Semesters shall be of 3700 marks and of 150 credits altogether. The following shall be the course structure:

##### **F.Y.B.A.: (Semester I & II)**

A student joining the First year B.A. course shall offer six subjects mentioned below. He/she is advised to select the subjects of First Semester very carefully because he/she has to select subjects for the following semesters from the subjects offered at First Semester.

- 1) Subject in Core course is compulsory.
- 2) A student has to offer five subjects from Elective Courses given above.

F.Y.B.A. Semester I			F.Y.B.A. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	A101	1. Compulsory English – I	Core Course	A201	1. Compulsory English – II
Elective Courses	<b>Any Five from the following:</b>		Elective Courses	<b>Any Five from the following:</b>	
	A111	1. English (G1) – I		A211	1. English (G1) – II
	A121	2. Economics (G1) – I		A221	2. Economics (G1) – II
	A131	3. Marathi (G1) – I		A231	3. Marathi (G1) – II
	A141	4. Geography (G1) – I		A241	4. Geography (G1) – II
	A151	5. Political Science (G1) – I		A251	5. Political Science (G1) – II
	A161	6. Sociology (G1) – I		A261	6. Sociology (G1) – II
			Skill Enhancement Course	SEC21	Basics of Information Technology

### S.Y.B.A.

A student studying at Semester III & IV for the B.A. Degree shall study the subject as given below:

- 1) Compulsory English from Core courses.
- 2) He/she has to select one group as a special subject from the given Core courses groups and which is included in the subjects offered at the First Semester. There will be three papers of special subject.

- 3) He/she has to select two general subjects i.e. First paper in each Special Group and which is not included in Core courses and from the subjects offered at the First Semester.

### ENVIRONMENT STUDIES

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 02 lectures per week for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree Grade Sheet. It is mandatory for every student to pass this course. If any student fails in this course, the result of his/her degree course will be withheld by the university.

S.Y.B.A. Semester III			S.Y.B.A. Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	A301	1. Compulsory English – I	Core Course	A401	1. Compulsory English – II
<b>Any one group from the following</b>			Elective Courses	<b>Any one group from the following</b>	
<b>A) Special Level: English</b>			<b>A) Special Level: English</b>		
	A311	1. English (G2) – I		A411	1. English (S2) – II
	A312	2. English (G1) – I		A412	2. English (S1) – II
	A313	3. English (G3) – I		A413	3. English (S2) – II
<b>B) Special Level: Economics</b>			<b>B) Special Level: Economics</b>		
	A321	1. Economics (G2) – I		A421	1. Economics (G2) – II
	A322	2. Economics (S1) – I		A422	2. Economics (S1) – II
	A323	3. Economics (S2) – I		A423	3. Economics (S2) – II
<b>C) Special Level: Marathi</b>			<b>C) Special Level: Marathi</b>		
	A331	1. Marathi (G2) – I		A431	1. Marathi (G2) – II
	A332	2. Economics (S1) – I		A432	2. Marathi (S1) – I
	A333	3. Economics (S2) – I		A433	3. Marathi (S2) – II



Core Courses	<b>D) Special Level: Geography</b>		Core Courses	<b>D) Special Level: Geography</b>	
	A341	1. Geography (G2) – I		A441	1. Geography (G2) – II
	A342	2. Geography (S1) – I		A442	2. Geography (S1) – II
	A343	3. Geography (S2) – I		A443	3. Geography (S2) – II
	<b>B) Special Level: Political Science</b>			<b>E) Special Level: Political Science</b>	
	A351	1. Political Science (G2) – I		A451	1. Political Science (G2) – I
	A352	2. Political Science (S1) – I		A452	2. Political Science (S1) – II
	A353	3. Political Science (S2) – I		A453	3. Political Science (S2) – II
	<b>F) Special Level: Sociology</b>			<b>F) Special Level: Sociology</b>	
	A361	1. Sociology (G2) – I		A461	1. Sociology (G2) – II
	A362	2. Sociology (S1) – I		A462	2. Sociology (S1) – II
	A363	3. Sociology (S2) – I		A463	3. Sociology (S2) – II
	<b>G) Special Level: Hindi</b>			<b>G) Special Level: Hindi</b>	
	A371	1. Hindi (G2) – I		A471	1. Hindi (G2) – II
	A372	2. Hindi (S1) – I		A472	2. Hindi (S1) – II
A373	3. Hindi (S2) – I	A473	3. Hindi (S2) – II		
<b>Skill Enhancement Course</b>	<b>SEC31</b>	<b>Communication Skill in English</b>			

## T.Y.B.A.

A student studying at Semester V & VI for the Third Year B.A. Degree shall study the subjects as given below.

- 1) Compulsory English.
- 2) Five papers of the group selected as special subject.

T.Y.B.A. Semester V			T.Y.B.A. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	A501	1. Compulsory English – I	Core Courses	A601	1. Compulsory English – II
	<b>One group from the following which is concurrent with Semester III &amp; IV:</b>			<b>One group from the following which is concurrent with Semester III &amp; IV:</b>	
	A) Special Level: English			A) Special Level: English	
	A511	1. English (S3) – I		A611	1. English (S3) – II
	A512	2. English (S4) – I		A612	2. English (S4) – II
	A513	3. English (S5) – I		A613	3. English (S5) – II
	A514	4. English (S6) – I		A614	4. English (S6) – II
	A515	5. English (S7) – I		A615	5. English (S7) – II
	<b>B) Special Level: Economics</b>			<b>B) Special Level: Economics</b>	
	A521	1. Economics (S3) – I		A621	1. Economics (S3) – II
	A522	2. Economics (S4) – I		A622	2. Economics (S4) – II
	A523	3. Economics (S5) – I		A623	3. Economics (S5) – II
	A524	4. Economics (S6) – I		A624	4. Economics (S6) – II
	A525	5. Economics (S7) – I		A625	5. Economics (S7) – II
	<b>C) Special Level: Marathi</b>			<b>C) Special Level: Marathi</b>	
	A531	1. Marathi (S3) – I		A631	1. Marathi (S3) – II
	A532	2. Marathi (S4) – I		A632	2. Marathi (S4) – II
	A533	3. Marathi (S5) – I		A633	3. Marathi (S5) – II
	A534	4. Marathi (S6) – I		A634	4. Marathi (S6) – II
	A535	5. Marathi (S7) – I		A635	5. Marathi (S7) – II

T.Y.B.A. Semester V			T.Y.B.A. Semester VI				
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper		
Core Courses	<b>D) Special Level: Geography</b>		Core Courses	<b>D) Special Level: Geography</b>			
	A541	1. Geography (S3) – I		A641	1. Geography (S3) – II		
	A542	2. Geography (S4) – I		A642	2. Geography (S4) – II		
	A543	3. Geography (S5) – I		A643	3. Geography (S5) – II		
	A544	4. Geography (S6) – I		A644	4. Geography (S6) – II		
	A545	5. Geography (S7) – I		A645	5. Geography (S7) – II		
	<b>E) Special Level: Political Science</b>			<b>E) Special Level: Political Science</b>			
	A551	1. Political Science (S3) – I		A651	1. Political Science (S3) – II		
	A552	2. Political Science (S4) – I		A652	2. Political Science (S4) – II		
	A553	3. Political Science (S5) – I		A653	3. Political Science (S5) – II		
	A554	4. Political Science (S6) – I		A654	4. Political Science (S6) – II		
	A555	5. Political Science (S7) – I		A655	5. Political Science (S7) – II		
	<b>F) Special Level: Sociology</b>			<b>F) Special Level: Sociology</b>			
	A561	1. Sociology (S3) – I		A661	1. Sociology (S3) – II		
	A562	2. Sociology (S4) – I		A662	2. Sociology (S4) – II		
	A563	3. Sociology (S5) – I		A663	3. Sociology (S5) – II		
	A564	4. Sociology (S6) – I		A664	4. Sociology (S6) – II		
	A565	5. Sociology (S7) – I		A665	5. Sociology (S7) – II		
	Ability Enhancement course	<b>This paper is compulsory for all the students:</b>					
		AEC 51		Soft Skills			

### **3.2 Bachelor of Library & Information Science (B.Lib & I.Sc.)**

#### **Eligibility for admission to B.Lib. & I.Sc. Course**

Any graduate of this University or any other recognized University shall be admitted to B.Lib & I.Sc. Course.

#### **Course Structure of B.Lib & I.Sc. Course**

The B.Lib & I.Sc. programme will be of one year duration consisting of two semesters and of minimum 40 Credits: Semester I (20 Credits) and Semester II (20 Credits). In first Semester, there will be four theory papers of 04 credits each and two theory paper of 2 credit. In Second Semester, there will be three theory papers of 04 credits, three practical paers of 2 credits and one clipping project / viva voce of 2 credits. All 13 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Thus B.Lib & I.Sc. degree examination, two Semesters shall be of minimum 1250 marks and of minimum 40 credits altogether. The following shall be the course structure:

**B.Lib & I.Sc. Semester – I**

**B.Lib & I.Sc. Semester – II**

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper	
Core: Compulsory	BL 11	Foundation of Library & Information Science	Core: Com- pulsory	BL 21	Information Services & System	
	BL 12	Document Description: Cataloguing Theory		BL 22	Knowledge Organization Information Processing Classification Theory	
	BL 13	Information Sources & Reference Services		BL 23	Information Technology Basic Theory	
	BL 14	Management of Libraries & Information Centers		BL 24	Information Technology Practical	
Core: Elective	<b>Any one from the following:</b>			BL 25	Knowledge Organization Information Processing Classification Practical	
	BL 15	Library System		BL 26	Information Retrieval: Library Cataloguing Practical	
	BL 16	Public Libraries		BL 27	Information Sources & references Services : News Paper Clipping Project	
Skill Enhance ment Course	BL 17	Soft Skills				

\* For paper BL 27 Information Sources & Reference Services : News Paper Clipping Project internal evaluation is to be done by evaluation of the plan of the project submitted by the student. A student has to submit project plan with in a month from the begining of Semester II

### 3.3 : Bachelor of Science (B.Sc.)

#### F.Y.B.Sc.(Sem. I and II)

#### CORE SELECTIVE GROUPS

(SELECT ANY ONE GROUP FROM THE FOLLOWING)

Group I :- Physics, Chemistry, Mathematics and Statistics (PCMS)

Group II :- Physics, Mathematics, Statistics and Computer Application (PMSCA)

Group III :- Physics, Chemistry, Botany and Zoology (PCBZ)

Group IV :- Chemistry, Botany, Zoology and Microbiology (CBZM)

Group V: - Chemistry, Zoology, Microbiology and Geography (CZMG)

F.Y.B.Sc. Semester I			F.Y.B.Sc. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course		<b>Physics</b>	Core Course		<b>Physics</b>
	P – 11	Mechanics & Properties of Matter		P – 21	Kinetic Theory & Thermodynamics
	P – 12	Modern Physics		P -22	Electricity & Magnetism
	P – 13	Practical course – I		P – 23	Practical course - II
Core Course		<b>Chemistry</b>	Core Course		<b>Chemistry</b>
	C-11	Physical and Inorganic Chemistry – I		C-21	Physical and Inorganic Chemistry – II
	C-12	Organic and Inorganic Chemistry – I		C-22	Organic and Inorganic Chemistry - II
	C -13	Practical course – I		C – 23	Practical Course-II

Core Course		<b>Botany</b>	Core Course		<b>Botany</b>
	B –11	Plant diversity and utilization of plants – I		B –21	Plant diversity and utilization of plants – II
	B –12	Cell biology		B –22	Industrial Botany-I
	B – 13	Practical course - I		B – 23	Practical course – II
Core Course		<b>Zoology</b>	Core Course		<b>Zoology</b>
	Z – 11	Animal systematic and Functional Anatomy of Non-chordates-I		Z – 21	Functional Anatomy of Chordates-I
	Z –12	Cell Biology and Genetics		Z – 22	Applied zoology (Vermiculture and Sericulture)
	Z- 13	Practical course - I		Z- 23	Practical course – II
Core Course		<b>Microbiology</b>	Core Course		<b>Microbiology</b>
	MB-11	Introduction to Microbiology		MB-21	Microbial Nutrition, Growth and control
	MB-12	Structure of Prokaryotes and Eukaryotes		MB-22	The diversity of Microbial World
	MB-13	Practical course - I		MB- 23	Practical course – II
Core Course		<b>Mathematics</b>	Core Course		<b>Mathematics</b>
	M-11	Algebra		M-21	Analytical Geometry
	M-12	Calculus		M-22	Integral Calculus and Differential Equations
	M – 13	Practical course - I		M – 23	Practical course – II
Core Course		<b>Statistics</b>	Core Course		<b>Statistics</b>
	S-11	Descriptive Statistics - I		S-21	Descriptive Statistics-II
	S-12	Discrete Probability and Probability Distributions - I		S-22	Discrete Probability and Probability Distributions- II
	S- 13	Practical course - I		S- 23	Practical course – II

Core Course		Geography	Core Course		Geography
	G -11	Physical Geography - I		G -21	Physical Geography – II
	G – 12	Climatology - I		G – 22	Oceanography
	G- 13	Practical course - I		G- 23	Practical course – II
Core Course		<b>Computer Application</b>	Core Course		<b>Computer Application</b>
	CA-11	Computer Fundamentals		CA-21	Operating Environment
	CA-12	Programming in C -I		CA-22	Programming in C -II
	CA- 13	Practical course - I		CA- 23	Practical course – II
				<b>This course is compulsory for all the students.</b>	
			Core Course	UG-SEC-21	Renewable Energy And Energy Harvesting

## S.Y.B.SC. (SEM. III AND IV)

### CORE SELECTIVE GROUPS

(SELECT ANY ONE GROUP FROM THE FOLLOWING)

Group I :- Physics, Chemistry and Mathematics (PCM)

Group V :- Chemistry, Botany and Zoology (CBZ)

Group VI :- Chemistry, Botany and Microbiology (CBM)

Group VII :- Chemistry, Zoology and Microbiology (CZM)

### ENVIRONMENT STUDIES

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 02 lectures per week for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree Grade Sheet. It is mandatory for every student to pass this course. If any student fails in this course, the result of his/her degree course will be withheld by the university.



**Semester III**

**Semester IV**

**(From the Academic Year 2019-20)**

<b>Subject Type</b>	<b>Code</b>	<b>Title of the paper</b>	<b>Subject Type</b>	<b>Code</b>	<b>Title of the paper</b>
Core: Course		<b>Physics</b>	Core: Course		<b>Physics</b>
	P – 31	Mathematical Methods for Physics		P – 41	Waves & Oscillations
	P – 32	Optics		P – 42	Electronics
	P – 33	Practical Course - III		P – 43	Practical Course - III
Core: Course		<b>Chemistry</b>	Core: Course		<b>Chemistry</b>
	C – 31	Physical and Analytical Chemistry - I		C – 41	Physical and Analytical Chemistry - II
	C – 32	Organic and Inorganic Chemistry - III		C – 42	Organic and Inorganic Chemistry - IV
	C – 33	Practical Course - III		C – 43	Practical Course - IV
Core : Course		<b>Botany</b>	Core: Course		<b>Botany</b>
	B - 31	Plant anatomy & Embryology		B – 41	Plant Biotechnology
	B – 32	Angiosperm Taxonomy		B – 42	Plant Physiology
	B – 33	Practical Course - III		B – 43	Practical Course - IV
Core: Course		<b>Zoology</b>	Core: Course		<b>Zoology</b>
	Z – 31	Functional Anatomy of Non-chordates - II and Biodiversity		Z – 41	Functional Anatomy of chordates - II
	Z – 32	Histology of Mammals		Z – 42	Physiology of Mammals
	Z – 33	Practical Course - III		Z – 43	Practical Course - IV

Core: Course		<b>Microbiology</b>	Core: Course		<b>Microbiology</b>
	MB – 31	Microbial Metabolism		MB – 41	Principles of Disease, Epidemiology and Immunology
	MB – 32	Bacterial Genelics		MB – 42	Applied Microbiology
	MB – 33	Practical Course - III		MB – 43	Practical Course - IV
Core: Course		<b>Mathematics</b>	Core: Course		<b>Mathematics</b>
	M – 31	Calculus of Several Variables		M – 41	Vector Calculus
	M – 32	Group Theory and Differential Equations		M – 42	Complex variables
	M – 33	Practical Course - III		M – 43	Practical Course - IV
Core: Course		<b>Statistics</b>	Core: Course		<b>Statistics</b>
	S – 31	Probability Distributions And Statistical Inference - I		S – 41	Probability Distributions And Statistical inference - II
	S – 32	Probability Distributions And Statistical Methods - I		S – 42	Probability Distributions And Statistical Methods - II
	S – 33	Practical Course - III		S – 43	Practical Course - IV
Core: Course		<b>Geography</b>	Core: Course		<b>Geography</b>
	G – 31	Human Geography - I		G – 41	Human Geography - II
	G – 32	Biogeogralhy - I		G – 42	Biogeogralhy - II
	G – 33	Practical Course - III		G – 43	Practical Course - IV
Core: Course		<b>Computer Application</b>	Core: Course		<b>Computer Application</b>
	CA – 31	Advanced C Concepts - I		CA – 41	Advanced C Concepts - II
	CA – 32	Digital Electronics - I		CA – 42	Digital Electronics - II
	CA – 33	Practical Course - III		CA – 43	Practical Course - IV
Electiv e Course	<b>Any of the following.</b>		Electiv e Course	<b>Any of the following.</b>	
	ENG – 31	English - I		ENG – 41	English - II
	MAR – 32	Marathi - I		MAR – 42	Marathi - II
SEC*	<b>This course is compulsory for all the students.</b>				
	UG – SEC 31	Medical Dignostics			

## T.Y.B.Sc. (Sem. V and VI)

The student should select any one subject from the core group which he / she has opted at S.Y.B.Sc. (Semester III and IV) as Principle subject.

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses		<b>Physics</b>	Core Courses		<b>Physics</b>
	P-51	Mathematical Methods in Physics		P-61	Classical Electrodynamics
	P-52	Quantum Mechanics		P-62	Atomic and Molecular Physics
	P-53	Solid State Physics		P-63	Nuclear Physics
	P-54	Advanced Electronics		P-64	Computational Physics
	P-55	Classical Mechanics		P-65	Thermodynamics & Statistical Physics
	P-56	Practical Course – V		P-66	Practical Course – VIII
	P-57	Practical Course – VI		P-67	Practical Course – IX
	P-58	Practical Course - VII		P-68	Practical Course - X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	P-59A	Elements of Materials Science		P-69A	Renewable Energy sources
	P-59B	Medical Electronics		P-69B	Physics of Nano Materials
	P-59C	Digital Electronics I		P-69C	Digital Electronics II

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses		<b>Chemistry</b>	Core Courses		<b>Chemistry</b>
	C-51	Physical Chemistry –I		C-61	Physical Chemistry-II
	C-52	Inorganic Chemistry – I		C-62	Inorganic Chemistry-II
	C-53	Organic Chemistry – I		C-63	Organic Chemistry-II
	C-54	Analytical Chemistry – I		C-64	Analytical Chemistry-II
	C-55	Industrial Chemistry - I		C-65	Industrial Chemistry-II
	C-56	Practical Course – V		C-66	Practical Course – VIII
	C-57	Practical Course – VI		C-67	Practical Course – IX
	C-58	Practical Course - VII		C-68	Practical Course - X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	C – 59A	Environment Chemistry-I		C – 69A	Environment Chemistry-II
	C – 59B	Nuclear Chemistry-I		C – 69B	Nuclear Chemistry-II
	C – 59C	Polymer Chemistry-I		C – 69C	Polymer Chemistry-II
T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Core Courses		<b>Botany</b>	Core Courses		<b>Botany</b>
	B –51	Biology of lower cryptogams(Algae & Fungi)		B –61	Biology of higher cryptogams (Bryophytes & Pteridophytes )
	B –52	Biology of seed plants (Angiosperms)		B –62	Biology of seed plants (Gymnosperms & Paleobotany)
	B –53	Plant pathology and Plant protection		B –63	Environmental Botany
	B –54	Genetics and Biostatistics		B –64	Palynology & Plant breeding
	B –55	Molecular biology and Biochemistry		B –65	Industrial botany II
	B-56	Practical Course – V		B-66	Practical Course – VIII
	B -57	Practical Course – VI		B -67	Practical Course – IX
	B - 58	Practical Course - VII		B - 68	Practical Course - X
<b>* Ability Enhancement</b>		<b>UG AEC – 51</b>		<b>Soft Skills</b>	

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	B- 59A	Aerobiology		B- 69A	Horticulture & Gardening
	B - 59B	Medico Botany		B - 69B	Phaemacognosy
	B - 59C	Conservation of Medicinal Plants		B - 69C	Seed Technology
Core Courses		<b>Zoology</b>	Core Courses		<b>Zoology</b>
	Z - 51	Developmental Biology		Z - 61	General Embryology
	Z - 52	Genetics and evolution		Z - 62	Toxicology
	Z - 53	Applied Zoology- Apiculture and Inland fisheries		Z - 63	Biological Techniques
	Z - 54	Parasitology		Z - 64	Functional Anatomy of Chordates-III
	Z - 55	Ecology and environmental pollution		Z - 65	Economic Entomology
	Z-56	Practical Course - V		Z-66	Practical Course - VIII
	Z -57	Practical Course - VI		Z -67	Practical Course - IX
	Z - 58	Practical Course - VII		Z - 68	Practical Course - X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	Z- 59A	Biochemistry and Molecular Biology		Z- 69A	Biotechnology
	Z - 59B	Comparative anatomy of Chordates and Micro- techniques		Z - 69B	Biostatistics
	Z - 59C	Evolution		Z - 69C	Biodiversity and wild Life
Core Courses		<b>Microbiology</b>	Core Courses		<b>Microbiology</b>
	MB 51	Medical Microbiology		MB 61	Chemotherapy and Biomedical instrumentation
	MB 52	Clinical Pathology		MB 62	Immunology
	MB 53	Virology		MB 63	Biotechnology
	MB 54	Genetics of Prokaryotes		MB 64	Genetics of Eukaryotes and Gene Manipulation
	MB 55	Enzyme Kinetics and Regulation		MB 65	Microbial Metabolism and Biochemical Evolution
	MB -56	Practical Course - V		MB -66	Practical Course - VIII
	MB -57	Practical Course - VI		MB -67	Practical Course - IX
	MB - 58	Practical Course - VII		MB - 68	Practical Course - X

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	MB-59A	Food and diary Microbiology		MB-69A	Agricultural and Environmental Microbiology.
	MB-59B	Applied Microbiology-I		MB-69B	Applied Microbiology-II
	MB-59C	Advance Techniques in Microbiology-I		MB-69C	Advanced Techniques in Microbiology-II
Core Courses	<b>Mathematics</b>		Core Courses	<b>Mathematics</b>	
	M-51	Real Analysis- I		M-61	Real Analysis- II
	M-52	Abstract Algebra – I		M-62	Abstract Algebra – II
	M-53	Discrete Mathematics –I		M-63	Discrete Mathematics –II
	M-54	Differential Geometry-I		M-64	Differential Geometry-II
	M-55	Computer Programming and Applications –I		M-65	Computer Programming and Applications –II
	M-56	Practical Course – V		M-66	Practical Course – VIII
	M-57	Practical Course – VI		M-67	Practical Course – IX
	M-58	Practical Course - VII		M-68	Practical Course - X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	M-59A	Mechanics(statics)		M-69A	Operation Research-II
	M-59B	Operation Research-I		M-69B	Mechanics(Dynamics)
	M-59C	Special Functions-I		M-69C	Special Functions-II
Core Courses	<b>Statistics</b>		Core Courses	<b>Statistics</b>	
	S-51	Distribution Theory - I		S-61	Distribution Theory - II
	S-52	Statistical Inference - I		S-62	Statistical Inference - II
	S-53	Sampling Methods and Design of Experiments-I		S-63	Sampling Methods and Design of Experiments-II
	S-54	Applied Statistics(A)-I		S-64	Applied Statistics(A)-II
	S-55	Applied Statistics(B)-I		S-65	Applied Statistics(B)-II
	S-56	Practical Course – V		S-66	Practical Course – VIII
	S-57	Practical Course – VI		S-67	Practical Course – IX
	S-58	Practical Course - VII		S-68	Practical Course - X

T.Y.B.Sc. Semester V			T.Y.B.Sc. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	S – 59A	Computer Programming. 'C' Programming (Turbo C)-I		S-69A	Computer Programming. 'C' Programming (Turbo C)-II
	S – 59B	Principles of Computer Science-I		S-69B	Principles of Computer Science-II
	S – 59C	Statistical Ecology		S – 69C	Medical Statistics
Core Courses	<b>Geography</b>		Core Courses	<b>Geography</b>	
	G -51	World Regional Geography-I		G-61	World Regional Geography-II
	G-52	Geography of India-I		G-62	Geography of India-II
	G-53	Resources and environment-I		G-63	Recourses and Environment-II
	G-54	Economic Geography-I		G-64	Economic Geography-II
	G-55	Applied Geography-I		G-65	Applied Geography-II
	G-56	Practical Course – V		G- 66	Practical Course – VIII
	G-57	Practical Course – VI		G-67	Practical Course – IX
	G- 58	Practical Course - VII		G- 68	Practical Course - X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	G-59A	Geography of Water Resources-I		G -69A	Geography of Water Resources-II
	G-59B	Geography of Soils-I		G-69B	Geography of Soils-II
	G-59C	Population Geography-I		G-69C	Population Geography-II
Core Courses	<b>Computer Application</b>		Core Courses	<b>Computer Application</b>	
	CA -51	Operating System-I		CA -61	Operating System-II
	CA -52	Visual basic. Net programming-I		CA -62	Visual basic. Net programming-II
	CA -53	Software Engineering -I		CA -63	Software Engineering-II
	CA -54	Database Management System-I		CA -64	Database Management System-II
	CA -55	Data and File structure-I		CA -65	Data and File structure-II
	CA- 56	Practical Course – V		CA- 66	Practical Course-VIII
	CA-57	Practical Course – VI		CA-67	Practical Course-IX
	CA- 58	Practical Course - VII		CA- 68	Practical Course-X
Elective Course	<b>Any one of the following.</b>		Elective Course	<b>Any one of the following.</b>	
	CA-59A	Computer Networks-I		CA-69A	Computer Networks-II
	CA-59B	Internet Programming-I		CA-69B	Internet Programming-II
	CA-59C	Theoretical computer science-I		CA-69C	Theoretical computer science-II

### 3.4 : Bachelor of Computer Science B.Sc. (Computer Science)

#### F.Y.B.Sc. (Computer Science):

F.Y.B.Sc. Semester I			F.Y.B.Sc. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	CS -11	Introduction to RDBMS	Core Course	CS -21	RDBMS using oracle
	CS -12	Programming in C - I		CS -22	Programming in C - II.
	CS -13	Mathematical Foundation of Computer Science		CS -23	Graph Theory
	CS -14	Algebra -I		CS -24	Algebra-II
	CS -15	Principles of Analog Electronics - I		CS -25	Principles of Analog Electronics - II
	CS-16	Principles of Digital Electronics -I		CS -26	Principles of Digital Electronics -II
Core Practical	CS PI	Computer Science Practical - I	Core Practical	CS PIII	Computer Science Practical - III
	CS PII	Computer Science Practical - II		CS PIV	Computer Science Practical - IV
	CS EI	Electronics Practical -I		CS EII	Electronics Practical -II
Elective Courses	<b>Any Two from the following:</b>		Elective Courses	<b>Any Two from the following:</b>	
	CS -17	Computer Oriented Statistical Techniques -I		CS -27	Computer Oriented Statistical Techniques - II
	CS-18	Compulsory English -I		CS-28	Compulsory English -II
	CS-19	Elementary Algorithmics		CS-29	Operating Environment
			<b>This paper is compulsory for all the students:</b>		
			<b>Skill Enhancement course</b>	<b>UGSEC -21</b>	<b>HTML Programming</b>



## S.Y.B.Sc. (Computer Science):

### Semester III

### Semester IV

Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Course	CS -31	Object Oriented Programming with C++	Core Course	CS -41	Data Structures using C++
	CS -32	Introduction to Net using C#		CS -42	ASP.Net
	CS -33	Linear Algebra		CS -43	Computational Geometry
	CS -34	Computer Oriented Numerical Methods		CS -44	Optimization Techniques
	CS -35	Digital systems and Microprocessors		CS -45	8051 Microcontroller
	CS-36	Principles of Communication		CS -46	Analog Systems
Core Practical	CS PV	Computer Science Practical - V	CS PVII	Computer Science Practical - VII	
	CS PVI	Computer Science Practical - VI	CS PVIII	Computer Science Practical - VIII	
	CS EIII	Electronics Practical -III	CS EIV	Electronics Practical -IV	
Elective Courses	<b>Any One from the following:</b>		Elective Courses	<b>Any One from the following:</b>	
	CS - 37	Cloud Computing - I		CS - 47	Cloud Computing - II
	CS - 38	Data warehousing and data mining - I		CS - 48	Data warehousing and data mining - II
Skill Enhancement Course	<b>This paper is compulsory for all the students:</b>				
	UGSE C - 31	Programming in Python			

### Environment Studies

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 50 lectures for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree marksheet. If any student fails in this course, the result of his/her degree course will be withheld by the university.

### T.Y.B.Sc. (Computer Science):

T.Y.B.Sc.Comp.Sci. Semester V			T.Y.B.Sc.Comp.Sci. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	CS -51	System Programming	Core Courses	CS -61	Linux Programming
	CS -52	Internet Technologies - I		CS -62	Internet Technologies – II
	CS -53	Theoretical Computer Science		CS -63	Compiler Construction
	CS -54	Programming in JAVA -I		CS -64	Programming in JAVA II
	CS -55	Software Engineering		CS -65	Unified Modeling Language
	CS-PIX	Computer Science Practical–IX		CS -PXII	Computer Science Practical – XII
	CS-PX	Computer Science Practical–X		CS PXIII	Computer Science Practical – XIII
	CS-PXI	Computer Science Practical–XI		CS -PXIV	Computer Science Practical – XIV
	CS-M	Mini Project -I		CS -M	Mini Project -II
Elective Courses	<b>Any One from the following:</b>		Elective Courses	<b>Any One from the following:</b>	
	CS -56	Data Communication and Networking -I		CS -56	Data Communication and Networking-II
	CS -57	Data Analytics -I		CS -57	Data Analytics -II
	CS -58	Research in Computer Science -I		CS -58	Research in Computer Science -II
Ability enhancement compulsory course	<b>This paper is compulsory for all the students:</b>				
	UG AEC - 51	Soft Skills			

### **3.5 : Bachelor of Commerce (B.Com.)**

#### **1. Course Structure and Scheme of Credits of B. Com. Course:**

The B. Com. programme will be of three years duration consisting of six semesters and of minimum 158 credits: Semester I (28 Credits), Semester II (30 Credits), Semester III (26 Credits), and Semester IV (24 Credits) Semester V (26 Credits), and Semester VI (24 Credits). In Semester I and II there will be seven theory papers (Core and Elective Courses) and Semester III to VI, there will be six theory papers (Core and Elective Courses) of 4 credits each. In addition, there will be one theory course (Ability enhancement or skill enhancement course) each in Semester II, Semester III and Semester V of 2 credits each. All 38 (Core and Elective Courses) papers will have 100 marks each out of which 40 marks will be for Continuous Assessment and 60 marks for University Examination. All Ability enhancement or skill in enhancement course will have 50 marks each out of which 20 marks will be for Continuous Assessment and 30 marks for University Examination. Thus, B. Com. Degree examination, six Semesters shall be of 3950 marks and of 158 credits altogether.

A student joining B. Com. Course should note that subjects in Core Courses are compulsory. In addition, he has to offer any subject or any one group from the Elective Courses. Fundamental Course is compulsory for all the students.

The following shall be the course structure :

F.Y.B.Com. Semester I			F.Y.B.Com. Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	C101	Compulsory English I	Core Courses	C201	Compulsory English II
	C108	Financial Accounting I		C208	Financial Accounting II
	C104	Business Economics I		C204	Business Economics II
	C105	Geography of Resources I		C205	Geography of Resources II
Elective Courses	<b>To choose any one of the following:</b>		Elective Courses	<b>To choose any one of the following:</b>	
	C106	Business Mathematics & Statistics I		C206	Business Mathematics & Statistics II
	C107	Computer Application in Business I		C207	Computer Application in Business II
	<b>To choose any one of the following:</b>			<b>To choose any one of the following:</b>	
	C111	Corporate Law I		C211	Corporate Law II
	C121	Banking and Insurance I		C221	Banking and Insurance II
	C131	Marketing I		C231	Marketing II
	<b>To choose any one of the following:</b>			<b>To choose any one of the following:</b>	
	C102	Additional English I		C202	Additional English II
	C103	Marathi I		C203	Marathi II
			Skill Enhancement Course	SEC 21	Basics of Information Technology

**S.Y. B.Com. Semester III**

**S.Y. B.Com. Semester IV**

<b>Subject Type</b>	<b>Code</b>	<b>Title of the paper</b>	<b>Subject Type</b>	<b>Code</b>	<b>Title of the paper</b>
Core Courses	C308	Corporate Accounting I	Core Courses	C408	Corporate Accounting II
	C309	Communication Skills I		C409	Communication Skills II
	C310	Principal of Business Management I		C410	Principles of Business Management II
	C304	Business Economics III		C404	Business Economics IV
Elective Courses	<b>To choose any one of the following:</b>		Elective Courses	<b>To choose any one of the following:</b>	
	C311	Corporate Law III		C411	Corporate Law IV
	C321	Banking and Insurance III		C421	Banking and Insurance IV
	C331	Marketing III		C431	Marketing IV
	<b>To choose any one of the following:</b>			<b>To choose any one of the following:</b>	
	C341	Cost Management Accounting I		C441	Cost Management Accounting II
	C351	Business Entrepreneurship I		C451	Business Entrepreneurship II
	C361	E - Commerce I		C461	E - Commerce II
	C371	Business Administration I		C471	Business Entrepreneurship II
<b>Skill Enhancement Course</b>	<b>SEC 31</b>	<b>Women Empowerment &amp; Social Justice</b>			

T.Y.B.Com. Semester V			T.Y.B.Com. Semester VI		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Courses	C508	Corporate Accounting III	Core Courses	C608	Corporate Accounting IV
	C512	International Economics I		C604	International Economics II
Elective Course	<b>To choose any one of the following:</b>		Elective Course	<b>To choose any one of the following:</b>	
	C513	Auditing & Taxation I		C612	Auditing & Taxation II
	C504	Business Regulatory Framework I		C613	Business Regulatory Framework II
	<b>To choose any one of the following:</b>			<b>To choose any one of the following:</b>	
	C511	Corporate Law V		C611	Corporate Law VI
	C521	Banking and Insurance V		C621	Banking and Insurance VI
	C531	Marketing V		C631	Marketing VI
	<b>To choose any one Group of the following:</b>			<b>To choose any one Group of the following:</b>	
	<b>Group A</b>			<b>Group A</b>	
	C541	Cost & Management Accounting III		C641	Cost & Management Accounting V
	C542	Cost & Management Accounting IV		C642	Cost & Management Accounting VI
	<b>Group B</b>			<b>Group B</b>	
	C551	Business Entrepreneurship III		C651	Business Entrepreneurship V
	C552	Business Entrepreneurship IV		C652	Business Entrepreneurship VI
	<b>Group C</b>			<b>Group C</b>	
	C561	E-Commerce III		C661	E-Commerce V
	C562	E-Commerce IV		C662	E-Commerce VI
	<b>Group D</b>			<b>Group D</b>	
	C571	Business Administration III		C671	Business Administration V
	C572	Business Administration IV		C672	Business Administration VI
Ability Enhancement Course	<b>This paper is compulsory for all the students.</b>				
	AEC 51	Soft Skills			

## 4 : SCHEME OF EXAMINATION (2018 Course)

### FOR ALL UNDERGRADUATE PROGRAMMES

#### ● **University Terms**

The dates for the commencement and conclusion of the First and the Second terms shall be fixed by the University authorities. The terms can be kept by students, who have registered their names with the University.

#### ● **Scheme of Examination**

The assessment of students in the academic session 2018-19 and thereafter shall be based on-

- (a) University Examinations (UE)
- (b) Internal Assessment (IA)
- (c) Choice Based Credit System (CBCS) and
- (d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average System (CGPA).

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 4 credits will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

- |   |          |
|---|----------|
| a) Attendance                                 | 10 Marks |
| b) Home Assignment/Tutorial/Test/Presentation | 15 Marks |
| c) Mid Semester Examination                   | 15 Marks |

#### ● **Practical : (Applicable to Commerce Faculty only)**

There shall be compulsory practical examination of 10 marks for B.Com. degree for all Elective Courses at the end of each semester but before UE. The practical examination will be based on the following:

- a) Journal : 5 Marks
- b) Oral : 5 Marks

Students should note that there is separate heads of passing in practical examination for B. Com.

The 60 marks in UE of the Elective Courses having practical will be converted into 50 marks.

#### ● **Diploma in Marketing and Diploma in Banking (along with to B.Com. Degree): (Applicable to Commerce Faculty only)**

A student admitted for B. Com. Semester I and opted for Marketing or Banking and Insurance as one of the elective courses, shall enroll himself/herself for Diploma in

Marketing or Diploma in Banking as the case may be. He/She has to apply for Diploma in the prescribed form. The duration of the Diploma is of three years and can be completed along with with B. Com. degree. The medium of instruction and examination shall be English.

For successful completion of the Diploma -

1. A student has to complete all practicals in Semester I, II, III and IV while in Semester V and VI he/she has to complete project report under the supervision of the concerned subject teacher.
2. The evaluation of project and viva voce examination shall be done by marks only and then it will be converted into grade in the ten point scale and awarded the same to the student.
3. A student shall have to obtain minimum 40% marks in project evaluation and viva voce taken together.

After successful completion of the diploma course, separate Diploma will be conferred on the students in the convocation of the University.

#### ● **Standard of Passing**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weightage for performance at UE and IA shall be 60% and 40% respectively.



GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

● **Formula to Calculate Grade Points (GP)**

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max} / 10$  (since we have adopted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula  $SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$  where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula  $CGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$ , where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimal place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA

% Marks (CGPA) =	$10 \times CGPA - 10$	if $5.00 \leq CGPA \leq 6.00$
	$5 \times CGPA + 20$	if $6.00 \leq CGPA \leq 8.00$
	$10 \times CGPA - 20$	if $8.00 \leq CGPA \leq 9.00$
	$20 \times CGPA - 110$	if $9.00 \leq CGPA \leq 9.50$
	$40 \times CGPA - 300$	if $9.50 \leq CGPA \leq 10.00$

- **Award of Honours**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Equivalent Range of Marks (%)	Final Grade	Performance Descriptor	Final Class
$9.50 \leq \text{CGPA} \leq 10.00$	$80 \leq \text{Marks} \leq 100$	O	Outstanding	First Class with Distinction
$9.00 \leq \text{CGPA} \leq 9.49$	$70 \leq \text{Marks} < 80$	A+	Excellent	
$8.00 \leq \text{CGPA} \leq 8.99$	$60 \leq \text{Marks} < 70$	A	Very Good	First Class
$7.00 \leq \text{CGPA} \leq 7.99$	$55 \leq \text{Marks} < 60$	B+	Good	Higher Second Class
$6.00 \leq \text{CGPA} \leq 6.99$	$50 \leq \text{Marks} < 55$	B	Average	Second Class
$5.00 \leq \text{CGPA} \leq 5.99$	$40 \leq \text{Marks} < 50$	C	Satisfactory	Pass Class
CGPA Below 5.00	Marks Below 40	F	Fail	Fail

- **Gracing**

The gracing shall be done as per existing rules of the University.

- **Verification and Revaluation**

There is a provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

- **Rule for ATKT**

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidate should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects. However, he/she should have clear all the papers at Semester I & II when he/she is admitted to Semester V.

- **Span Period to Qualify a Degree**

As per the guidelines issued by the University Grants Commission (UGC) on "Determination of Uniform Span Period within which a student may be allowed to Qualify for a Degree", a student has to qualify for a degree within the period prescribed by the UGC. If a student could not, he/she will be allowed two more years beyond the prescribed period.

In exceptional cases, further extension of one more year may be considered by the University. This is applicable to those students who will be admitted from the academic year 2016-17 onwards as per the Notification (No. 775 dated 14/12/2015) issued by Bharati Vidyapeeth University.

- **Format of the Transcript**

A student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details.

## **5. : ELIGIBILITY FOR ADMISSION TO POST GRADUATE PROGRAMMES**

### **Choice Based Credit System (CBCS) (2018 Course)**

**1. Eligibility for admission to M.A. (English) Course:**

Any graduate of this University or any other recognized University shall be admitted to M.A. (English) Course.

**2. Eligibility for admission to M.A. (Economics) Course:**

Any graduate of this University or any other recognized University shall be admitted to B.A. (Economics) Course.

**3. Eligibility for admission to M.Lib. & I.Sc Course:**

Any graduate of this University or any other recognized University shall be admitted to B.A. (Economics) Course.

**4. Eligibility for admission to M.Sc. (Chemistry) Course:**

A student shall be eligible for admission to the First Year M.Sc (Analytical/Organic/Inorganic Chemistry) degree course who has completed B.Sc (Chemistry) graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

**5. Eligibility for admission to M.Sc. (Microbiology) Course:**

**A candidate who has passed the**

- Bachelor of Science from any recognized university with Microbiology as Principle subject (Major) or Microbiology (Honors).
- Bachelor of Science from any recognized university with Botany/Zoology/Biochemistry/Biotechnology/Environmental science as major subjects with Microbiology as subsidiary subject.
- Bachelor of Science from any recognized university with Microbiology as one of the subjects.
- The candidate who has secured aggregate of 50% marks (45 % marks in case of SC/ST) in the graduate course as well as in the Microbiology Subject shall be eligible for admission to the First Year M.Sc. degree course.

**6. Eligibility for admission to M.Sc. (Computer Science) Course:**

A student shall be eligible for admission to the First Year M.Sc. (Computer Science) degree course who has completed B.Sc.(Computer Science) / B.Sc(Computer application )/B.Sc.(IT)graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

**7. Eligibility for admission to M.Com. Course:**

A candidate who has passed the B. Com. or B.B.A. of this University or any other recognised university or any graduate of this or any other recognised university shall be permitted to take admission to the M. Com. degree course of this University.

## 6 : Course Structure (PG Programme)(CBCS 2018 COURSE)

### 6.1 : Master of Arts (M.A. English)

#### 1. Course Structure of M.A. (English) Course:

The M.A. programme will be of two years duration consisting of four semesters and of minimum 70 Credits: Semester I (16 Credits), Semester II (18 Credits), Semester III (18 Credits), and Semester IV (18 Credits). In first three Semesters, there will be four theory papers of 04 credits each. In Fourth Semester, there will be three theory papers of 06 credits and one research project of 10 credits. All 16 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. All Ability enhancement or skill enhancement courses will have 50 marks each, out of which 20 marks will be for continuous assessment and 30 marks for university examination. Thus M.A. English degree examination, four Semesters shall be of minimum 1700 marks and of minimum 70 credits altogether. The following shall be the course structure:

**M.A. English: First Year** The M.A. programme will be of two years duration consisting

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGEN G 11	Literature in English from 1550 to 1832 – I	Core: Compulsory	PGENG 21	Literature in English from 1550 to 1832 – II
	PGEN G 12	Introduction to the Study of English Language – I		PGENG 22	Introduction to the Study of English Language – II
	PGEN G 13	English Language and Literature Teaching – I		PGENG 23	English Language and Literature Teaching – II
Core: Elective	<b>Any one from the following:</b>		Core: Elective	<b>Any one from the following:</b>	
	PGEN G 14	a) Postcolonial Literature – I		PGENG 24	a) Postcolonial Literature – II
	PGEN G 15	b) Linguistics and Stylistics – I		PGENG 25	b) Linguistics and Stylistics – II
	PGEN G 16	c) American Literature: 19th Century – I		PGENG 26	c) American Literature: 19th Century – II
	PGEN G 17	d) Indian Literature in English Translation – I		PGENG 27	d) Indian Literature in English Translation – II
			Ability Enhancement Course	PGAEC 11	English for Specific Purposes

Semester III			Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGEN G 31	Literature in English from 1832 to 1980 – I	Core: Compulsory	PGENG 41	Literature in English from 1832 to 1980 – II
	PGEN G 32	Contemporary Critical Thoughts – I		PGENG 42	Contemporary Critical Thoughts – II
	PGEN G 33	Research Methodology – I		PGENG 43	Research Methodology – II (Project Report)
Core: Elective	<b>Any one from the following:</b>		Core: Elective	<b>Any one from the following:</b>	
	PGEN G 34	a) Postcolonial Indian English Literature – I		PGENG 44	a) Postcolonial Indian English Literature – II
	PGEN G 35	b) Semantics and Pragmatics – I		PGENG 45	b) Semantics and Pragmatics – II
	PGEN G 36	c) Contemporary American Literature and Culture – I		PGENG 46	c) Contemporary American Literature and Culture – II
	PGEN G 37	d) World Classics in English Translation – I		PGENG 47	d) World Classics in English Translation – II
Skill Enhancement Course	PGSEC 31	Soft Skills			

## 2. Scheme of Examination:

The Assessment of Regular students of Master of Arts (M.A.) English course in the academic session 2018-19 and after, shall be based on

- University Examinations,
- Internal Assessment,
- Choice Based Credit System, and
- Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

#### **Research Project Work:**

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

#### **Division of Marks**

Synopsis with working bibliography (Internal Assessment)	: 40 Marks
A full Project Report (Minimum 50-80 pages) (University Assessment)	: 40 Marks
Viva Voce (University Assessment)	: 20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 06 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University.

The candidate has to submit the project 15 days before the commencement of the fourth semester university examination. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidence to be endorsed by the Head or Guide.



### 3. Standard of Passing:

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.A. (English) with the following honours.

CGPA in [4.00, 4.99] -- Pass Class

CGPA in [5.00, 5.49] -- Second Class

CGPA in [5.50, 5.99] -- Higher Second Class

CGPA in [6.00, 7.99] -- First Class

CGPA in [8.00, 10.00] -- First Class with Distinction

### 4. Scheme of credits:

Four hours per week teaching in one semester will lead to four credits and research project will carry 06 credits.

### 5. Grade point scheme:

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,69.9]	A	8.0
[60.0,64.9 ]	B+	7.0
[ 55.0,59.9]	B	6.0
[ 50.0,54.9]	C+	5.5
[ 45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5

### GRACING:

The gracing shall be done as per existing rules of the University.

### VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

## **6.1 : Master of Arts (M.A.) Economics (CBCS 2019 Course)** **(Under : The Faculty of Arts, Social Sciences and Commerce)**

The M.A. Economics degree course provides an opportunity to acquire advanced knowledge in the main areas of Economics.

### **1. Course Structure of Objectives of the course:**

The Post Graduate Degree Programm M.A. (Economics), provides an opportunity to acquire in-depth knowledge of advance economic theories with a view to develop analytical skills for applying these theories to current economic problems in India and abroad.

### **Eligibility for admission to M.A. (Economics) Course:**

Any graduate of this university or any other recognized university shall be admitted to M.A. (Economics) Course. However, a student who has a degree other than Economics as a special subject shall have to clear the entrance test conducted by the department.

### **Medium of Instructions:**

The medium of instructions of M.A. (Economics) Course will be in English only.

### **Course Structure of M.A. (Economics) Course:**

The M.A. Economics course will be of two years duration consisting of two separate parts i.e. Part – I and Part – II. There will be four papers in each year i.e. Part – I and Part – II. All 08 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Skill and Ability Enhancement Courses having (50 + 50 = 100 marks) Thus M.A. Economics degree examination, Part – I and Part – II shall be of 900 marks. The following shall be the course structure:

### M.A. Economics: Part – I

Code	Title of the paper	Maximum Marks		
		Internal Assessment	University Examination	Total
ECO 11	Micro Economic Analysis	40	60	100
ECO 12	Public Economics	40	60	100
ECO 13	Agricultural Economics	40	60	100
<b>Any one from the following:</b>				
ECO 14	a) Industrial Economics	40	60	100
ECO 15	b) Financial Institutions and Markets	40	60	100
Ability Enhancement Course	Fundamental of Investments (Semester II)	20	30	50

### M.A. Economics: Part – II

Code	Title of the paper	Maximum Marks		
		Internal Assessment	University Examination	Total
ECO 21	Macro Economic Analysis	40	60	100
ECO 22	International Economics	40	60	100
ECO 23	Research Methodology	40	60	100
<b>Any one from the following:</b>				
ECO 24	a) Economics of Growth and Development	40	60	100
ECO 25	b) Demography	40	60	100
Skill Enhancement Course	Consumer Protection (Semester III)	20	30	50

**(Note: Special paper for second year will be from the same group as chosen by the student in Part – I. In the column M. A. Economics Part I title of the papers are for the semester-I as well as for Semester II and at the same time in the column M. A. Economics Part II title of the papers are the same for the semester III and Semester IV)**

## 1. Scheme of Examination:

The Assessment of Regular students of Master of Arts (M.A.) Economics course in the academic session 2019-20 and after, shall be based on

- (a) University Examinations,
- (b) Internal Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

### Research Project Work :

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

### Division of Marks :

Synopsis with working bibliography (Internal Assessment)	:	40 Marks
A full Project Report (Minimum 50-80 pages) (University Assessment)	:	40 Marks
Viva Voce (University Assessment)	:	20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 06 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University.

The candidate has to submit the project report before the deadline announced by the department. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidences to be endorsed by the Head or the Guide.

## 2. Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

Even a student fails in IA, he/she shall be declared 'pass' in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the student passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### 3. Formula to Calculate Grade Points (GP):

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max}/10$  (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of a student when he/she completes the programme is the final result of the student.

The SGPA is calculated by the formula  $\text{SGPA} = \frac{\sum C_k \times \text{GP}_k}{\sum C_k}$ , where  $C_k$  is the credit-value assigned to a course and  $\text{GP}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula  $\text{CGPA} = \frac{\sum C_k \times \text{GP}_k}{\sum C_k}$ , where  $C_k$  is the credit-value assigned to a course and  $\text{GP}_k$  is the GPA obtained by the student in

the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimal place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	$10 \times \text{CGPA} - 10$	if $5.00 \leq \text{CGPA} \leq 6.00$
	$5 \times \text{CGPA} + 20$	if $6.00 \leq \text{CGPA} \leq 8.00$
	$10 \times \text{CGPA} - 20$	if $8.00 \leq \text{CGPA} \leq 9.00$
	$20 \times \text{CGPA} - 110$	if $9.00 \leq \text{CGPA} \leq 9.50$
	$40 \times \text{CGPA} - 300$	if $9.50 \leq \text{CGPA} \leq 10.00$

#### 4. Award of honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA Below 5.00	F	Fail	Mar

#### 5. Gracing:

The gracing shall be done as per existing rules of the University.

#### 6. Verification and Revaluation:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

### **6.3 Master of Library & Information Science (M.Lib & I.Sc.) (CBCS 2018 COURSE)**

- 1. Eligibility for admission to M.Lib. & I.Sc. Course:** B.Lib. & I.Sc. degree of this University or any other recognized University shall be admitted to M.Lib & I.Sc. Course.

#### **Course Structure of M.Lib & I.Sc. Course:**

The M.Lib & I.Sc. programme will be of one years duration consisting of two semesters and of minimum 38 Credits: Semester I (20 Credits) and Semester II (18 Credits). In first Semester, there will be four theory papers of 04 credits each and two theory paper of 2 credit. In Second Semester, there will be four theory papers of 04 credits and one practical paer of 2 credits. All 10 papers will have 100 marks each out of which 40 marks will be for Internal Assessment and 60 marks for University Examination. Thus B.Lib & I.Sc. degree examination, two Semesters shall be of minimum 1050 marks and of minimum 36 credits altogether. The following shall be the course structure:



Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	ML 11	Information Communication and Society	Core: Compulsory	ML 21	Research Methods and statistical Techniques
	ML 12	Information Sources Services & System		ML 22	Applications of Information Technologies in LIS Theory
	ML 13	Management of libraries and Information Centers		ML 23	Information Processing and Retrieval
	ML 14	Academic and Public Library Systems		ML 24	Applications of Information Technologies in LIS: Practical
Core: Elective	<b>Any one from the following:</b>		Core: Elective	<b>Any one from the following:</b>	
	ML 15	Technical Writing Development		ML 25	Library and Users
	ML 16	Multimedia Application Development		ML 26	Social Science Information System
	ML 17	Information Analysis, Repackaging and Consolidation			
Skill Enhancement Course	ML 18	Use of of Social Media in LIS			

## **5. Scheme of Examination**

The Assessment of Regular students of Master of Library & Information Science (M.Lib & I.Sc.) course in the academic session 2018-19 and after, shall be based on

- (a) University Examinations,
- (b) Internal Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average system

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average(SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Final Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

## **6. Standard of Passing**

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.Lib & I.Sc. with the following honours.

- CGPA in [4.00, 4.99] -- Pass Class
- CGPA in [5.00, 5.49] -- Second Class
- CGPA in [5.50, 5.99] -- Higher Second Class
- CGPA in [6.00, 7.99] -- First Class
- CGPA in [8.00, 10.00] -- First Class with Distinction

### 7. Scheme of credits

Four hours per week teaching in one semester will lead to four credits and project will carry 02 credits.

### 8. Grade point scheme

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

<b>Marks as Percentage</b>	<b>Grade</b>	<b>Grade Point</b>
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0, 69.9]	A	8.0
[60.0, 64.9]	B+	7.0
[55.0, 59.9]	B	6.0
[50.0, 54.9]	C+	5.5
[45.0, 49.9]	C	5.0
[40.0, 44.9]	D	4.5

At the end of each semester, student will be given a transcript showing the performance and result in each course. The transcript shows, for each course the title of the course, credit values, grade in UE, grade in IA, Grade point index, result as pass or fail. Also, the Semester grade point average and cumulative grade point average will be shown. Further, the equivalent percentage of marks corresponding to

SGPA and CGPA will be shown. The formula to convert SGPA or CGPA to equivalent percentage is given by:

$$10 \times \text{CGPA} \text{ if CGPA/SGPA is in } [4.00, 6.00]$$

$$\text{Equivalent percentage marks} = 05 \times \text{CGPA} + 30 \text{ if CGPA/SGPA is in } [6.00, 9.00]$$

$$25 \times \text{CGPA} - 150 \text{ if CGPA/SGPA is in } [9.00, 10.00]$$

The above formula computes to the following table:-

Range in % of marks	Range of CGPA	Letter grade	Division
[75.0, 100]	[9.00, 10.00]	O	First class with Distinction
[70.0, 74.9]	[8.00, 8.99]	A+	
[65.0, 69.9]	[7.00, 7.99]	A	First class
[60.0, 64.9]	[6.00, 6.99]	B+	
[55.0, 59.9]	[5.50, 5.99]	B	Higher second class
[50.0, 54.9]	[5.00, 5.49]	C+	Second class
[45.0, 49.9]	[4.50, 4.99]	C	Pass class
[40.0, 44.9]	[4.00, 4.49]	D	
[00.0, 39.9]	[0.00, 3.99]	F	Fail

Thus, the percentage of marks can be obtained by using the following table:

CGPA	% of Marks	CGPA	% of Marks	CGPA	% of Marks	CGPA	% of Marks
4.0	40.0	5.5	55.0	7.0	65.0	8.5	72.5
4.1	41.0	5.6	56.0	7.1	65.5	8.6	73.0
4.2	42.0	5.7	57.0	7.2	66.0	8.7	73.5
4.3	43.0	5.8	58.0	7.3	66.5	8.8	74.0
4.4	44.0	5.9	59.0	7.4	67.0	8.9	74.5
4.5	45.0	6.0	60.0	7.5	67.5	9.0	75.0
4.6	46.0	6.1	60.5	7.6	68.0	9.1	77.5
4.7	47.0	6.2	61.0	7.7	68.5	9.2	80.0
4.8	48.0	6.3	61.5	7.8	69.0	9.3	82.5
4.9	49.0	6.4	62.0	7.9	69.5	9.4	85.0
5.0	50.0	6.5	62.5	8.0	70.0	9.5	87.5
5.1	51.0	6.6	63.0	8.1	70.5	9.6	90.0
5.2	52.0	6.7	63.5	8.2	71.0	9.7	92.5
5.3	53.0	6.8	64.0	8.3	71.5	9.8	95.0
5.4	54.0	6.9	64.5	8.4	72.0	9.9	97.5
						10.0	100.0

## GRACING

The gracing shall be done as per existing rules of the University.

## VERIFICATION AND REVALUATION

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

## FORMAT OF THE TRANSCRIPT

The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No. of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
6								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	
Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.								

## **6.4 : Master of Science (Analytical/Organic/Inorganic Chemistry)**

### **1. INTRODUCTION**

The Master of Science (Analytical/Organic/Inorganic Chemistry), program is a full time 84 Credits program offered by BharatiVidyapeeth Deemed University, Pune.

### **2. GENERAL OBJECTIVES OF THE COURSE:**

Chemistry is a pervasive subject. All the branches of science need chemistry. It is an experimental science and students need to train in practicals to get expertise in doing fine experiments and handle sophisticated instruments. Along with the data obtained its statistical analysis is also required to establish authenticity in the fields like environmental science, space chemistry and biotechnology. There are immense potentialities for chemistry and post graduates to undertake advanced research or in Industries as skilled chemists.

**GOAL OF THE SYLLABUS:** To impart the thorough knowledge of Chemistry, capability of self thinking, self study, identifying the problems and develop the problem solving attitude. To make the student globally competent.

### **3. ELIGIBILITY FOR ADMISSION TO THIS COURSE**

A student shall be eligible for admission to the First Year M.Sc (Analytical/Organic/Inorganic Chemistry) degree course who has completed B.Sc (Chemistry) graduation from any recognized university satisfying the following conditions. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.

### **4. COURSE STRUCTURE**

- 1) The M.Sc. (Chemistry) course will be of four semesters and with a minimum of 84 credits. The medium of instruction and examination will be on English.
- 2) Credits for Semester I-12 Credits, Semester II -30 Credits, Semester III- 18 Credits and Semester IV- 24 Credits.
- 3) The assessment of 1 credit at Semester IV of M.Sc.(Chemistry) that is for Industrial Training programme will be carried out as follows :-

- i) A student will inform the department about the joining date of the above mentioned training.
  - ii) The student will have to make presentation at the end of the programme and the student will have to submit a compiled report which will be assessed towards course credit as Internal Assessment Marks for Core Elective subject.
- 4) Each theory course prescribed for M. Sc. should be covered in 4 hours, each of 60 minutes duration per week per course
  - 5) Each practical course will require 4 hours of laboratory work per week and the course will be extended over two semesters and will be examined at the end of the academic year.
  - 6) For theory course the question paper should include at least 20 % weightage for problem solving. Problem solving would include numerical problems and may be objective type questions.
  - 7) Thus M.Sc (Analytical/Organic/Inorganic Chemistry) degree examination has four semesters and shall be of 2100 marks and of minimum 84 credits altogether. The following shall be the course structure:

**M.Sc. (Analytical Chemistry): SEMESTER – I**

Semester	Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH -101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH -102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH -103	Organic Chemistry-I	04	04	03	40	60	100

## SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester II	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGCH - 208	Scientific Writing	02	02	02	20	30	50

## SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGAC 301	Thermal, Radio and Electro-analytical methods	04	04	03	40	60	100
		PGAC 302	Modern Aspects of Analytical Chemistry	04	04	03	40	60	100
		PGAC 303	Recent Analytical Techniques	04	04	03	40	60	100
		PGAC 304	Analysis of Pharmaceuticals	04	04	03	40	60	100
		PGAC 305	Assessment of Water Quality	02	02	02	20	30	50



## SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam . Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGAC 401	Advanced Analytical Techniques	04	04	03	40	60	100
		PGAC 402	Recent Separation Techniques	04	04	03	40	60	100
<b>Any one from the following: From PGAC-403 to PGAC-405</b>									
Semester IV	Core: Elective#	PGAC 403	Environmental Analysis	04	3+1	03	40	60	100
		PGAC 404	Computer Interface with Chemistry	04	3+1	03	40	60	100
		PGAC 405	Modern Methods of Analysis	04	3+1	03	40	60	100
	Core: Compulsory	PGAC 406	Practical Course -I*	02	2+2	06	40	60	100
		PGAC 407	Practical Course -II*	02	2+2	06	40	60	100
		PGAC 408	Practical Course –III * OR Project Work*	02	2+2	06	40	60	100

\* Examination for practical courses will be conducted at the end of academic year.

# Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGAC-403, PGAC-404, PGAC-405).

## M.Sc. (Organic Chemistry): SEMESTER – I

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH - 102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH - 103	Organic Chemistry-I	04	04	03	40	60	100

## SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGAE C- 208	Scientific Writing	02	02	02	20	30	50

## SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGOC 301	Advanced Organic Reaction Mechanism	04	04	03	40	60	100
		PGOC 302	Spectroscopic Methods In Structure Determination	04	04	03	40	60	100
		PGOC 303	Advanced Stereochemistry	04	04	03	40	60	100
		PGOC 304	Medicinal Chemistry	04	04	03	40	60	100
	Skill Enhancement Course	PGSEC 305	Assessment of Water Quality	02	02	02	20	30	50

## SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam . Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGOC - 401	Synthetic Organic Chemistry	04	04	03	40	60	100
		PGOC - 402	Chemistry Of Natural Products	04	04	03	40	60	100
<b>Any one from the following: From PGAC-403 to PGAC-405</b>									
Semester IV	Core: Elective#	PGOC - 403	Green Chemistry	04	04	3+1	40	60	100
		PGOC - 404	Applied Organic Chemistry	04	04	3+1	40	60	100
		PGOC - 405	Bio-Organic Chemistry	04	04	3+1	40	60	100
	Core: Compulsory	PGOC - 406	Mixture Separation*	02	2+2	06	40	60	100
		PGOC - 407	Advanced Preparations*	02	2+2	06	40	60	100
		PGOC - 408	Research Project / Laboratory Course*	02	2+2	06	40	60	100

\* Examination for practical courses will be conducted at the end of academic year.

# Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGOC-403, PGOC-404, PGOC-405).

### M.Sc. (Inorganic Chemistry): SEMESTER – I

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 101	Physical Chemistry- I	04	04	03	40	60	100
		PGCH - 102	Inorganic Chemistry-I	04	04	03	40	60	100
		PGCH - 103	Organic Chemistry-I	04	04	03	40	60	100

### SEMESTER – II

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam. Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester I	Core: Compulsory	PGCH - 201	Physical Chemistry- II	04	04	03	40	60	100
		PGCH - 202	Inorganic Chemistry-II	04	04	03	40	60	100
		PGCH - 203	Organic Chemistry-II	04	04	03	40	60	100
		PGCH - 204	Fundamentals of analytical Chemistry	04	04	03	40	60	100
		PGCH - 205	Physical Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 206	Inorganic Chemistry practical*	04	02+02	06	40	60	100
		PGCH - 207	Organic Chemistry practical*	04	02+02	06	40	60	100
	Ability Enhancement Course	PGAE C- 208	Scientific Writing	02	02	02	20	30	50

### SEMESTER – III

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester III	Core: Compulsory	PGIC-301	Advanced Coordination Chemistry	04	04	03	40	60	100
		PGIC-302	Bioinorganic Chemistry and Heterogeneous Catalysis	04	04	03	40	60	100
		PGIC-303	Inorganic Solid State Chemistry and Inorganic Polymer Chemistry	04	04	03	40	60	100
		PGIC-304	Inorganic Analytical Chemistry	04	04	03	40	60	100
	Skill Enhancement Course	PGSEC 305	Assessment of Water Quality	02	02	03	20	30	50

## SEMESTER – IV

Semester	Subject Type	Code	Title of the paper	Hrs/Week	Credits	Exam Hrs	Maximum Marks		
							Internal Assessment	University Examination	Total
Semester IV	Core: Compulsory	PGIC-401	Organometallic Chemistry	04	04	03	40	60	100
		PGIC-402	Material Chemistry and Nanoscience and Nanotechnology Related to Inorganic Systems	04	04	03	40	60	100
<b>Any one from the following: From PGAC-403 to PGAC-405</b>									
Semester IV	Core: Elective#	PGIC - 403	Modern Instrumental Techniques for Inorganic Analysis	04	3+1	03	40	60	100
		PGIC - 404	Inorganic Pharmaceutical Chemistry	04	3+1	03	40	60	100
		PGIC - 405	Applications of Inorganic Chemistry in Agriculture, Environmental Science and Space Science	04	3+1	03	40	60	100
	Core: Compulsory	PGIC - 406	Practical Course-I*	02	2+2	06	40	60	100
		PGIC - 407	Practical Course-II*	02	2+2	06	40	60	100
		PGIC - 408	Research Project OR Practical Course-III*	02	2+2	06	40	60	100

\* Examination for practical courses will be conducted at the end of academic year.

# Core Elective Course includes Core: Elective subjects and Industrial project. Industrial Project includes one day visit, Internet survey, project writing, presentation or oral and be evaluated as the internal marks for Core: Elective Course (PGOC-403, PGOC-404, PGOC-405).

## 5. SCHEME OF CREDITS:

The M.Sc (Analytical/Organic/Inorganic Chemistry) is of 84 credits. The distribution of credits over semesters is given below.

Course Type	Credits	SEM-I	SEM - II	SEM – III	SEM-IV	Total	Examination
		L(pw) 60Hrs	L(pw) 60Hrs	L(pw) 60Hrs	L(pw) 60Hrs	Credits 60Hrs	
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	4 60Hrs	16C 240Hrs	University
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	4 60Hrs	16C 240Hrs	University
Core Compulsory Theory	4	4 60Hrs	4 60Hrs	4 60Hrs	-	12C 180Hrs	University
Core Compulsory Theory	4	-	4 60Hrs	4 60Hrs	-	8C 120Hrs	University
Core: Elective Theory	3	-	-	-	3 45Hrs	3C 45Hrs	University
Industrial Project	1	-	-	-	1 15Hrs	1C 15Hrs	University
Ability Enhancement Course	2	-	2 30Hrs	-	-	2C 30Hrs	University
Skill Enhancement Course	2	-	-	2 30Hrs	-	2C 30Hrs	University
Physical Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Inorganic Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Organic Chemistry Practical	2+2	-2 60Hrs	2 30Hrs	-	-	4C 60Hrs	University
Practical Course –I	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University
Practical Course –II	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University
Practical Course-III OR Project Work	2+2	-	-	2 30Hrs	2 30Hrs	4C 60Hrs	University



**Total Required Credits:**

Semester	Core Courses	Elective Course	SEC / AECC	Total
I	12	----	----	12
II	28	----	02	30
III	16	----	02	18
IV	20	04	----	24
<b>Grand Total</b>	<b>76</b>	<b>04</b>	<b>04</b>	<b>84</b>

**6. MEDIUM OF INSTRUCTION:**

The medium of instruction and examination shall be English.

**7. UNIVERSITY TERMS:**

The dates for the commencement and conclusion of the First and the Second terms shall be fixed by the University authorities. The terms can be kept by students, who have registered their names with the University.

**8. SCHEME OF EXAMINATION:**

The Assessment of Regular students of Master of Science (M.Sc.) course in the academic session 2018-19 and thereafter shall be based on

- (a) University Examinations (UE),
- (b) Continuous Internal Assessment (IA),
- (c) Choice Based Credit System (CBCS), and
- (d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average system (CGPA)

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures atleast 40% of

marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks which will be carried out by the department during the term. The Internal Assessment may be in the forms as follows: Attendance, Written tests, seminars, term papers, presentations, assignments, orals or any such others. There will be at least two types of assessments from the types given above.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A candidate shall be permitted to proceed from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

#### **9. Research Project Work:**

There will be a Research Project optional for practical course –III to be prepared by a student. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

#### **Division of Marks**

Internal Assessment :40 Marks

A full Project Report&Viva Voce (University Assessment) : 60 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 04 credits will be awarded to a successful candidate in this subject. The project may be evaluated by three examiners one internal and two external, selected from the panel of PG examiners of the University.

The candidate has to submit the project report before the deadline announced by the department. A candidate who fails to submit the project may resubmit the

same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidences to be endorsed by the Head or the Guide.

#### **10. STANDARD OF PASSING:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

Even a student fails in IA, he/she shall be declared 'pass' in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the student passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weighteg for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA

## FORMULA TO CALCULATE GRADE POINTS (GP):

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max} / 10$  (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} < 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula  $SGPA = \frac{\sum Ck \times GPk}{\sum Ck}$  where  $Ck$  is the credit-value assigned to a course and  $GPk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. The SGPA shall be calculated up to two decimal place accuracy.

The CGPA is calculated by the formula  $CGPA = \frac{\sum Ck \times GPk}{\sum Ck}$  where  $Ck$  is the credit-value assigned to a course and  $GPk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. The CGPA shall be calculated up to two decimals place accuracy.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	$10 \times \text{CGPA} - 10$	if $5.00 \leq \text{CGPA} \leq 6.00$
	$5 \times \text{CGPA} + 20$	if $6.00 \leq \text{CGPA} \leq 8.00$
	$10 \times \text{CGPA} - 20$	if $8.00 \leq \text{CGPA} \leq 9.00$
	$20 \times \text{CGPA} - 110$	if $9.00 \leq \text{CGPA} \leq 9.50$
	$40 \times \text{CGPA} - 300$	if $9.50 \leq \text{CGPA} \leq 10.00$

### 11. AWARD OF HONOURS:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA Below 5.00	F	Fail	Marks Below 40

A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidates should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects.

### 12. GRACING:

The gracing shall be done as per existing rules of the University.

### 13. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

### 14. FORMAT OF THE TRANSCRIPT:

The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No.of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	

Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.

## **6.5 : Master of Science (M.Sc. Microbiology)**

### **1. Structure of M.Sc. (Microbiology) CBCS degree program**

The overall structure of the course to be implemented from the academic year 2018-2019 onwards is as follows.

- A. The M.Sc. (Microbiology) course will be of 2 years duration. Each year will be of 2 semesters - Thus the entire course will be of 4 semesters.
- B. First, Second and Fourth semester will comprise of four theory and two practical courses each.
- C. Third semester will be totally for Internship (Major project).
- D. Entire M.Sc. course in Microbiology shall be covered in 14 theory papers including 'Ability enhancement course' and 'Skill enhancement course', 6 practical courses, and an Internship (major project with Dissertation). Each theory paper will be covered in 4 lectures of one hour per week. Each practical course shall be covered in two practical turns of three clock hours per week. Thus, the students will work for each practical on two days of the week, daily for minimum six hrs. Students will be given eight hrs in a week for library work.
- E. Students will have to complete an Internship program (Major project with dissertation) so as to learn research methodology and presentation of work. The Internship (major project with dissertation) shall carry 200 marks. The students will work for their projects, complete the experimental work in third semester, and complete the writing part of the project during the winter break. Minimum number of students participating in a project will be two and maximum number of students would be four. The assessment of the project will be at beginning of the fourth semester which includes the presentation and viva-voce by external and internal examiner

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
THEORY : Core Compulsory	PGMB101	Biochemistry	Core: Compulsory	PGMB201	Fermentor Design and Microbial Biotechnology
	PGMB102	Immunology		PGMB202	Analytical Techniques
	PGMB103	Genetics and Molecular Biology		PGMB203	Quantitative Biology
Core Elective	<b>Any one from the following:</b>		Core Elective	<b>Any one from the following:</b>	
	PGMB104	Microbial Ecology		PGMB204	Microbial Metabolism
	PGMB105	Environmental Microbiology		PGMB205	Physiology and Metabolism
Practical Course	PGMB111	Practical course 1	Practical Course	PGMB211	Practical course 3
	PGMB112	Practical course 2		PGMB212	Practical course 4
			Ability Enhancement Course	PGAEC201	Scientific Writing

### SEMESTER-III

Subject Type	Code	Title of the paper
Core: Compulsory	PGMB 304	Internship (major project).
	PGMB305	Internship (major project).

### SEMESTER-IV

Subject Type	Code	Title of the paper
Core: Compulsory	PGMB 401	Virology
	PGMB 402	Medical Microbiology
	PGMB 403	Food and Dairy Microbiology
Core: Elective	<b>Any one from the following:</b>	
	PGMB 404	Advanced Biotechnology
	PGMB 405	Advanced Analytical Techniques
Practical Course	PGMB 411	Practical course 5
	PGMB 412	Practical course 6
Skill Enhancement Course	PGSEC 401	Exploring Microbial Diversity



## 2. Rules for the examination: -

- A. A candidate shall not be admitted to the semester examination unless he / she has satisfactorily kept terms for the courses at the respective department of this university.
- B. An application (which must be in the prescribed form and accompanied by the prescribed fee) for admission to any of the examination of M.Sc. (Microbiology Degree course shall be submitted by a candidate to the Registrar through the Head of the Institution attended by him / her on or before the prescribed date along with a certificate from the Head of the Institution having attended the course and kept the terms in the various subjects and of having satisfied the other conditions laid down by the university and of being fit candidate for the examination.

### C. Assessment pattern

#### a. **Continuous Internal Assessment :**

**Theory:** Three Tutorials will be conducted through out the semester for each theory course and marks out of 40 per course will be submitted to the university as Internal marks.

**Practical:** Internal marks for the practical course will be based on the continuous assessment of the daily work, orals, seminars/presentations; Tour/visit reports, class tests, literature review and attendance(Any two). Students will be assessed for 40 marks for each practical course.

#### b. **Annual Examination :**

**Theory:** An University examination will be held at the end of every semester. This Examination in each subject will be of 60 marks for three hours duration

The final result of the students in each subject will be based on Final GPA obtained by the students for the internal assessment and University Examination.

**Practical:** There shall be Annual practical examination of 60 marks at the end of 2nd and 4th Semester.

The practical examination for the courses PGMB 111, PGMB 112, PGMB 211, and PGMB 212 will be conducted at the end of second semester. Practical examination for courses PGMB 411 and PGMB 412 will be conducted at the end of fourth semester. Practical courses PGMB 311 PGMB 312 are allotted for Internship. The assessment for the said courses will be as follows.

**Project Work:** Students have to undertake a major project so as to learn research methodology and presentation of work. The project shall carry 200 marks which will be allotted as follows:

**Project experimental work (140 marks)**

Assessment by the external examiner : 70 marks

Assessment by the project guide : 70 marks

**Presentation of the project (40 marks)**

Assessment by the external examiner : 20 marks

Assessment by the guide – (day to day) : 20 marks

**Two seminars presentations (20 marks)** : (10 marks per seminar)

Seminars in the third semester on the project work

The assessment for the said courses will be conducted at the beginning of the fourth semester.

The student will be assessed on the basis of following criteria for 140 marks.

- (i) Choice of the topic selected for the project.
- (ii) Aims and objectives of the project.
- (iii) Updated literature survey.
- (iv) Novel and other applications of the project (can a patent be filed on further work).Materials and methodology used.
- (v) Out come and Achievements of the project.
- (vi) Conclusion.
- (vii) Presentation of the project. (methodology of presentation)

Award of the Grade will be based on the following criteria.

**c. Rules regarding ATKT to second year M.Sc. Microbiology course.**

A student will be allowed to keep terms at the second year of the M.Sc. course if her / his terms for the first year have been granted.

**d. Standard of passing :**

- i. The candidate who has obtained at least D grade shall be declared to have passed in the said course.
- ii. The candidate who has not secured C grade in a particular paper in the University Examination will have to secure at least C grade in the subsequent examination in the particular paper.:

A) The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:-

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,67.9]	A	8.0
[60.0,64.9 ]	B+	7.0
[ 55.0,59.9]	B	6.0
[ 50.0,54.9]	C+	5.5
[ 45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5
[00.0, 39.9]	F	0.0

(B) For courses which have both University Examination (UE) and Internal Assessment(IA):

In order to pass in a course, the student must obtain a minimum of 'D' grade at the UE and a GPI of 4.0 in aggregate of UE and IA. There is no separate passing in IA. The GPI is calculated only if the student passes at UE by combining percentage marks at UE and IA with weights 0.6 and 0.4 respectively. A student who fails has to clear the course by appearing at UE only as a back-log candidate.

(C) For courses which have no University Examination:

There are some courses, the General courses, for which there is no UE. The respective institutes conduct 'continuous assessment' and EoTE( End of term examination).For such courses the computation of GPI, passing criteria, and back-log clearing rules are as in (B) above.

(D) At the end of each semester, a cumulative grade point average (CGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

(E) A student who passes in all the courses will be declared to have passed the entire M.Sc (Microbiology) with the following honours.

CGPI in [4.00, 4.99] -- Pass Class

CGPI in [5.00, 5.49] -- Second Class

CGPI in [5.50, 5.99] -- Higher Second Class

CGPI in [6.00, 6.99] -- First Class

CGPI in [7.00, 10.00] -- Distinction.

(F) PROMOTION RULES:

A student will be allowed to keep all terms for the duration of the programme.

(G) Continuous Assessment (CA)

40% marks of the course towards CA will be based on tests (Minimum 2). In addition, a teacher may consider one or more of the following evaluation systems:-

i) Seminar /presentation by the student

ii) Assignment by the student

Each theory paper is of 60 marks and internal paper is for 40 marks.

Each practical examination for lab course is of 60 marks and four hour duration for three consecutive days.. The project courses in Semester III will be evaluated for 200 marks for the allotted credits by a panel consisting of one internal and one external examiner.

## 6.6 : Master of Computer Science (M.Sc. Computer Science)

### 1. Course Structure

The M.Sc. (Computer Science) course will be two year full time course consisting of minimum four semesters and with a minimum of 94 credits. The medium of instruction and examination will be only English. The credit allotment for M.Sc.(Computer Science) course : Semester I (24 Credits), Semester II (26Credits), Semester III (26 Credits), and Semester IV (18 Credits). In each Semester, there will be four papers(three core compulsory and one core elective) of 100 marks each, two Laboratory course and minor project for each Semester of 100 marks each, out of which 40 marks will be for internal assessment and 60 marks for university examination. Fourth semester is internship for 200 marks. Thus M.Sc.(Computer Science) degree examination, four semesters shall be 2400 marks and of minimum 94credits altogether . The following shall be the course structure:

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core: Compulsory	PGCS-101	Algorithm Design Patterns	Core: Compulsory	PGCS-201	Software Project Management
	PGCS-102	Paradigm of programming Languages		PGCS-202	Cloud Computing
	PGCS-103	Advanced Database Concepts		PGCS-203	Java Application Programming
	PGCS-MI	Minor Project –I		PGCS-MII	Minor Project -II
Core: Elective	<b>Any one from the following:</b>		Core: Elective	<b>Any one from the following:</b>	
	PGCS-104	Parallel Processing		PGCS-204	Network Security
	PGCS-105	Theory of Automata		PGCS-205	Embedded Computing
	PGCS-106	Digital Image Processing		PGCS-206	Data Mining

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Elective : Practical's	<b>Any two from the following:</b>		Elective : Practical's	<b>Any two from the following:</b>	
	PGCS-107	Lab Course –I		PGCS-207	Lab Course –IV
	PGCS-108	Lab Course –II		PGCS-208	Lab Course –V
	PGCS-109	Lab Course –III		PGCS-209	Lab Course –VI
			Ability Enhancement Course	PGAEC 11	Soft Skills

### SEMESTER III

Semester	Subject Type	Code	Title of the paper
Semester III	Core:Compulsory	PGCS-301	Artificial Intelligence
		PGCS-302	Mobile Technologies
		PGCS-303	.Net Technologies
		PGCS-MIII	Minor Project –III
	Core: Elective	<b>Any one from the following:</b>	
		PGCS-304	Software Architecture
		PGCS-305	Software Testing
	Elective Practical's	PGCS-306	Advanced Operating System
		<b>Any two from the following:</b>	
		PGCS-307	Lab Course –VII
		PGCS-308	Lab Course –VIII
		PGCS-309	Lab Course –IX
		Skill Enhancement Course	PGSEC 31

### SEMESTER IV

Semester	Course Number	Course Title
Semester IV	PGCS-401	Internship

## 5. Scheme of Examination:

In order to pass in a course, the student must obtain a minimum of 'D' grade at the UE and a GPI of 4.5 in aggregate of University Examination and Internal Assessment. For each paper of 100 marks, there will be internal assessment of 40 marks and the university examination of 60 marks for 3 hours duration.

The Internal Assessment (IA) of each course will be for 40 marks and conducted by the college during the term. The assessment may be based on evaluations of the following: Written tests, seminar/presentation by the student, assignment, orals or any other. Hence there must be at least two evaluations of different kind.

Each practical examination for laboratory course is of 100 marks and three hours duration. The minor projects in Semesters I, II and III will be evaluated for 100 marks for the allotted credits by a panel consisting of one internal and one external examiner. For both laboratory course and minor project, there will be internal assessment of 40 marks and the university examination of 60 marks.

A candidate shall be permitted to proceed from the first semester upto final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidate should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects.

At the end of each semester, a cumulative grade point average (CGPA) and also Semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A student who passes in all the courses will be declared to have passed the entire M.Sc (Computer Science) with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	– First Class with Distinction

## 6. STANDARD OF PASSING:

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the University Examination and a GPA of 4.0 in aggregate of University Examination and Internal Assessment taken together.

A student who passes in all the courses will be declared to have passed M.Sc (Computer Science) with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	-- First Class with Distinction

**7. Scheme of credits:**

The M.Sc(Comp.Sci) is of 94credits. The distribution of credits over semesters is given below.

Semester	Total credits
SEM I	24
SEM II	26
SEM III	26
SEM IV	18
Total	94

4 Credits	:	4 lectures per week
2 Credits	:	4 hours practical per week

**8. Grade point scheme:**

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,69.9]	A	8.0
[60.0,64.9]	B+	7.0
[ 55.0,59.9]	B	6.0
[ 50.0,54.9]	C+	5.5
[ 45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5



**9. GRACING:**

The gracing shall be done as per existing rules of the University.

**10. VERIFICATION AND REVALUATION:**

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

**6.7 : Master of Commerce (M. Com.) (CBCS 2018 Course)**

**1. Course Structure:**

The M. Com. degree course will be of two year duration consisting of four semesters and of minimum 70 credits as below:

Semester I (16 credits)] Semester II (18 credits), Semester III (18 credits) and Semester IV (18 credits). In each semester there will be four theory papers of 4 credits each. In addition there will be one theory course (Ability enhancement or skill enhancement course) each in semester II & III of 2 credits each in fourth semester there will be research project of 2 credits.

In each Semester, there will be four papers of 100 marks each out of which 40 marks will be for Internal Assessment (attendance, home assignments, class tests, long term papers, classroom presentations) and 60 marks for University Examination. All ability enhancement or skill enhancement courses will have 50 mark each, out of which 20 marks will be for continuous assessment and 30 marks for university examination. Thus M. Com. degree examination, four Semesters shall be of 1700 marks and of minimum 70 credits altogether. The following shall be the course structure.

Semester I			Semester II		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Compulsory	PGCO M101	Business Finance-I	Core Compulsory	PGCOM 201	Business Finance-II
	PGCO M102	Management Concepts & Organisational Behaviour-I		PGCOM 202	Management Concepts & Organisational Behaviour-II
Core Elective	<b>To choose any one Group of the following:</b>		Core Elective	<b>To choose any one Group of the following:</b>	
	<b>Group A</b>			<b>Group A</b>	
	PGCO M 103	Advanced Accounting-I		PGCOM 203	Advanced Accounting-III
	PGCO M 104	Advanced Accounting-II		PGCOM 204	Advanced Accounting-IV
	<b>Group B</b>			<b>Group B</b>	
	PGCO M 105	Marketing-I		PGCOM 205	Marketing-III
	PGCO M 106	Marketing-II		PGCOM 206	Marketing-IV
	<b>Group C</b>			<b>Group C</b>	
	PGCO M 107	Business Administration-I		PGCOM 207	Business Administration-III
	PGCO M 108	Business Administration-II		PGCOM 208	Business Administration-IV
	<b>Group D</b>			<b>Group D</b>	
	PGCO M 109	Advanced Cost Accounting-I		PGCOM 209	Advanced Cost Accounting-III
	PGCO M 110	Advanced Cost Accounting-II		PGCOM 210	Advanced Cost Accounting-IV
				Skill Enhancement Course	<b>This Paper is compulsory for all Students</b>
			PGGEN 21	Consumer Protection	

Semester III			Semester IV		
Subject Type	Code	Title of the paper	Subject Type	Code	Title of the paper
Core Compulsory	PGCO M301	Management Accounting -I	Core Compulsory	PGCOM 401	Management Accounting -II
	PGCO M302	Research Methodology-I		PGCOM 402	Research Methodology-II(Project Report)
Core Elective	<b>To choose any one Group of the following:</b>		Core Elective	<b>To choose any one Group of the following:</b>	
	<b>Group A</b>			<b>Group A</b>	
	PGCO M 303	Advanced Accounting-V		PGCOM 403	Advanced Accounting-VII
	PGCO M 304	Advanced Accounting-VI		PGCOM 404	Advanced Accounting-VIII
	<b>Group B</b>			<b>Group B</b>	
	PGCO M 305	Marketing-V		PGCOM 405	Marketing-VII
	PGCO M 306	Marketing-VI		PGCOM 406	Marketing-VIII
	<b>Group C</b>			<b>Group C</b>	
	PGCO M 307	Business Administration-V		PGCOM 407	Business Administration-VII
	PGCO M 308	Business Administration-VI		PGCOM 408	Business Administration-VIII
	<b>Group D</b>			<b>Group D</b>	
	PGCO M 309	Advanced Cost Accounting-V		PGCOM 409	Advanced Cost Accounting-VII
	PGCO M 310	Advanced Cost Accounting-VI		PGCOM 410	Advanced Cost Accounting-VIII
Ability Enhancement Course	<b>This Paper is compulsory for all Students</b>				
	PGGE N 31	Income Tax Management			

## 5. Scheme of Examination:

The examination of regular students of M. Com. degree course of the Bharati Vidyapeeth (Deemed to be University), Pune, India admitted in the academic session 2018-19 and after shall be based on-

- (a) Semester Examinations,
- (b) Continuous Assessment,
- (c) Choice Based Credit System, and
- (d) Semester Grade Point Average and Cumulative Grade Point Average System

For each paper of 100 marks, there will be an Internal Assessment (IA) of 40 marks and the University Examination (UE) of 60 marks/3 hours duration at the end of each semester. A candidate who will secure atleast 40% of marks allotted to each paper will be given 4 credits. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The IA for each paper will be of 40 marks which will be carried out by the department during the term. The IA may be in the forms of written tests, seminars, term papers, presentations, assignments, orals or any such others. Here will be at least two types of assessments given above.

There shall be four semester examinations: first semester examination at the middle of the first academic year and the second semester examination at the end of the first academic year. Similarly, the third and fourth semester examinations shall be held at the middle and the end of the second academic year, respectively.

The candidates shall be permitted to proceed from the first semester up to final semester irrespective of their failure in any of the semester examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (subsequent) semester subjects

At the end of each semester, a cumulative grade point (CGPA) & also semester grade point average (SGPA) will be calculated as a weighted average of the GPI of all course in which the student has passed till that semester.

## 6. **Research Project Work:**

There will be a Research Project to be prepared by a student during the fourth semester. The objective of the project work is to introduce students to research methodology in the subject and prepare them for pursuing research in theoretical or experimental or computational areas of the subject. The project work is to be undertaken under guidance of a teacher allotted to a student by the department.

Division of Marks

Synopsis with working bibliography (Internal Assessment) : 40 Marks

A full Project Report (Minimum 50-80 pages) : 40 Marks

Viva Voce : 20 Marks

As the Research Project is based on the self study done by the candidate and evaluated for 100 marks altogether, 6 credits will be awarded to a successful candidate in this subject. The project may be evaluated by two examiners one internal and one external, selected from the panel of PG examiners of the University. The viva voce must be conducted by the teachers selected out of the panel of PG examiners maintained by the University.

The candidate has to submit the project Report on or before the date declared by the department. The project report shall be typed and submitted in duplicate. A candidate who fails to submit the project may resubmit the same in the subsequent semester examination for evaluation. The project work activities must be duly supported by documentary evidence to be endorsed by the Head or Guide.

## 7. **Standard of Passing:**

A candidate shall be declared to have passed in the paper provided he/she has secured minimum GP of 4.5 in the UE and a GPA of 4.0 in aggregate of UE and IA taken together.

## 8. **Classification of Successful Candidates:**

Candidates who secured not less than 60% of aggregate marks (IA+UE) in the whole examination shall be declared to have passed the examination in the first class. All other successful candidates shall be declared to have passed in second

class. Candidates who obtain 70% of the marks in the aggregate (IA+UE) shall be deemed to have passed the examination in first class with distinction.

A student who passes in all the courses will be declared to have passed the M. Com. degree with the following honours.

CGPA in [4.00, 4.99]	-- Pass Class
CGPA in [5.00, 5.49]	-- Second Class
CGPA in [5.50, 5.99]	-- Higher Second Class
CGPA in [6.00, 7.99]	-- First Class
CGPA in [8.00, 10.00]	-- First Class with Distinction

**9. Scheme of Credits:**

Sixty (60) hours of teaching will lead to four credits (which mean four hours per week teaching in one semester) and long term paper as well as presentation will carry one credit each.

**10. Medium of Instruction:**

The medium of instruction and examination shall be in English. However, students can write their papers in Marathi also.

**11. Extra Credits:**

Regular students can also opt for extra credits if the departmental committee agrees. A student must at the commencement of the semester communicate which extra credits he/she is going to opt. A student can enroll for extra credits over and above the total 70 credits prescribed for the course by attending and appearing for the examination of the opted extra credits. However, in such case grades of the extra credit will not be counted for arriving at GPA.

The extra credit course can be selected from within the institute or any other faculties of Bharati Vidyapeeth University offering courses for Faculty of Arts, Social Sciences and Commerce or Faculty of Science, which will be declared at the commencement of session. Such extra credits will be mentioned separately in the grade sheet.

## 12. Grade Points Scheme:

The term grading system indicates a 10-point scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade. The total performance within a semester and continuous performance starting from the first semester are indicated respectively by Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA). Candidates who pass all the examinations prescribed for the course in the first appearance itself alone are eligible for Ranking.

The 10-point scale would be used to convert marks out of 100 to grades and grade points according to the following table:

Marks as Percentage	Grade	Grade Point
[75.0, 100]	O	10.0
[70.0, 74.9]	A+	9.0
[65.0,67.9]	A	8.0
[60.0,64.9 ]	B+	7.0
[ 55.0,59.9]	B	6.0
[ 50.0,54.9]	C+	5.5
[ 45.0,49.9]	C	5.0
[40.0,44.9]	D	4.5
[00.0, 39.9]	F	0.0

### GRACING:

The gracing shall be done as per existing rules of the University.

### VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.



**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA**  
**YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE & COMMERCE, PUNE-38**

**7.1 : FEE STRUCTURE**  
**UNDER GRADUATE (GRANT-IN-AID SECTION)**

**ACADEMIC YEAR 2020-2021**

CLASS	FEES													Total Fee
	(Rs.)													
	2	3	4	5	6	7	8	9	10	11	12	13	14	
1	Admission Fee	Tuition Fee	Laboratory Fee	Library Fee	Student Activity & Magazine Fee	Gymkhana Fee	University Eligibility Fee	Student Welfare and Insurance	College Test & Tutorial Fee	Medical Check up Fee	University Development Fund	Sem. Exam. Fee		
F.Y.B.A.(Sem I & II)	10	800	0	100	200	50	50	50	50	100	100	250	1760	
S.Y.B.A.(Sem II & III)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
T.Y.B.A.(Sem IV & V)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
F.Y.B.SC.(Sem I & II)	10	800	325	100	200	50	50	50	50	100	100	300	2135	
S.Y.B.SC.(Sem II & III)	10	800	325	100	200	50	0	50	50	100	100	350	2135	
T.Y.B.SC.(Sem IV & V)	10	800	325	100	200	50	0	50	50	100	100	350	2135	
F.Y.B.Com.(Sem I & II)	10	800	0	100	200	50	50	50	50	100	100	250	1760	
S.Y.B.Com.(Sem II & III)	10	800	0	100	200	50	0	50	50	100	100	300	1760	
T.Y.B.Com.(Sem IV & V)	10	800	0	100	200	50	0	50	50	100	100	300	1760	

**NOTE :**

- 1) Every International student has to pay Rs. 1000/- as Medical check up & HIV Test fees and Tuition fees five times than that of Maharashtra student.
- 2) The International students seeking admission to Bachelor Degree should pay eligibility fee US \$400, and for Master Degree US \$500.
- \*3) Students other than Maharashtra State should pay the Tuition fee double to the fees of regular Maharashtra State students.
- 4) The students offering computer application subject should pay Rs. 7,000/- as additional laboratory fee every year.



**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE, INDIA  
YASHWANTRAO MOHITE COLLEGE OF ARTS, SCIENCE &  
COMMERCE, PUNE-38**

**7.2 : FEE STRUCTURE**

**Under-Graduate & Post-Graduate (Non Grant Section)  
ACADEMIC YEAR 2020-2021**

Sr.No.	Class	Adm. Fee	Tuition Fee	Total Fee
1	F.Y. B.Sc. (Comp. Sc.)	500	27000	27500
2.	S.Y. B.Sc. (Comp. Sc.)	500	27000	27500
3.	T.Y. B.Sc. (Comp. Sc.)	500	27000	27500
4.	M.Sc. I (Chemistry)	500	35000	35000
5.	M.Sc. II (Chemistry)	500	30000	35500
6.	M.Sc. I (Microbiology)	500	35000	35500
7.	M.Sc. II (Microbiology)	500	35000	35500
8.	M.Sc. I (Computer Science)	500	35000	35500
9.	M.Sc. II (Computer Science)	500	35000	35500
10.	M.A. I (English) & Economics	500	11000	11500
11.	M.A. II (English) & Economics	500	11000	11500
12.	M.Com. I	500	11000	11500
13.	M.Com. II	500	11000	11500
14.	B.Lib & I.Sc.	500	10000	10500
15.	M.Lib & I.Sc.	500	14000	14500

**NOTE :**

- 1) Every International student has to pay Rs. 1,000/- as Medical Check up & HIV Test fees and Tuition fees five times than that of Maharashtra student.
- 2) The International students seeking admission to Bachelor Degree should pay eligibility fee US \$400 and for Master Degree US\$ 500.

● **Refund of Fees**

1. If a student submits his application for cancellation of admission in a prescribed form duly completed within 15 calendar days from the date of admission to that particular course, 10 per cent of the total amount of tuition fees prescribed for the course will be deducted from the amount of tuition fees paid by him.
2. If a student submits his application for cancellation of admission in a prescribed form duly completed within 30 calendar days from the date of admission to that particular

course, 25 per cent of the total amount of tuition fees prescribed for the course will be deducted from the amount of tuition fees paid by him.

3. If a student submits his application for cancellation of his admission after 30 calendar days from the date of admission to that particular course no refund of fees will be made
4. Under no circumstances other fees paid by the student will be refunded either in part or in full except the amount of college and university development fund.
5. If any student admitted to any of course leaves the course at any time after 90 calendar days after the date of his admission to that course in an academic year, he/she will be required to pay full amount of tuition fees for the entire Year of the course.

- **Hostel Accommodation**

Accommodation for boys and girls is available in the hostels. The students who have been admitted in the college will be eligible for admission in the hostel. They will have to apply separately in the prescribed form available in the hostel office.

- **Refund of Deposits**

A student should collect his/her deposit(s) within six months from the date of cancellation of his/her admission or within six months of completion of his/her course.

- **Grant of Terms**

The student will be granted terms and allowed to appear at university examination provided he has kept satisfactory **attendance of 75% for each subject / course / paper**.

- **Govt. Scholarships & Freeships**

Eligible and deserving students can avail of the facilities of various Govt. scholarships which are awarded on the basis of merit at S.S.C/H.S.C. examination and income of parents. This facility is not applicable for B.Sc. Computer Science students & Post Graduate Courses.

### **Scholarships**

- 1) National Merit Scholarship
- 2) National Loan Scholarship
- 3) State Govt./Central Government Open Merit Scholarship
- 4) Scholarship to Children of Primary and Secondary School Teachers
- 5) Talent Development in Maths and Physics Scholarship.
- 6) Freedom Fighter
- 7) Physically Handicapped Students Scholarship
- 8) Central Government Minority Scholarship
- 9) Single Girl Child - Indira Gandhi Scholarship
- 10) North-East / State Government Scholarship

NOTE : It will be the sole responsibility of the student to apply for freeships/ scholarships in the prescribed form and before the prescribed date. The college will not be responsible for any loss of scholarship / freeship due to negligence on the part of the student. Merit scholarship/freeship will be awarded to the deserving students by the college.

- **Extra Curricular Activities**

The following extra curricular activities are provided to the students by the college.

- 1) National Cadet Corps (N.C.C.)

The College has N.C.C. facility.

- 2) National Service Scheme (N.S.S.)

Interested students may join N.S.S.

- 3) Debating, Art Circle, Science Association, Commerce Association and Ladies Association.

- 4) Indoor, Outdoor Games

- **Library**

The college has a well equipped library. Needy and deserving students are given books under the Book-Bank Scheme.

- **Gymkhana**

Adequate arrangements are made for games and sports. Special equipments are made available for the development of the Gymnasium Section. The facilities for following games are provided by the college.

**Name of Games :**

- 1) Basket Ball

- 7) Table Tennis

- 2) Soft Ball

- 8) Chess

- 3) Foot Ball

- 9) Wrestling

- 4) Holly Ball

- 10) Athletics

- 5) Hand Ball

- 11) Swimming

- 6) Cricket

- 12) Gymnasium & Other Indian Games.

- **Earn and Learn Scheme**

Poor and meritorious students are given financial assistance under this scheme by providing some work to meet their expenses towards fees, books etc.

- **Medical Check-Up**

A medical check up is compulsory for all the students.

- **Student Safety Policy**

Bharati Vidyapeeth Deemed University provides facility of student safety policy for students studying in the Bharati Vidyapeeth Deemed University.

## 8 : RULES OF DISCIPLINE

- 1) Students should be regular and punctual in attending classes, tutorials and submission of the term-work in various subjects. Terms shall not be granted and a student shall not be certified for examination if his/her progress, conduct and attendance is not satisfactory.
- 2) Students, if found indulging in anti-national activities contrary to the provisions of the Acts & Laws enforced by Government will be liable to be expelled from the college without any notice by the Principal of the College.
- 3) Ragging of students in any form within or outside the College and hostel is strictly prohibited. Defaulters will be strictly dealt with as per Govt. instructions in this matter.
- 4) Smoking, drinking (alcohol) and use of drugs is strictly prohibited in the premises of the College and hostel.
- 5) Bicycles, scooters and vehicles should be parked only in areas provided for the purpose. The institute accepts no responsibility for their safe custody. Vehicles lodged elsewhere may be confiscated.
- 6) Any changes in the address of the student must be intimated by him in writing to the college office immediately.
- 7) Students must use aprons and uniforms of prescribed pattern while working in dissection hall, laboratories, class-room and in the college.
- 8) A student must carry Identity Card / Smart Card signed by the Principal and produce the same whenever asked by the College Authorities. **Without Identity card / Smart Card students will not be allowed to enter the college premises.**
- 9) A student is expected to read the notices put up on the notice board of the College. The College accepts no responsibility for loss of any advantage by student due to his failure to read the notice in time.
- 10) In case, a student requires to remain absent for some reasons, he/she will be required to take the prior permission of the Principal.
- 11) If any of the statement made in application form or any information supplied by the student in connection with his/her admission is later on, at any time found to

be false or incorrect, his/her admission will be cancelled, fees forfeited and he/she will be expelled from the college by the Principal and prosecuted by Govt., if deemed necessary.

- 12) A student shall not go to the press or any other publicity media without permission of the Principal.
- 13) Any damage to the college property, apparatus, furniture, equipments, library books, building etc. must be paid immediately by the students.
- 14) Students must attend social and national events organised by the College such as 26<sup>th</sup> January, 10<sup>th</sup> May and 15<sup>th</sup> August, and all other declared national celebrations.
- 15) A student will be bound by the rules and regulations framed by the College / University from time to time.
- 16) No student will be allowed to appear for the university examination unless he/she has paid all his/her dues and completed his/her practical journals and has kept satisfactory attendance.
- 17) Principal reserves the right to prescribe from time to time any rule/s of discipline and accordingly take necessary disciplinary action.

Bharati Vidyapeeth Deemed University framed general discipline code of conduct for the admitted students in the college premises entitled as "Student Discipline and Conduct Rule 2008" under the provision of Article 24(h) rules of Vidyapeeth. Students are required to go through in above "Student Discipline and Conduct Rule 2008". The same is displayed on the notice board for the information of admitted students.



### **IMPORTANT NOTE**

#### **Attendance of International Students :**

Office of the Commissioner of Police has made mandatory to the college to observe International students attendance in the college and send the monthly report of the individual international student to the police (FRO). In this context, International students are appealed to be regular and punctual in attending classes, practical work, tutorials, submission of the term-work in various subjects. If the progress, conduct and attendance of any international student is not satisfactory his/her terms shall not be granted

## **09 : Instructions to Newly admitted Students for Permanent Registration Number (PRN) Registration**

1. Student need to visit the “[www.bvuniversity.edu.in](http://www.bvuniversity.edu.in)” website.
2. Click on **Student PRN No. generation** link under the Admission Notice Column.
3. Select **New Registration** link (1st time user only).
4. Select College / Faculty / Course / Specialization (if any) as per specified on College Fee receipt.
5. Now create USER by entering all the valid personal details. Use EMAIL ID as USER ID for further communication.
6. After successfully creation of USER, all the credentials will be send on mail (on registered mail ID).
7. Student now needs to login and with the valid credential to fill the form.
8. After login student needs to UPLOAD PHOTO, SIGNATURE and FEE RECEIPT in soft copy (Guidelines for uploading Images are given on the Website).
9. After uploading these documents, student will proceed on next page.
10. Student needs to enter personal details, local communication details, permanent communication details and educational details.
11. System will display the list of eligibility documents according to the course.
12. After completing these procedures student will able to see the application form, at this stage student can edit and update the information.
13. Student will submit the form and take print out of this form.
14. Student needs to submit this application form to the college office.
15. For existing students, the same procedure is applicable except they have to enter PRN number at the time of filling the form.
16. Kindly refer registration guide given on the website.
17. For any difficulties regarding PRN system, kindly contact **020-24407163** or mail on **bvusisprn@gmail.com**

### **Anti-Ragging Undertaking**

As per the norms laid down by the Ministry of Human Resource Development, Governemnt of India and University Grants Commission, New Delhi all the students seeking admission first time in this College, have to submit Anti-Ragging undertaking online through the following websites :

- 1) **[www.antiragging.in](http://www.antiragging.in)**
- 2) **[www.amanmovement.org](http://www.amanmovement.org)**

A student has to take print out of the same undertaking and attach the hard copy to admission form. Submission of Anti-Ragging Undertaking is mandatory to all newly admitted students.





## Institutions of Bharati Vidyapeeth Bharati Vidyapeeth (Deemed to be University) Pune, India

Accredited with 'A+' Grade (3rd cycle) by NAAC,  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



### CONSTITUENT INSTITUTIONS

• Medical College, Pune (with School of Optometry, School of Audiology and Speech Language Pathology and Centre for Health Management and Research, Pune) • Medical College & Hospital, Sangli • Dental College & Hospital, Pune • Dental College & Hospital, Navi Mumbai • Dental College & Hospital, Sangli • College of Ayurved, Pune • Homoeopathic Medical College, Pune • College of Nursing, Pune • College of Nursing, Sangli • College of Nursing, Navi Mumbai • College of Engineering, Pune • College of Architecture, Pune • Poona College of Pharmacy, Pune • Institute of Management & Entrepreneurship Development, Pune • Institute of Management and Research, New Delhi • Abhijit Kadam Institute of Management & Social Sciences, Solapur • Institute of Management, Kolhapur • Institute of Management and Rural Dev. Administration, Sangli • Yashwantrao Mohite Institute of Management, Karad • Institute of Hotel Management & Catering Technology, Pune • Yashwantrao Mohite College of Arts, Science and Commerce, Pune (with School of Performing Arts) • New Law College, Pune • College of Physical Education, Pune • Social Sciences Centre, Pune (Social Work) • Institute of Environment Education and Research, Pune • Interactive Research School for Health Affairs, Pune • Rajiv Gandhi Institute of Information Technology and Bio-Technology, Pune • Yashwantrao Chavan Institute of Social Science Studies & Research, Pune • Research and Development Centre in Pharmaceutical Sciences and Applied Chemistry, Pune.

### Bharati Vidyapeeth – Higher Education (Institutions Affiliated to other Universities)

• College of Engineering for Women, Pune • College of Fine Arts, Pune • Kala Mahavidyalaya, Pune • Jawaharlal Nehru Institute of Technology (Polytechnic), Pune • Institute of Pharmacy (Polytechnic), Pune • School of Photography, Pune • College of Engineering, Lavale, Pune • Institute of Management Studies & Research, Navi Mumbai • Institute of Management and Master of Computer Application and Information Technology, Navi Mumbai • College of Engineering, Navi Mumbai • College of Architecture and School of Designing and Decoration, Navi Mumbai • College of Pharmacy, Navi Mumbai • Institute of Pharmacy (Poly), Navi Mumbai • Institute of Technology (Poly), Navi Mumbai • Institute of Hotel and Tourism Management, Navi Mumbai • College of Engineering, New Delhi • Institute of Computer Application and Management, New Delhi • College of Pharmacy, Kolhapur • New Law College, Kolhapur • College of Engineering, Kolhapur • Dr. Patangrao Kadam Arts, Science & Commerce College (Jr., Sr., and P.G.), Sangli • Matoshri Bayabai Shripatrao Kadam Kanya Mahavidyalaya (Jr. & Sr.) Kadegaon (Sangli) • New Law College, Sangli • Institute of Technology (Poly), Palus (Sangli) • Loknete Mohanrao Kadam College of Agriculture, Kadegaon (Sangli) • College of Horticulture, Kadegaon (Sangli) • Yashwantrao Chavan Law College, Karad

### School of Bharati Vidyapeeth

• Bal Viikas Mandir (Marathi Medium) – Erandwane, Pune – 38, Navi Mumbai, Solapur • Primary, Secondary Schools and Junior Colleges (Marathi Medium) at different places such as in Pune, Solapur, Raigad, Satara, Sangli, Kolhapur, Palghar and other places • Ravindranath Tagore School of Excellence, Pre-Primary and Primary Schools, Balewadi, Pune • Pre Primary, Primary, High Schools and Senior Secondary Schools (English Medium), Erandwane, Pune, Dhankawadi, Pune, Lohegaon, Pune, Navi Mumbai, Jawhar, Dist. Palghar, Vikramgad, Dist. Satara, Kolhapur, Vita, Dist. Sangli, Kadegaon, Dist. Sangli • Residential CBSC School (English Medium) Pachgani, Dist. Satara • Primary and Secondary Ashram Schools, Jawhar, Dist. Palghar • Industrial Training Institute for Girls, Kadegaon (Sangli).

### Associate Institutions

• Bharati Vidyapeeth English-Maths Exam Department • Bharati Vidyapeeth's Bharati Printing Press • Bharati Sahakari Bank Ltd. • Bharati Madhyawarti Sahakari Grahak Bhandar Ltd. • Sonhira Sahakari Sakhar Karkhana Ltd., Wangi, Kadegaon, Dist. Sangli • Sageshwar Sahakari Soot Girmi Ltd., Kadegaon, Dist. Sangli • Krishna Verla Sahakari Soot Girmi Ltd., Kundal-Palus, • Sou. Vijaymala Patangrao Kadam Mahila Auodyogik Sahakari Santha, Kadegaon, Dist. Sangli • Mahatma Gandhi Hospital & Research Centre | Bharati Vidyapeeth Medical Foundation • Bharati Hospital & Research Centre • Eye Bank • Mobile Health Care Unit & Ambulance • Foundation for Rural Development • Bharati Vidyapeeth Krida Pratishthan • Bharati Vidyapeeth Kala Academy • Sonhira Milk Producers and Allied Agro Co-op. Soc. Ltd., Kadegaon • Sonhira Co-op. Poultry Society Ltd., Kadegaon, Dist. Sangli

*Where the mind is without fear and  
The head is held high;  
Where knowledge is free;  
Where the world has not been broken  
Up into fragments by narrow domestic walls;  
Where words come out from the depth of truth...  
Where the clear stream of reason has  
Not lost its way into the dreary desert  
Sand of dead habit...  
Into that heaven of freedom, my  
Father, let my country awake.*

*- Rabindranath Tagore*



Bharati Vidyapeeth (Deemed to be University), Pune  
**YASHWANTRAO MOHITE COLLEGE, PUNE**

**SCIENCE RESEARCH CENTRE**





C) FACULTY :  ARTS /  SCIENCE /  COMMERCE /  COMPUTER SCIENCE

Under Graduate/ Post Graduate

Class : .....

**Subjects Offered :**

- 1..... 2.....
- 3..... 4.....
- 5..... 6.....
- 7..... 8.....
- 9. Practical Courses .....

**D) DECLARATION BY STUDENT**

- 1) I have read the rules of the College and do hereby undertake, if admitted, to abide by them as they are at present in force or those hereafter framed by the College authorities.
- 2) I have read carefully the rules & regulations printed in the prospectus as regards to keeping and granting of terms, I will abide by the decision of the Principal in the matter of the grant of terms.
- 3) I have fully understood the rules regarding refund of fees mentioned in the prospectus.
- 4) I also further undertake to keep my guardian in regular touch with my progress in studies and other conditions while at the College.
- 5) I hereby submit to the disciplinary jurisdiction of the Vice Chancellor and other officer and authorities of the University and authorities of the College and Institution and shall observe and abide by the rules made by the Vice Chancellor on that behalf/and also the rules made by the Principal of the College.

6) **Anti Ragging Affidavit Reference No. :** ..... **Yours obediently,**

Place .....

Signature .....

Date .....

(Name: .....)

**E) PARTICULARS AND DECLARATION OF PARENTS/GUARDIAN**

- 1) Parents Full Name & address :.....  
.....
- 2) Relationship of Parent/ Guardian ..... Contact No. 

0																			
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
- 3) Occupation : Farmer/ Worker/ Labour/ Business/ Government employee/Private employee/others
- 4) Office Address .....  
..... Contact No. 

0																			
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
- 5) Annual Income Rs. ....

I hereby give my consent for admitting my son/daughter/ ward in the college, I have read all the rules and regulations of this college and I undertake that my Son/daughter/ward will abide by all the rules/ discipline of the college. Any disciplinary action taken against him/ her by college in case of violation of the rules will be binding on me.

Date :

Signature of Guardian/ Parent's

.....  
(Name .....)

**F) FOR OFFICE USE ONLY**

Shri. / Miss. / Mrs. .... has been provisionally admitted in the faculty of ..... in class ..... subject to the approval of the University.

Place : Pune

Date :

Checked by

Principal



# Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A' Grade (2017) by NAAC  
 'B' Grade University Status by MHRD, Govt. of India  
 Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam  
 M.A., LL.B., Ph.D.  
 Chancellor

Prof. Dr. Shivajirao Kadam  
 M.Sc., Ph.D.  
 Pro Chancellor

Prof. M. M. Salunkhe  
 M.Sc., Ph.D., F.R.S.C.  
 Vice Chancellor



Bharati Vidyapeeth Bhawan  
 Lal Bahadur Shastri Marg,  
 Pune - 411 030 (INDIA)

Tel : +91-20-24407100, 24325701  
 Fax : +91-20-24398121, 24321910  
 E-mail: bvuniversity@vsnl.co.in  
 Web : www.bvuniversity.edu.in

## NOTIFICATION NO. 875

It is hereby notified for the information of all concerned that the Academic Council, at its 54<sup>th</sup> meeting held on 18/09/2017, has resolved to approve the revised course structure for B.A. and B.Com. programme under the Faculty of Arts, Social Sciences and Commerce and syllabus for semesters I and II of B.A. and B.Com. based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for B.A. and B.Com. programme and syllabus for F.Y.B.A. and F.Y.B.Com. programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1794  
 Date: September 21, 2017

*G. Rajkumar*  
 Registrar

To

1. The Dean, Faculty of Arts, Social Sciences and Commerce, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

18/09/2017 10:11:11 AM



*[Signature]*  
 Incharge Principal  
 Yashwantrao Mohite College, Pune-38



# Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A' Grade (2017) by NAAC  
A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam  
M.A., M.L.S., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.A., Ph.D.  
Pro Chancellor

Prof. M. M. Salunke  
M.A., Ph.D., Ph.D.  
Vice Chancellor



Bharati Vidyapeeth Bharati  
Lal Bahadur Shastri Marg  
Pune - 411 009 (INDIA)

Tel: +91-20-24407100, 24320701  
Fax: +91-20-24320121, 24321510  
E-mail: bvuniversity@yahoo.com  
Web: www.bvuniversity.edu.in

## NOTIFICATION NO. 876

It is hereby notified for the information of all concerned that the Academic Council, at its 54<sup>th</sup> meeting held on 18/09/2017, has resolved to approve the revised course structure for B.Sc. and B.Sc. (Computer Science) programme under the Faculty of Science and syllabus for semesters I and II of B.Sc. and B.Sc. (Computer Science) based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for B.Sc. and B.Sc. (Computer Science) programme and syllabus for F. Y. B.Sc. and F. Y. B.Sc. (Computer Science) programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1795

Date: September 21, 2017

*G. Gayakwad*  
Registrar

To

1. The Dean, Faculty of Science, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Advertisement/18/2017/876/1/2



*[Signature]*

**Incharge Principal**  
Yashwantrao Mohite College, Pune-38



Prof. Dr. Shivajirao Kadam  
Chancellor M.Sc. Ph.D.

Prof. Dr. M. M. Salunkhe  
M.Sc. Ph.D. FRSC  
Vice Chancellor

# Bharati Vidyapeeth (Deemed to be University) Pune, India.

Founder Chancellor: Dr. Patangrao Kadam

- \* Accredited with 'A' Grade (2012) by NAAC \*
- \* Category I University Status by UGC \*
- \* NIRF Ranking - 55 \*

"Social Transformation Through Dynamic Education"

Since 1984



and Beyond  
BHARATI VIDYAPEETH

Dr. Vishwajeet Kadam  
B.Tech., M.A., Ph.D.  
Pro Vice Chancellor  
G. Jayakumar  
B.Com., U.P. in Arts  
Registrar

## NOTIFICATION NO. 957

It is hereby notified for the information of all concerned that the Academic Council, at its 56<sup>th</sup> meeting held on 4-12-2018, has resolved to approve the revised syllabi of S.Y. B.A., S.Y. B.Com., S.Y. B.Sc. and S.Y. B.Sc. (Computer Science) under CBCS pattern of the Faculty of Arts, Social Science and Commerce and the Faculty of Science to be implemented from the academic year 2019-20.

A copy of the revised syllabi of S.Y. B.A., S.Y. B.Com., S.Y. B.Sc. and S.Y. B.Sc. (Computer Science) is enclosed.

This is for the information of all concern.

Ref. No. BVDU/2018-19/4232

Date: January 8, 2019

*G. Jayakumar*  
Registrar

To,

- 1 The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 38
- 2 The Dean, Faculty of Science, Y. M. College, Pune 38
- 3 The Principal, Y. M. College, Pune 38
- 4 The Controller of Examinations, BVDU.
- 5 The IT Cell for uploading in the Website.

BVDU/2018-19/4232/1/1



*M. Mohite*  
Incharge Principal

Bharati Vidyapeeth Bhamburda, Lal Dehroad, Shambhaji Marg, Pune - 411 030 (INDIA)  
Tel.: +91-20-24427193, 24325701 | Fax: +E-1-20-24429121, 24429116 | Email: bvuniversity@yahoo.co.in | Web: www.bvuniversity.edu.in

Yashwantrao Mohite College, Pune-38



# Bharati Vidyapeeth (Deemed to be University) Pune, India.



Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Chancellor

Prof. Dr. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Founder Chancellor : Dr. Patangrao Kadam

★ Accredited with 'A+' Grade (2017) by NAAC ★  
★ Category-I University Status by UGC ★  
★ NIRF Ranking - 66 ★

"Social Transformation Through Dynamic Education"

Dr. Vishwajeet Kadam  
B.Tech., M.B.A., Ph.D.  
Pro Vice Chancellor  
G. Jayakumar  
M.Com., D.Phil. (Arts)  
Registrar

## NOTIFICATION NO. 1001

It is hereby notified for the information of all concerned that the Academic Council, at its 59<sup>th</sup> meeting held on 18-7-2019, has resolved to approve the revised syllabi of T.Y. B.A., T.Y. B.Com., T.Y. B.Sc. and T.Y. B.Sc. (Computer Science) under CBCS pattern of the Faculty of Arts, Social Science and Commerce and the Faculty of Science to be implemented from the academic year 2020-21.

A copy of the revised syllabi of T.Y. B.A., T.Y. B.Com., T.Y. B.Sc. and T.Y. B.Sc. (Computer Science) is enclosed.

This is for the information of all concern.

Ref. No. BVDU/2019-20/1097

Date: July 26, 2019

*G. Jayakumar*  
Registrar

To,

- 1 The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 38
- 2 The Dean, Faculty of Science, Y. M. College, Pune 38
- 3 The Principal, Y. M. College, Pune 38
- 4 The Controller of Examinations, BVDU.
- ✓ 5 The IT Cell for uploading in the Website.

AC18-7-2019(65-5-10)



*[Signature]*  
Incharge Principal  
Yashwantrao Mohite College, Pune-38



# Bharati Vidyapeeth Deemed University, Pune (India)

Accredited with 'A' Grade (2017) by NAAC  
B Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Hon'ble Dr. Patangrao Kadam  
M.A., B.A., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.A., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., FRSC  
Vice Chancellor



Bharati Vidyapeeth Bhawan,  
Lal Bahadur Shastri Marg,  
Pune - 411 006 (INDIA)

Tel. : +91-20-24407100, 24325751  
Fax : +91-20-24329121, 24321910  
E-mail : bvuuniversity@yepco.edu.in  
Web : www.bvuuniversity.edu.in

## NOTIFICATION NO. 877

It is hereby notified for the information of all concerned that the Academic Council, at its 54<sup>th</sup> meeting held on 18/09/2017, has resolved to approve the revised course structure for M.A. and M.Com. programme under the Faculty of Arts, Social Sciences and Commerce offered at BVDU Y. M. College, Pune and syllabus for semesters I, II, III and IV of M.A. and M.Com. based on Choice Based Credit System to be implemented from the academic year 2018-19.

A copy of the revised course structure for M.A. and M.Com. programme and syllabus for semesters I, II, III and IV of M.A. and M.Com. programmes based on CBCS is enclosed.

All the concern may please note.

Ref. No. BVDU/2017-18/1796  
Date: September 21, 2017

*G. Rajkumar*  
Registrar

To

1. The Dean, Faculty of Arts, Social Sciences and Commerce, Pune - 38
2. The Principal, BVDU Y. M. College, Pune - 38.
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

Ref: BVDU/2017-18/1796

*[Handwritten Signature]*

**Incharge Principal**  
Yeshwantrao Mohite College, Pune-38





# Bharati Vidyapeeth (Deemed to be University) Pune, India.



Hon'ble Dr. Patangrao Kadam  
M.A., U.B., Ph.D.  
Chancellor

Prof. Dr. Shrivajirao Kadam  
M.Sc., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Accredited with 'A' Grade (2017) by NAAC  
'W' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Bharati Vidyapeeth Bhavan,  
Lal Bahadur Shastri Marg,  
Pune - 411 030 (INDIA)

Tel. : +91-20-24407100, 24325701  
Fax : +91-20-24339121, 24321910  
E-mail : bvuniversity@yahoo.co.in  
Web : www.bvuniversity.edu.in

## NOTIFICATION NO.905

It is hereby notified for the information of all concerned that the Academic Council, at its 55<sup>th</sup> meeting held on 26-3-2018, has resolved to approve the revised course structure and syllabi of M.Sc. (Microbiology), M.Sc. (Computer Science), M.Sc. (Analytical/Organic/Inorganic Chemistry) under CBCS in the Faculty of Science offered in the University to be implemented from the academic year 2018-19.

All the concerned may please note.

Ref. No. BVDU/2017-18/ 5346

Date: April 10, 2018

*G. Rajeshwar*  
Registrar

To

1. The Dean, Faculty of Science, BVDU, Y. M. College, Pune 38
2. The Principal, BVDU, Y. M. College, Pune 38
3. The Controller of Examinations, BVDU.
4. The IT Cell for uploading in the Website.

XXXXXXXXXXXXXXXXXXXX



*[Handwritten Signature]*

**Incharge Principal**  
Yashwantrao Mohite College, Pune-38





**Bharati Vidyapeeth**  
(Deemed to be University)  
Pune, India.

**Founder Chancellor : Dr. Patangrao Kadam**

- \* Accredited with 'A' Grade (2017) by NAAC \*
- \* Category I University Status by UGC \*
- \* NIRF Ranking 2018 \*

"Social Transformation Through Dynamic Education"



**Dr. Vishwajeet Kadam**  
Pro Vice Chancellor  
**G. Jayakumar**  
Registrar

**Prof. Dr. Shivajirao Kadam**  
Chancellor

**Prof. Dr. M. M. Salunkhe**  
Vice Chancellor

**NOTIFICATION NO. 930**

The authorities of the University have approved to start the following two programmes on regular mode under BVDU Yashwantrao Mohite College of Arts, Science and Commerce, Pune from the academic year 2018-19.

- (1) Bachelor of Library & Information Science (B.Lib. & I.Sc.) and
- (2) Master of Library & Information Science (M.Lib. & I.Sc.)

It was further resolved to approve the Course Structure, Syllabus and Examination Rules for the above programmes.

All concerned are requested to make a note the same.

Ref. No. BVDU/2018-19/ 1626  
Date : August 22, 2018

*G. Jayakumar*  
Registrar

To,

1. The Principal, Y. M. College, Pune 411038.
2. The Dean, Faculty of Arts, Social Sciences and Commerce, Social Science Centre, Pune 411038.
3. The Controller of Examinations, BVDU.
4. The Eligibility Section, BVDU
5. Webmaster for uploading in the website.

18/08/2018

*[Handwritten Signature]*

**Incharge Principal**  
Yashwantrao Mohite College, Pune-38



# **Bharati Vidyapeeth Deemed University**

## **COLLEGE OF PHYSICAL EDUCATION**

Dhankawadi, Pune-411 043 (Maharashtra), INDIA

### **DIPLOMA IN YOGA EDUCATION**

**(PG D.Y.Ed. - 1 Year)**

#### **GENERAL OBJECTIVES**

- 1) To train the candidates in the esoteric aspects of Yoga that deals with the problems of integration of personality.
- 2) To prepare the students to undertake teaching work in yoga.
- 3) To inculcate rational thinking and scientific temper among the students of yoga.
- 4) To use managerial and organizational skills for becoming a yoga teacher.
- 5) To help them understand varied responsibilities of a yoga teacher.
- 6) To acquaint the student with school/ college Health Programme.
- 7) To acquaint the students with the basic concept of management of yoga education in the school.
- 8) To understand the evaluation procedure in Physical Education.
- 9) To develop competencies and skills in yoga needed for becoming a healthy individual.
- 10) To enrich proper knowledge of yoga among the students to resolve emerging issues such as health & fitness, wellness etc.
- 11) To develop a special aptitude towards spiritual phenomenon through yoga.

#### **Programme outcome**

1. At the end of the course the students will be able to understand traditional Indian Yoga systems; the philosophy of the Yoga systems and the new thought in Yoga movement in the country.
2. The students will be able to understand the principles of Hatha Yoga and the texts in this field.
3. The programme will develop basic understanding of the human anatomy, the human physiology and a deeper understanding of the human systems
4. The students will be introduced to the essential elements of a yogic life style, the concept of health and disease and their remedies through yoga practice. They will also learn the overview of the five sheath human existence.
5. The students will be introduced to regular and rigorous practice (sadhana) of yoga practices that would make them disciplined and knowledgeable Yoga teachers

## REGULATIONS

### 1. **Duration of the Course:**

This is a co-education course. The duration of the course of study is for 1 year. The total Teaching days shall not be less than 200 days excluding examination.

### 2. **Eligibility for Admission:**

Candidate must be a graduate from any discipline.

### 3. **Selection Procedure for Admission:**

Admission to the eligible candidates will be given as per the selection procedure laid down by the College from time to time.

### 4. **Rules of examination**

- He/ she have completed all the practical and other work according to the syllabus up to the satisfaction of the principal. He/ she should have obtained such a certificate from the principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.
- Student who fails in any one or more internal practical works in the term end examination will be permitted to complete in the subsequent year of examination
- Student who fails in any one or more papers in the final examination will be permitted to rewrite the remained paper or papers in the subsequent year of examination
- **Medium of Instruction:** Medium of Instruction will be Marathi or Hindi or English or in combination. The candidate appearing for examination will have the option of answering all the examination subjects either in Marathi or in Hindi or in English.
- The college will complete the internal assessment of the heads mentioned in the syllabus. The internal assessment will be in the form of marks.
- For the rationalization of internal marks, the **College shall appoint moderation committee** (keeping the Principal of the college or his nominee as Chairman). The Committee will take the review of the internal marks given by the college faculties and advice the college if necessary. The college should take the appropriate action as per the advice of the committee.

### **Norms for passing PG D.Y.Ed. Examination :**

To pass the examination the candidate must obtain at least 35% marks in each theory and 40% in practical separately and the aggregate must be 45%.

- i) Pass Class: 45% & above and below 50%

- ii) II Class: 50% & above and below 60%.  
 iii) I Class: 60% & above and below 70%.  
 iv) I Class with distinction: 70% & above

**Note:**

- 1) The candidate who has obtained minimum 35% or more marks in any head of passing but failed in the examination shall be eligible to claim exemption in such head/heads. Candidates claiming exemption will not be eligible for first class with Distinction, first class, and second class and merit list.
- 2) The candidate has completed their terms but has not completed internal work are eligible do so in next one academic year only.

**SCHEME OF EXAMINATION**

**PART-A (THEORY)**

<b>Subject Code</b>	<b>Theory Subjects</b>	<b>Final Paper (Marks)</b>	<b>Sessional (Marks)</b>	<b>Total (Marks)</b>	<b>Minimum Aggregate Passing Marks</b>	<b>Credits</b>
DYEd/Th-1	Foundation of Patanjala Yoga Sutra (3 periods per week)	75	25	100	35	6
DYEd/Th-2	Foundation of Hath yoga (3 periods per week)	75	25	100	35	6
DYEd/Th-3	Yoga, Cultural Synthesis & Value Education (3 periods per week)	75	25	100	35	6
DYEd/Th-4	Anatomic-physiological aspects in Yoga Education (3 periods per week)	75	25	100	35	6
DYEd/Th-5	Psychology of Yoga Education (3 periods per week)	75	25	100	35	6
DYEd/Th-6	Teaching Methods in Yoga Education (3 periods per week)	75	25	100	35	6
	<b>TOTAL</b>	<b>450</b>	<b>150</b>	<b>600</b>	<b>-</b>	<b>36</b>

**PART-B (PRACTICAL SKILL)**

<b>Activity Code</b>	<b>Activities</b>	<b>Max. Marks</b>	<b>Min. Pass Marks</b>	<b>Credits</b>
DYEd/Pr-1	Asanas (3 periods per week)	100	40	6
DYEd/Pr-2	Pranayamas (2 periods per week)	100	40	4
DYEd/Pr-3	Kriyas (2 periods per week)	100	40	4
DYEd/Pr-4	Bandhas & Mudras (2 periods per week)	100	40	4
DYEd/Pr-5	Antaranga Yoga (2 periods per week)	100	20	4
DYEd/Pr-6	Practice teaching (1 period per week) 1) peer group lesson-ten 2) external lesson- two	100	20	2
	<b>TOTAL</b>	<b>600</b>	<b>-</b>	<b>24</b>

**Total Credit (A+B) = 60**

### **GENERAL OBJECTIVES**

- 1) To train the candidates in the esoteric aspects of Yoga that deals with the problems of integration of personality.
- 2) To prepare the students to undertake teaching work in yoga.
- 3) To inculcate rational thinking and scientific temper among the students of yoga.
- 4) To use managerial and organizational skills for becoming a yoga teacher.
- 5) To help them understand varied responsibilities of a yoga teacher.
- 6) To acquaint the student with school/ college Health Programme.
- 7) To acquaint the students with the basic concept of management of yoga education in the school.
- 8) To understand the evaluation procedure in Physical Education.
- 9) To develop competencies and skills in yoga needed for becoming a healthy individual.
- 10) To enrich proper knowledge of yoga among the students to resolve emerging issues such as health & fitness, wellness etc.
- 11) To develop a special aptitude towards spiritual phenomenon through yoga.

### **REGULATIONS**

#### **1. Duration of the Course:**

This is a co-education course. The duration of the course of study is for 1 year. The total Teaching days shall not be less than 200 days excluding examination.

#### **2. Eligibility for Admission:**

Candidate must be a graduate from any discipline.

### **3. Selection Procedure for Admission:**

Admission to the eligible candidates will be given as per the selection procedure laid down by the College from time to time

**4. Medium of instruction** :- Medium of instruction will be **Marathi** or **Hindi** or **English** in combination. The candidate appearing for examination will have the option of answering all the examination subjects either in Marathi or in Hindi or in English

### **5. Rules of examination**

- A candidate (He/She) must have completed all the practical and other work according to the syllabus up to the satisfaction of the principal. He/she should have obtained such a certificate from the principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.
- The College will complete the internal assessment of the heads mentioned in the syllabus internal assessment will be in the form of marks.
- For the rationalization of internal marks, the college shall appoint moderation committee (keeping the principal of the college or his nominee as chairman). The Committee will take the review of the internal marks given by the college and advice the college if necessary. The college should take the appropriate action as per the advice of the committee.
- 80% of marks will be assessed through external evaluation and 20% shall be by the internal evaluation.
- A candidate must record attendance at the periods in college for the whole year as prescribed in the university norms (min.80%) to be able to appear for university examination.
- Candidate should complete all the practical and internal assessment work up to the satisfaction of the principal / Head of the unit.
- To pass the examination the candidate should score minimum 40% marks separately in internal as well as external examination for each theory and practical paper

## **SYLLABUS FOR P.G. DIPLOMA IN YOGA EDUCATION (P.G.D.Y.Ed.)**

**PAPER I- Foundation of Patanjala Yoga Sutra (P.Y.S.)**

**Marks 100**

### **Unit-I.**

1. P.Y.S.: Introduction to P.Y.S., its author and its concept about Yoga and chapters.
2. P.Y.S.: According to *Samkhya* Philosophy,
3. Yoga traditions: P.Y.S. and other Traditions ( *Gita, Hatha, Mantra, Laya*)
4. Brief survey of P.Y.S. and its Traditional and Modern commentaries and other related works on P.Y.S.
5. Concept of Citta, its structure & functions and need to channelize it

### **Unit-II.**

1. *Abhyasa & Vairagya.*
2. Factors that accelerate *Patanjala Yoga Sadhana, Bhavapratyaya Yogis & Upayapratyaya Yogis,*
3. Concept of *Isvara* and *Isvarapranidhana/ Pranava Japa*
4. Concept of *Cittaviksepa/ antaraya, Eka tattva – Abhyasa .*
5. Concept and methods to achieve *Cittaprasadana,*

### **Unit-III.**

1. *Kriyayoga:* Meaning, concept , importance and Its educational value.

2. *Klesas*: Concept & their remedy.
3. Concept of *Caturvyuha*: *heya*, *heyahetu*, *hana* and *hanopaya*.
4. *Rtambhara prajna*,
5. Concept of Saptabhumi Prajna

#### **Unit-IV.**

1. *Yamas* and *Niyamas*: Concept and practice.
2. Concept and practice of *Asanas*, *Pranayama*, *Pratyahara* according to Patanjali and their practice in the light of other scripture.
3. Concept of *Dharana*, *Dhyana* and *Samadhi*, their differences and salient features
4. *Samprajnata* and *Anya*, *Samapattis*, *Sabija Samadhi* and *Nirbija Samadhi* and difference between Samapatti and Samadhi
5. Concept of *Samyama* in PYS.

#### **REFERENCE BOOKS**

##### **A) Traditional Commentaries:**

1. Shri *Patanjala Yoga Darshanam* published by Kaivalyadhama, Lonavla 410 403.
2. “*Patanjala-Rahasyam*” of Raghavananda Saraswati : In THE SAMGA YOGADARSANA : The Kashi Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India),1935.
3. “*Patanjala-Yogasutra-Bhasya-Vivarsanam*” of Sankaro Bhagavadpada, edited by poiagam by poiagam Sir Rama Sastri and S.R. Krishnamurti Sastri (The Madras Government oriental Series No.94),the Govt. Oriental Manuscripts Library, Madras (India)1952.
4. “*Rajamartanda*”of Bhojaraja :In *YOGASUTRAM OF MAHARSHI PATANJALA*. The Chowkhamba Sanskrit Sansthan, Varanasi, (India),1982 (Second Edition).
5. “*Sutrarha-bodhini*” of Narayana Tirtha : In YOGADARSANAM Edited by Pandita Ratna Gopal Bhatta (The Chowkamba Sanskrit Series Nos.154 and 159) The Chowkamba Sanskrit Book Depot, Banaras (India)1911.
6. “ *Tattvavaisaradi*” (Ta. Vai.) of Vacaspati Misra : In THE SAMGA YOGADARSANA “ The Kashi Sanskrit Series No.110,The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India), 1935.
7. “*Vyasabhasya*” of Vyasa : In *PATANJALA YOGASUTANI* edited by Kasinath Sastri Agashe (Anandashrama Sanskrit Series No.47) Anandashrama press,poona (India)1932.
8. “*Yoga Karika*” of Hariharananda Aranya : In *THE SAMGA YOGADARSANA* Gosvami Damodara Sastri : The Kashi Sanskrit Series No.110, The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series No.110, The Chowkhamba Sanskrit Series Office, Banaras (India), 1935.



9. YOGASARASAMGRAHA OF *Vijnanabhiksu* : edited by *Dr. Pavan Kumari*, Eastern Book Linkars, Delhi, 1935.

**B. Modern Commentaries:**

**a) English-**

1. *Patanjala Yoga Sutra*, Dr.P.V.Karambelkar,Kaivalyadhama,Lonavala.
2. The Science of Yoga,I.K.Taimini, The Theosophical Publication House, Madras.
3. The Science of Yoga, Aprabuddha, Shri Aprabuddha Vichar Sadhana, Nagpur.
4. “*Yoga-Vattik*” (YV) of *Vijnanabhiksu* (Volume I To IV),edited by T.S Rukmani : Munshiram Manoharlal Publishers Pvt.Ltd., New Delhi 110 055, 1983.
5. Introduction to *yoga sutra*, Ram Shankar Bhattacharya, Bharatiya Vidya prakashan, Varanasi 1.
6. Yoga Sutra of Patanjali, Ballantyne & Shastri, Akay Book Corporation, Delhi 35
7. Four Chapters on Freedom, Swami Satyananda Saraswti, Bihar School Of Yoga, Munger, Bihar.

**B) Hindi:**

- 1) *Patanjala Yoga Darshanam*, Acharya Udayavir shastri, Chairman, Virajananda Vaidik (Shodh) Samsthan, Gajiyabad, U.P.
- 2) *Patanjala Yoga Darshanam*, Vol.1 to 4, Dr.Vimla Karnataka , Kashi Hindu Vishvavidyalaya, Varanasi and Ratana publications, aranasi.
- 3) *Patanjala Yoga Darshanam*, Acharya Rajvir Shastri, Arsha Sahitya prachar Trust, New Delhi 110 007
- 4) Maharshi Patanjalikrit Yoga Darsana, Harikrishna Goyanka, Gita press, Gorakhpur.
- 5) *Patanjala Yogapradipika*, Shri Swami Omananda Tirth, Gita Press,Gorakh
- 6) Patanjalyogadarshanam, Shrimat swami Hariharananda aradhya, Motilala Banarashidas New Delhi 10007.
- 7) *Vyasa bhasya Samvalitam*,Patanjalyogadarshanam, Dr. Sureshchandra Shrivastava ,Chaukhamba Surbharati Prakashan ,Varanasi 220001.

## **PAPER II. Foundations of Hatha Yoga**

**Marks 100**

### **Unit – I**

- 1) Concept of Yoga in the light of its definitions, Schools of Yoga- *Bhavana* Yoga-*Jnana*, *Karma* and *Bhakti*; *Prana Samyama* Yoga- *Mantra*, *Hatha* , *Laya* and *Raja*;
- 2) Introduction to important *Hathayogic* Texts with special reference to *Hathapradipika* (HP) and *Gheranda Samhita* (Gh S), Special features of these two texts,
- 3) Ideal place and ideal hut according to *HP* and *Gh S*.
- 4) *Sadhaka* and *Badhaka* Factors according to *HP*,
- 5) Concept of *Mitahara* in *HP* and *Gh S*.

### **Unit – II**

- 1) Antiquity and definitions of *Asana*,
- 2) All 15 asanas from *HP* and 32 Asanas from *Gh S*.
- 3) Evolution of *Pranayama*, Components of *Pranayama*, *Yukta* and *Ayukta* *Pranayama*,
- 4) Concept of *Kanda* and *Nadi* in *Hathayoga*, *Nadishodhana* *Pranayama* in *HP* and *Gh S*.
- 5) *Yoga Therapy* in 5<sup>th</sup> Chapter of *HP* of *Kaivalyadhama*.

### **Unit – III**

- 1) Importance of *Cleansing* processes in *Yogic* curriculum, comparison between *Pancha karma* and *Shat karma*,
- 2) *Cleansing* processes in *HP* and *Gh S*.
- 3) Eight *kumbhaka*s in *HP* and *Gh S*, Special study of *Suryabhedana*, *Ujjayi*, *Bhramari*, *Bhastrika* and *Kevala/ Kevali* in *HP* and *Gh S*
- 4) *Sahita kumbhaka* in *Gh S*,

5) *Sitkari and Plavini Kumbhaka* in *HP*

#### **Unit -IV**

1. Importance and purpose of *Mudras* in *Hathayoga*, Concept of *Kundalini* and its arousal,
2. *Mudras* in *HP* and *Gh S*, Special study of *Khecari* and *Shaktichalana*,
3. Five *Dharanas*, in *Hatha yoga*
4. Concept of *Pratyahara* and *Dhyana* in *Hathayoga* with special reference to *Gh S*, Concept and technique of *Samadhi* in *Gh S*,
5. Concept of *Laya* and *nada*, Technique and stages of *Nadanusandhana*.

#### **REFERENCE BOOKS**

1. *Goraksha Shatakam* of *Gorakshanath* (Pub by kaivalyadhama, Lonavla)
2. *Shiv samhita* (Pub. By Kaivalyadhama ,Lonavla )
3. *Vasishtha samhita* (Pub. By Kaivalyadhama ,Lonavla )
4. *Yoga Yajnavalkya yajnavalkya smriti*
5. *Asana* by Swami Kuvalayananda (Pub by kaivalyadhama, Lonavla)
6. *Pranayama* by Swami Kuvalayananda (Pub by kaivalyadhama, Lonavla)

**PAPER III. Yoga, Cultural Synthesis & Value Education: Marks 100**

#### **UNIT – I**

##### **Yoga and Culture**

1. Concept and meaning of *Yoga* and its forms.
2. Definition of Culture and Civilization,
3. Salient Characteristics of Indian and Western Culture.
4. *Yoga* as basis of Culture and Humanitarianism

#### **UNIT – II**

##### **Yoga and Philosophy (Darshana)& Philosophy of Yoga in Darshana,**

1. Brief Introduction to *Yoga* in *Veda* and *Upanishads*, *Shrimad Bhagawad Gita* with special reference to – *Jnana Yoga*, *Karma Yoga* and *Bhakti Yoga* – their inter- relationship and synthesis.
2. Salient features of Indian Philosophy and Western Philosophy
3. Six systems of Indian Philosophy with special reference to concepts of Soul, Bondage and Liberation. Relation of *Yoga* to these systems.
4. Brief Introduction to the contribution of Modern Indian personalities like Swami Vivekananda, Gandhiji, Shri Aurobindo, Swami Shivanandaji and Swami Kuvalayanandaji towards World Peace and Harmony with special reference to *Yoga*.

## **UNIT III**

### **Yoga, Religion and Mysticism**

1. Meaning and significance of Religion; Yoga and Religion; Yoga and Jainism
2. Yoga and Buddhism
3. Yoga and Islam,
4. Yoga and Christianity
5. Yoga and Mysticism, Yoga and Suficism.

## **UNIT IV**

### **Yoga and Value Education**

Values – meaning, significance, classification; Indian Understanding of Values.

1. Basis of Value Development –
  - a) Socio-cultural,
  - b) Psychological.
2. Concept of Value Education – Meaning, aims and objectives, Rationale of Value Education, Contents of Value Education and Role of Teachers.

**Methods of Value Education:-** a) Yoga as a method of Value Education.  
b) Implication & application of Value Education in one's own life style.  
Short –term project to prepare & follow & submit to in- charge for evaluation . (Committed Project)

### **Reference Books –**

- 1) Mysticism and Philosophy – Stace, W.T. Mac Milan and Co., London, 1961.
- 2) Mysticism in World's Religions – Geoffrey Parinder, Oxford University Press, New York, Shendon Press, 1976.
- 3) Education in value a Source book Pub: national council of education research and training Nov 1992, Secretary, NCERT ,Sri Aurobindo Marg New Delhi 10016 Price Rs.54
- 4) Hindu Cultural An Introduction, Pub – Central Chinmaya Mission trust, Mumbai

- 5) Indian Philosophy Datta & Chatterjee Hindi and English, Pub.:University of Calcutta, Calcutta Year 1984, 8<sup>th</sup> Reprint
- 6) World's Religions, Pub.: Sri Swami Shivananda, Ananda Kutir, Rishikesh, Himalayas, The Sivananda Publication League, Rishkesh. Year 1947
- 7) Bharatiya Darshana: parasnath Dwivedi- Hindi Pub.: Shriram Mehra & com., Agra 3 Year 1980
- 8) *Bharatiya Sanskriti*, - Dr. Rajkishor Singh Hindi, Pub.: Vinod Pustak Mandir, Agra, Year 1995-96
- 9) *Dharma Avem Sanskriti* V.K.Bhatiya, -Hindi, Pub.: Sahitya Bhavan, Agra, Year 1978

#### **PAPER IV. Anatomico-Physiological aspects in Yoga Education (Marks100)**

##### **UNIT I –**

##### **1) Knowledge about the Living Body :**

1. Concept of Living body and stages of life – modern view.
2. Concept of Anatomy & Physiology and its importance in Yogic field.
3. Modern History of Scientific concept about yogic practices.
4. Structural organization of body.
5. Basic physiological concepts.
6. Concept of harmony in related with health (all systems , organs cells)

##### **2) Nervous System :**

1. Anatomy of Brain , spinal cord , nerves.
2. Voluntary & Autonomus work of nervous system.
3. Concept of the development of brain and nerve cell.
4. Role of neurotransmitters.

##### **3) Digestive system –**

- 1) Structure and functions of all part of alimentary track and glands
- 2) Process of digestion; factors influencing the digestion.
- 3) Concept of diet through modern, Ayurvedic and yogic views.
- 4) Indigestion and its complications; How does yoga help to reverse the complication due to indigestion.

##### **UNIT II –**

##### **1) Respiratory system**

- Structure and functions of all parts of respiratory track.
- Mechanism of ventilation, diffusion and cellular respiration, breath regulation.
- Lung capacity and factors influencing it.
- Yogic practices for healthy respiratory system

## **2) Circulatory system –**

- Structure and functions of the heart , blood vessels & blood cells.
- Concept of blood pressure and effect of yoga practices on it.

## **3) Endocrine system –**

- Structure and functions of all endocrine glands.
- Neuro endocrine balance and yoga
- Yogic practices, how they influences work of glands.

## **4) Reproductive and Excretory System:**

- Structure and Functions & effect of Yoga practices on it.

## **UNIT III –**

### **1) Musculoskeletal System**

Muscles –properties, function, types of muscles

Types of contraction & stretching

Bones – function and types of bones

Yoga and health of muscles and bones in different stage of life.

### **2) Asana**

Definition

View of traditional text, scientific view,

Types.

Anatomy, physiology, therapeutic importance & limitation of various asanas described in traditional texts.

Asana- How to use as a therapy.

### **3) Pranayama**

Definition, psycho-physiological effect.

Various types according to traditional texts and their importance.

Therapeutic importance and research about Pranayama.

## **UNIT- IV**

### **1) Kriya**

Cleansing concept in *Hatha & Patanjali*

Neti – Effect, importance and limitation

*Vastra* and *Nauli* - Effect, importance and limitation

*Kapalabhati* - Effect, importance and limitation

*Trataka* - Effect, importance and limitation.

*Shankha Prakshalana* & other processes.

## 2) **Meditation**

Scientific view

Types and variation. As a means & Goal/End.

Types and variations

## 3) **Yoga Therapy**

Concept of Yoga Therapy 1- Life style modification.2- practice.

*Klesha* and *antarayas* & how to overcome it. *Chittaprasadhana*.

Yogic management of 1- psychosomatic disorders.

2. Metabolic disorders

3. Immunity related diseases.

## **UNIT V –**

1. Concept of Body, Mind and beyond mind.
2. Conceptual understanding of body mind & beyond with reference to human body function.
3. Body as a micro & macrocosm with interrelation.
4. *Nadi chakra*, *Kosha* , Subtle body etc.

## **UNIT VI –**

1. Structural & functional comparison of modern / ancient yoga , ayurveda, Homeopathy.
2. Experience based knowledge & information about human body- According to yogic text & with their technical terms without equation & comparison according to *Hatha Pradipika* & *PYS*.

## **Reference books**

1. Structure and function of human body.....published by Kaivalyadhama
2. *Asana* by swami kuvalayananda , kaivalyadhama ,Lonavla
3. *Pranayama* by Swami kuvalayananda ,kaivalyadhama ,Lonavla
4. *Yogic Therapy* by swami Kuvalayananda, kaivalyadhama ,Lonavla
5. *Anatomy & Physiology for Nurses*, Evelyn Pearce,16<sup>th</sup> Edn.1992
6. *Anatomy & physiology for Nurses*, Evelyn Pearce, (Hindi version) by Manju & Mahesh
7. *Yogic therapy* by Swami Shivananda Saraswati ,1957
8. *simple Yoga and Therapy* by Yogeshwar,1986
9. *Management of common diseases* compiled by swami Karmananda Saraswati ,Bihar School of Yoga, 1983.
10. *Principles of anatomy and Physiology* ,Tortora and Anagnostakos (1984), Harper & Row Publisher ,New Delhi.
11. *Swadhyay* and *Yoga therapy* Dr. D.R.Vaze, Lonavla : Kaivalyadhama.

**PAPER V. Psychology of Yoga Education**

**Marks 100**

**UNIT –I**

1. Similarities and dissimilarities between the sciences of yoga and modern psychology.
2. Advantages and limitations in understanding yoga through psychological means and methods.
3. Definitions of Health, Mental Health, Mental Hygiene and Total health in the context of the concept of swasthya.
4. Who is ‘ Swastha’ ? waht is “Swa” as per P.Y.S.

**UNIT –II**

1. **Normality”** in yoga and modern Psychology in the context of different theories and models available in psychology. Emphasis should be laid on “Normality “ in yoga.
2. Psychosomatic abnormalities / disorders: Freudian approach to these disorders causes of these disorders according to Patanjala Yoga Sutra.
3. Personality Development and yoga: Modern theories of personality, Indian approach to personality and personality integration.

**UNIT –III**

1. Personal and interpersonal adjustment through yogic methods with special reference to Niyamas & Yamas.
2. Attitude change through yogic & psychological methods
3. Tacklling ill effects of conflict / Frustration through yogic methods.



4. How far, “Yoga-Psychology” is developed ? How far a synthesis of psychology and yoga is possible for personality development.

#### **UNIT –IV**

- 1. Concept of stress:** Modern psychological and yogic perspectives.
- 2. Methods of Citta Prasadanaam for**
  - (a) Stress management
  - (b) Application of Patanjali Yoga Sutra for a total Health.
- 3. Prayer:** a cross –cultural approach to mento-spiritual development , psychology of prayer ,benefits of prayer to the yoga Sadhaka , as well as, to the common man.

#### **REFERENCE BOOKS :**

1. Bhoga R.S. (2010)Yoga and mental Health Lonavla, kaivlyadhama
2. Bhogal R.S.(2006) Yoga and modern psychology, Lonavla, Kaivalyadhama
3. Mathur, S.S.(1985) *Samanya Manovigyan* (Hindi) Agra :Vinod Pustak Mandir
4. Morgan, C.T. & king R.A.(1978) Introduction to Psychology ,New Delhi :Tata McGraw- hill Publishing company limited
5. Pandit,R.V.(1971)*Samanya Manasa Shastra* (Marathi). Nagpur: Payal Prakasan
6. Sharma,Ram Nath,(1960) Indian psychology; Meerut: Kedar Nath Ram Nath.

#### **PAPER VI. Teaching Methods in Yoga Education**

**100 Marks**

- Besides the above mentioned theory, subjects and practicals, students will also be taught the art of teaching Yoga. Since Yoga is a specialized field, the method of its teaching is also unique. Kalvalyadhama has evolved special methods of teaching yoga hence the subject. This has been further divided into Theroy and Practical Teaching.

#### **Unit 1**

Introduction: need of practice teaching and its use in yogic practice.

Yoga and Yogic practices.

#### **Unit 2**

- 2.1. Meaning and Scope of Teaching Methods.
- 2.2. Sources of Teaching Methods.
- 2.3. Presentation techniques: its meaning and relevance in yoga education .

#### **Unit 3**

- 3.1. Teaching aids: its meaning and need up to the modern time power point.
- 3.2. Class management: its meaning and need.

#### **Unit 4**

- 4.1. Lesson plan: meaning and need.

- 4.2. Preparation of lesson plan in yogic practice.
- 4.3. Time allotment in different lesson plans & its importance.
- 4.4. Lesson presentation.

### **Practical Teaching**

Each student will be assigned to prepare and teach five lessons on different aspects of Yoga. Out of Which the 5th Lesson is to be presented by each student on any one topic relating common disease.

### **Reference book**

1. Gharote, M.L. and Ganguly, S.K. (1988) Teaching Methods of Yogic Practice, Kaivalyadhama, Lonavla,
2. Doanld G. Butter (1975) Teaching Yoga, Geoffery Chapman Publisher,
3. *Yogasana* Teacher's Guide (1983) National council of Educational Research and Training,
4. K.K. Bhatia and J.N. Arora, Methodology of Teaching, Prakash brothers Ludhiana 1985
5. Sachitra Shaleya Yogaabhyasakrama, (Marathi), director Sports and Youth welfare Pune 1976
6. Tiwari O.P. (1984) asana Why and How? Kaivalydhama, Lonavla.

### **PRACTICAL TRAINING :**

**Marks 100**

Shavasana	Vatayanasana
Shrishasana	Garudasana
Crocodile Practices ( Four variations )	Shirh-padangusthasana
Pavanmuktasana	Vajrasana
Naukasana	Padmasana
Viparitakarani	Siddhasana
Sarvangasana	Swastikasana
Matsyasana	Shavasana
Halasana	Makarasana
Karnapidasana	Brahmamudra
Bhujangasana	<b>B. PRANAYAMA</b>
Shalabhasana	1. Anuloma-viloma
Sarpasana	2. Ujjayi
Dhanurasana	3. Shitali
Vakrasana	4. Sitkari
Ardha-Matsyendrasana	5. Bhastrika
Paschimatanasana	6. Bhramari
Supta Vajrasana	7. Suryabhedana
Yoga Mudra	8. Chandrabhedana
Simhasana	9. Murccha (Theory only)
Gomukhasana	10. Plavini (Theory only)
Matsyendrasana	<b>C. BANDHAS AND MUDRAS</b>
Mayurasana	1. Jalandhara Bandha
Kukkutasana	2. Uddiyana Bandha
Uttana Kurmasana	3. Jicha Bandha
Ushtrasana	

<p>Gorakshasana  Padma - Bakasana  Baddha -padmasana  Akarmadhanurasana  Ugrasana  Parvatasana  Janushriasana  Tolangulasana  Muktasana  Virasana  Guptasana  Sankatasana  Uttanamandukasana  Vrishabhasana  Padangusthasana  Garbhasana  Bhadrasana  Kapotasana  Ekpadaskandhasna  Chakrasana (Sideward)  Chakrasana (Backward)  Virkshasana  Tadasana  Pada - hastasana  Utkatasana  Natarajasana</p>	<p>4.Mula Bandha</p> <p><b>D.KRIYAS</b></p> <ol style="list-style-type: none"> <li>1.Jala Neti</li> <li>2.Sutra Neti</li> <li>3.Dhauti (Vamana,Danda,Vastra)</li> <li>4.Nauli</li> <li>5.Kapalabhati</li> <li>6.Aganisara</li> <li>7.Trataka</li> <li>8.Shankhprakashalana</li> </ol> <p><b>E.RECITATIONS</b></p> <ol style="list-style-type: none"> <li>1.Pranava Japa</li> <li>2.Svasti Mantra</li> <li>3.Rudropasana</li> <li>4.Savitru Upasana</li> <li>5.Mahapurushavidya</li> <li>6.Om Stavana</li> <li>7. 15<sup>th</sup> Chapter of shrimad Bagwat Gita</li> </ol> <p><b>F.OTHER PRACTICES</b></p> <ol style="list-style-type: none"> <li>1.Meditation Techniques</li> <li>2.Suryanamaskar</li> <li>3.Sukshma Vyayama</li> <li>4.Kriya Yoga Session-consisting of Pranayama,Mantra,Yoga,Sutra etc.</li> </ol>
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### Calculation of Credit:

<b>For theory</b>	<b>For practical</b>
1 day = 2 hrs. For 200 days, total (200x2) = 400 hrs. 36 credits = 400 hrs. <b>1 credit = 11 hrs.</b>	1 day = 1 hrs (1 hr in morning + 1 hr in evening) For 200 days, total (200x2) = 400 hrs. 24 credits = 400 hrs. <b>1 credit = 16 hrs.</b>
<b>Minimum eligibility for exam:</b> Minimum 4 Credits in each paper = 11 hrs x 4=44 hrs. Thus, <b>44 hrs. to be spent</b> for each paper	<b>Minimum eligibility for exam:</b> Minimum 2 Credits in each event = 16 hrs. x 2= 32 hrs. Thus, <b>32 hrs. to be spent</b> for each event

A student must acquire 4 credits in each theory paper and 2 credits in practical event. Thus, the year-wise credit to be acquired is as follows:

<b>Year</b>	<b>Minimum CREDIT</b>		<b>Minimum TOTAL Credit needed</b>
	Theory paper	Practical	
1 <sup>st</sup> year	<b>Minimum 4 credits x 6 papers</b> <b>=24 credits</b>	<b>Minimum 2 credits x 6 events</b> <b>=12 credits</b>	<b>36 Credits</b> (Out of 60)

**Theory Lectures : 600                      Credits : 24**

**Practical                                        : 600                      Credits : 12**

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**

**(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of  
Govt. of India )**

**COLLEGE OF PHYSICAL EDUCATION**

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

**REACCREDITED 'A' GRADE BY NAAC**



**Bachelor of Physical Education & Sports  
(B.P.E.S)-3Years**

**(6 Semester Programme)**

**CURRICULUM FRAMEWORK  
2015-2018**

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR  
[B.P.E.S -3 years] (Six SEMESTERS)  
CHOICE BASED CREDIT SYSTEM (CBCS)**

**Preamble:** Bachelor of Physical Education and Sports i.e. B.P.E.S (Six Semesters Choice Based Credit System) for 3 year duration This is a professional programme meant for preparing basics to become teachers of physical education.

B.P.E.S programme shall be designed to integrate the study of physical activity in childhood, social context of Physical Education, historical development, subject knowledge of psychology, pedagogy, aim of Physical Education, communication language & skills etc. The B.P.E.S programme comprises of compulsory and optional theory papers as well as physical activity (practical courses).

**Programme Outcome**

1. Students will know and apply discipline specific scientific and theoretical concepts critical to development of physically educated person.
2. Students will plan, design and implement learning experiences that facilitate and enhance the growth of learners of diverse needs from varying backgrounds.
3. Students will use effective communication and pedagogical skills and strategies to enhance student engagement & learning.
4. Students will utilize assessments and reflection to foster student learning and to inform instructional decisions.
5. Students will inherit qualities essential to become effective professionals.
6. Students will understand the disciplinary content knowledge, application of content knowledge to teaching physical education.
7. Students will evaluate self and seek opportunities to grow professionally and humanistically.
8. Students will use appropriate technology to enhance teaching and learning and enhance personal and professional productivity.
9. Students will foster relationship with colleagues, parents, community and associated agencies to support student's growth & wellbeing.

**Duration, Intake, Eligibility and Admission Procedure:**

The Duration, Intake, Eligibility and Admission Procedure are as per the University norms and standards.

**Duration:** B.P.E.S programme shall be of duration of three academic years,

that is, Six semesters. However, the students shall be permitted to complete the B.P.E.S programme requirements within a maximum of Five years from the date of admission to the programme. However, if a student fails to complete the degree in 5 years he should take fresh admission.

**Intake:-**

50 seats are approved by University for B.P.E.S course.

\*No differently-abled candidate is eligible for the admission in B.P.E.S Course.

**Eligibility**

Candidate should have passed the higher secondary (10+2 standard) or equivalent examination with 40% marks. Relaxation of 5% marks will be given to the candidates belonging to S.C. & S.T. and other notified categories as per Government Rules or for extraordinary sportsman.

**Age:-**

For General category candidates, the upper age limit is 25 years as on 1<sup>st</sup> July of the academic year. Age relaxation for SC, ST and OBC candidate will be given according to the rules and regulation of Bharati Vidyapeeth University and GOI

**Admission procedure:-**

Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

<b>a- Physical fitness test</b>	<b>50 marks</b>
<b>b- Written test</b>	<b>30 marks</b>
<b>c- Interview</b>	<b>10 marks</b>
<b>d- Sports achievement</b>	<b>10 marks</b>

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at Bharati Vidyapeeth Deemed University College of Physical Education

There shall be Physical Fitness Test (modified AAHPER/CNADIAN/OR ANYOTHER fitness test) of 50 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

- (A)** Theory Paper comprising of 30 multiple-choice questions of 30 minutes duration carrying 30 marks. Questions shall be based on Aptitude Test, Current Affairs and General Knowledge about sports.



**(B)** Interview comprising of 10 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

**(C)** Sports Participation **Weightage** :- Candidate shall be given maximum 10 marks *weight age* on the basis of their sports participation in any one of the following level:

<b>Participation</b>	<b>Marks</b>
<input type="checkbox"/> <b>International:</b>	<b>10</b>
<input type="checkbox"/> <b>Senior National championship/ National Games:</b>	
1st Place :	<b>10</b>
2nd Place :	<b>08</b>
3rd Place :	<b>07</b>
Participation:	<b>05</b>
<input type="checkbox"/> <b>All India Inter-Zonal Inter University Competitions:</b>	
1st Place :	<b>08</b>
2nd Place :	<b>07</b>
3rd Place :	<b>06</b>
Participation:	<b>05</b>
<input type="checkbox"/> <b>Zonal Inter University Competitions/Junior National Competitions:</b>	
1st Place :	<b>07</b>
2nd Place :	<b>06</b>
3rd Place :	<b>05</b>
Participation:	<b>04</b>
<input type="checkbox"/> <b>Senior State Championship/Rural national games/Woman Festival:</b>	
1st Place :	<b>05</b>
2nd Place :	<b>04</b>

3rd Place :	<b>03</b>
Participation:	<b>02</b>

**Note:-**

\*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (**AIU**) and/or School Games Federation of India (**SGFI**).

\*The obtained position must be during last five academic sessions.

\*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; the candidate shall not get any marks for sports **weightage**.

**Medical examination:-**

Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern office.

**1. Rules of examination****(i) Eligibility for appearing at B. A. (Physical Education) examination:**

Students should have kept at least 80% attendance in each year for theory and practical.

He/ she must complete all the practical and other work according to the syllabus up to the satisfaction of the Principal. He/ she must obtain such a certificate from the Principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.

**(ii) Annual Examination:****Theory**

An annual examination will be held at the end of each year which shall be called "Annual Examination". This is a 6 semester course in semester-wise distribution of theory marks for each annual examination will be as follows:

1 <sup>st</sup> Semester:	400
2 <sup>nd</sup> Semester:	400
3 <sup>rd</sup> Semester:	400
4 <sup>th</sup> Semester:	400
5 <sup>th</sup> Semester:	400
6 <sup>st</sup> Semester:	400

### **Practical:**

There shall be practical examination to be conducted at the end of the completion of teaching every year. Year-wise distribution of practical marks for each annual examination will be as follows:

1 <sup>st</sup> Semester:	500
2 <sup>nd</sup> Semester:	500
3 <sup>rd</sup> Semester:	500
4 <sup>th</sup> Semester:	500
5 <sup>th</sup> Semester:	500
6 <sup>st</sup> Semester:	500

- N.B.-** (i) University Exam, internal assessment and practical will be done by a Panel of two examiners (One Internal And One External )appointed by University
- (ii) For the rationalization of internal marks, the **College shall appoint moderation committee** (keeping the Principal of the college or his nominee as Chairman). The Committee will take the review of the internal marks given by the college faculties and advice the college, if necessary. The college should take the appropriate action as per the advice of the committee and submit the internal marks to the University.

### **3. Standard of Passing**

A candidate should obtain minimum 40% of marks in each theory paper and also he/she should get 40% marks to pass the subject including theory and **sessional**. Similarly, to pass the examination, the candidate should also obtain minimum 40% marks in practical examination.

**4. A.T.K.T.**

A candidate may be allowed to take admission in succeeding year of the course irrespective of number of papers/ practical events in which he/she fails. It is mandatory that the whole course shall be completed within a period of 5 years from the date of admission.

**SCHEME OF EXAMINATION FOR B.P.E.S**

**(6SEMESTERS)**

**(2015-2018)**

**Semester wise Distribution of Marks & Credits**

		<b>Sem-I</b>	<b>Sem-II</b>	<b>Sem-III</b>	<b>Sem-IV</b>	<b>Sem-V</b>	<b>Sem-VI</b>	<b>Total</b>
<b>Part-A: Theory Courses</b>	<b>Marks</b>	400	400	400	400	400	400	<b>2400</b>
	<b>Credits</b>	16	16	16	16	16	16	<b>96</b>
<b>Part-B: Activity Courses (Games/Sports)</b>	<b>Marks</b>	400	400	300	300	400	400	<b>2200</b>
	<b>Credits</b>	8	8	6	6	8	8	<b>44</b>
<b>Part- C: Game/ Sport Specialization</b>	<b>Marks</b>	100	100	100	100	100	100	<b>600</b>
	<b>Credits</b>	2	2	2	2	2	2	<b>12</b>
<b>Part D -: Teaching Ability and Internship</b>	<b>Marks</b>	--	--	100	100	--	--	<b>200</b>
	<b>Credits</b>	--	--	2	2	--	--	<b>4</b>
<b>Grand Total</b>	<b>Marks</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>5400</b>
	<b>Credits</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>156</b>

**NOTES:**

- Each Theory Course shall have 4 Units and 3 hrs. Duration final examination except Sports Specialization which will have 3 units in each semester and 2-hour duration semester-end examination.
- The pattern of Semester-end question papers shall be:

**2.1. For papers having Max. Marks- 60: [12+12+12+12+(4x3)=60 marks]**

1. For University examination each question paper shall consist of 9 questions (4 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units).
2. The candidate will attempt any one question from each unit. The 5<sup>th</sup> question will be compulsory consisting 4 short notes of 3 marks each.
3. For Internal Assessment of Theory Courses one Mid Semester Test of 30 marks for each course will be conducted by the college. For the mid semester test each question paper (of 30 marks) shall consist of 5 questions (4 long answer questions from first two unit and 1 combined question of 2 short notes from both units). The candidate will attempt any one question from each unit (2 questions of 12 marks each from first 4 questions). The 5<sup>th</sup> question will be compulsory consisting 2 short notes of 3 marks each. In addition, the teacher concerned shall conduct one open book examination consisting of 10 marks and submit the marks to the college exam department.
4. For Semester-end Examination in Activity Courses, the breaks-up of 100 Marks shall be as follows:
 

- Skill proficiency/playing ability	:	80
- Diary / Record book	:	20
5. For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:
 

- Skill proficiency/playing ability	:	50
- Written Test	:	50
6. For Lesson Plan, student needs to complete perform 10 ground lesson in 3<sup>rd</sup> and 4<sup>th</sup> Semester at college itself.
 

- Lesson Plan	:	100 marks
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**CURRICULUM FRAMEWORK FOR**  
**B.P.E.S**  
**(6 SEMESTERS (2015-2018))**

**B.P.E.S I-Semester (July 2015 to November 2015)**

**PART-A: THEORY COURSES:**

<b>Subject Code</b>	<b>Courses</b>	<b>University Exam</b>	<b>Internal Assessment</b>	<b>Total</b>	<b>Lectures</b>	<b>Credits</b>
B.P.E.S /I/A/HC/01	Fundamental of Physical Education	60	40	100	64	4
B.P.E.S /I/A/HC/02	Anatomy	60	40	100	64	4
B.P.E.S /I/A/HC/03	English	60	40	100	64	4
B.P.E.S /I/A/SC/01 B.P.E.S /I/A/SC/02	<u>Select anyone of the following:</u> *Historical development of Sports Movements *First Aid	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**NOTE:** **HC**- Hard Core/Compulsory Course; **SC**- Soft Core/Elective Course.

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Classes</b>	<b>Credits</b>
B.P.E.S /I/B/HC/01	Conditioning	100	48	2
B.P.E.S /I/B/HC/02	Track and Field (Running events)	100	48	2
B.P.E.S /I/B/SC/01-04	<b><u>Select anyone Activity/Game/Sport from each</u></b>	100X2	48X2	2X2

	<b>Group**</b> ( <b>B1</b> and <b>B2</b> – the offer shall depends as per the choice of students ).			
	<b>Total</b>	<b>400</b>	<b>--</b>	<b>08</b>

**\*\*Groups of Activity/Game/Sport:**

<b>Activity Group-B1</b>		<b>Activity Group-B2</b>	
<b>Activity Code</b>	<b>Activity</b>	<b>Activity Code</b>	<b>Activity</b>
B.P.E.S /I /B/SC/01	Basketball	BPEd/I/B/SC/03	Table Tennis
B.P.E.S /I /B/SC/02	Volleyball	BPEd/I/B/SC/04	Tennis

**PART-C: GAME/SPORT SPECIALIZATION:**

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Clas s</b>	<b>Credits</b>
B.P.E.S /I/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport- seasonal only)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**NOTE: SCC-** Soft Core Compulsory.



**B.P.E.S****II-Semester (December 2015 to April 2016)****PART-A: THEORY COURSES:**

<b>Subject Code</b>	<b>Courses</b>	<b>University Exam</b>	<b>Internal Assessment</b>	<b>Total</b>	<b>Lecture</b>	<b>Credits</b>
B.P.E.S /II/A/HC/01	<b>Physiology of Exercise</b>	60	40	100	64	4
B.P.E.S /II/A/HC/02	<b>Information Technology</b>	60	40	100	64	4
B.P.E.S /II/A/HC/03	<b>Psychology of Sports</b>	60	40	100	64	4
B.P.E.S /II/A/SC/01	<b>Select anyone of the following:</b>  *Fitness and Wellness	60	40	100	64	4
B.P.E.S /II/A/SC/02	*Adapted Physical Education					
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.P.E.S /II/B/HC/01	Track & Field-I (Field)	100	48	2

	Events)			
B.P.E.S /II/B/HC/03	Light Apparatus	100	48	2
B.P.E.S /II/B/SC/01-04	<b>Select anyone Activity/Game/Sport from Group-B3* and B4*</b>  (the offer shall depends as per the choice of students).	100X2	48X2	2X2
	Total	<b>400</b>	<b>192</b>	<b>08</b>

**\*Group of Activity/Game/Sport:**

<b>Activity Group-B3</b>		<b>Activity Group-B4</b>	
<b>Activity Code</b>	<b>Activity Code</b>	<b>Activity Code</b>	<b>Activity</b>
B.P.E.S /II/B/SC/01	Handball	B.P.E.S /II/B/SC/03	Kho- Kho
B.P.E.S /II/B/SC/02	Cricket	B.P.E.S /II/B/SC/04	Weight Lifting

**PART-C: GAME/SPORT SPECIALIZATION:**(Continued from Semester-I)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Classes</b>	<b>Credits</b>
B.P.E.S /II/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**B.P.E.S**  
**III-Semester (July 2016 to November 2016)**

**PART-A: THEORY COURSES:**

<b>Subject Code</b>	<b>Courses</b>	<b>University Exam</b>	<b>Internal Assessment</b>	<b>Total</b>	<b>Lecture</b>	<b>Credits</b>
B.P.E.S /III/A/HC/01	<b>Kinesiology</b>	60	40	100	64	4
B.P.E.S /III/A/HC/02	<b>Methods of Teaching in Physical Education</b>	60	40	100	64	4
B.P.E.S /III/A/HC/03	<b>Health Education</b>	60	40	100	64	4
B.P.E.S /III/A/SC/01 B.P.E.S /III/A/SC/02	<b><u>Select anyone of the following:</u></b> *Sports Entrepreneur *Professional Preparation in Physical Education	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.P.E.S /III/B/HC/01	Conditioning	100	48	2
B.P.E.S /III/B/HC/02	Judo	100	48	2
B.P.E.S /III/B/HC/03	<b>Select anyone</b> <b><u>Activity/Game/Sport</u></b> <b>from Group-B5&amp; B6</b>  (the offer shall depends as per the choice of students).	100	48	2
	<b>Total</b>	<b>300</b>	<b>144</b>	<b>06</b>

**\*Group of Activity/Game/Sport:**

<b>Activity Group-B5</b>		<b>Activity Group-B6</b>	
<b>Activity Code</b>	<b>Activity Code</b>	<b>Activity Code</b>	<b>Activity</b>
B.P.E.S /III/B/SC/01	Yoga	B.P.E.S /III/B/SC/02	Aerobics
B.P.E.S /III/B/SC/03	Boxing	B.P.E.S /II/B/SC/04	Taekwondo

**PART-C: GAME/SPORT SPECIALIZATION:**(continue from Semester - I &II)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Classes</b>	<b>Credits</b>
B.P.E.S /III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):**

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.P.E.S /III/C/HC/01	Teaching Practice	100	48	2

**B.P.E.S IV-Semester (December 2016 to April 2017)****PART-A: THEORY COURSES:**

<b>Subject Code</b>	<b>Courses</b>	<b>University Exam</b>	<b>Internal Assessment</b>	<b>Total</b>	<b>Lectures</b>	<b>Credits</b>
B.P.E.S /IV/A/HC/01	<b>Event Management</b>	60	40	100	64	4
B.P.E.S /IV/A/HC/02	<b>Sports Sociology</b>	60	40	100	64	4
B.P.E.S /IV/A/HC/03	<b>Environment Science</b>	60	40	100	64	4
B.P.E.S / IV /A/SC/01 B.P.E.S / IV /A/SC/02	<b>Select anyone of the following:</b> <ul style="list-style-type: none"> <li>• Fitness Instructor</li> <li>• Sports Industry</li> </ul>	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Classes</b>	<b>Credits</b>
B.P.E.S /IV/B/HC/02	Weight Training	100	48	2
B.P.E.S /IV/B/HC/03	Gymnastics	100	48	2
B.P.E.S /IV/B/HC/03	Camping/ Hiking /Tracking	100	48	2
	<b>Total</b>	<b>300</b>	<b>144</b>	<b>6</b>

**PART-C: GAME/SPORT SPECIALIZATION:(Different from Semester – I-II&III)**

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Classes</b>	<b>Credits</b>
B.P.E.S /IV/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):**

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S / IV /C/HC/01	Teaching Practice	100	48	2

**B.P.E.S V-Semester (July 2017 to November 2017)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /V/A/HC/01	<b>Correctives in Physical Education</b>	60	40	100	64	4
B.P.E.S /V/A/HC/02	<b>Test measurement and Evaluation</b>	60	40	100	64	4
B.P.E.S /V/A/HC/03	<b>Yoga Education</b>	60	40	100	64	4
B.P.E.S /V/A/SC/01 B.P.E.S/V/A/SC/02	<b>Select anyone of the following:</b> <ul style="list-style-type: none"> <li>• Gym Management</li> <li>• Sports Journalism</li> </ul>	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.P.E.S /V/B/HC/01	Kabaddi	100	48	2
B.P.E.S /V/B/HC/02	Mallakhamb	100	48	2

B.P.E.S /V/B/HC/03	Wrestling	100	48	2
B.P.E.S /V/B/HC/04	Badminton	100	48	2
	<b>Total</b>	<b>400</b>	<b>192</b>	<b>8</b>

**PART-C: SPECIALIZATION:**(Continue from Semester –IVsemester)

Activity Code	Name of Area	University Exam	Class	Credits
B.P.E.S /V/D/SCC/01	<b><u>SPECIALIZATION</u></b>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**B.P.E.S VI-Semester (December 2017 to April 2018)**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.P.E.S /VI/A/HC/01	<b>Basic of Sports Training</b>	60	40	100	64	
B.P.E.S /VI/A/HC/02	<b>Stress Management</b>	60	40	100	64	4
B.P.E.S /VI/A/HC/03	<b>Education Technology</b>	60	40	100	64	4
B.P.E.S /VI/A/SC/01  B.P.E.S /VI/A/SC/02	<b><u>Select anyone of the following:</u></b> <ul style="list-style-type: none"> <li>● Recreation in Physical Education</li> <li>● Art Of Daily Scheduling</li> </ul>	60	40	100	64	4



	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>
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**PART-A: THEORY COURSES:****PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.P.E.S /VI/B/HC/01	Softball	100	48	2
B.P.E.S /VI/B/HC/02	Hockey	100	48	2
B.P.E.S /VI/B/HC/03	Football	100	48	2
B.P.E.S /VI/B/HC/03	Swimming	100	48	2
	<b>Total</b>	<b>400</b>	<b>192</b>	<b>8</b>

**PART-C: SPECIALIZATION :**( continue from Semester –IV& V)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.P.E.S /VI/D/SCC/01	<b><u>SPECIALIZATION</u></b>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**(Choice Based Credit System)****Standard of Passing:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

<b>Range of Marks (Out of 100)</b>	<b>Grade</b>	<b>Grade Point</b>
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} \leq 80$	A+	9
$60 \leq \text{Marks} \leq 70$	A	8
$55 \leq \text{Marks} \leq 60$	B+	7
$50 \leq \text{Marks} \leq 55$	B	6
$40 \leq \text{Marks} \leq 50$	C	5
$\text{Marks} \leq 40$	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

#### **Formula to calculate Grade Points (GP)**

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex  $x$ -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

<b>Range of marks at the evaluation</b>	<b>Formula for the Grade Point</b>
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x)+1

Two kinds of performance indicators, namely, the semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.E.S programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA -10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA +20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA -20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA -110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA -300	If $9.50 \leq \text{CGPA} \leq 10.00$

### **Award of Honours:**

A student who has completed the minimum credits specified for the B.P.E.S programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

**Educational Tour/Camp:** In addition to the above rules the student must fulfill the following requirements to acquire the degree which is mandatory. Educational Tour or Leadership Camp organized by the College of Physical Education of at least 07 days. The students shall contribute separately for these activities.

### **B.P.E.S**

#### **(Physical Education and Sports )**

#### **6 semester Credit system**

#### **Syllabus**

#### **Semester I**

## B.P.E.S /I/A/HC/01: **Fundamental of Physical Education**

### Unit I: Introduction

- a. Meaning, Definition, Scope and Functions of Physical Education
- b. Different Interpretations of Physical Education
- c. Concept of Movement Education
- d. Physical Education an Integral Part of Education
- e. Life time Physical Education for Fitness

### Unit II: Philosophical Foundations

- a. Meaning of Philosophy, Philosophical basis of Physical Education, Different Schools of Philosophy
- b. History of Physical Education
- c. Objectives of Preprimary, Primary and Secondary School Physical Education Programmes
- d. Concept of Physical Fitness
- e. Cultural aspect of sports and worthy use of Leisure time through Physical Education activities
- f. F) National and International understanding through Sports

### Unit III: Contribution of Thinkers & Competitions.

- |                       |                     |
|-----------------------|---------------------|
| a. Swami Kuvalayanand | b. Baren'Dcaubertin |
| c. Shri. Aurobindo    | d. Olympic Games    |
| e. Asian Games        |                     |

### Unit IV: Recreations.

- a. Meaning, Definition, Scope & Functions of Recreations
- b. Recreation in Rural, Urban & Industrial Area
- c. Age-Wise Planning & leadership in recreation

### **Book Recommended**

- i Principles of Education – R. M. Marathe, MoghePrakashan, Kolhapur
- ii Teacher and Education in Emerging Indian Society – NCERT, New Delhi.
- iii Human Values Education – S. P Rahela
- iv Foundation of Physical Education – Bucher Charles, WCB/McGraw Hill, 1999
- v The Principles of Physical Education – Willam J. E. W. B. Sounders Com. Philadelphia, 1964.

**B.P.E.S /I/A/HC/02: Anatomy****UNIT-I Introduction**

- a. Introduction of Basic concepts of Anatomy
- b. Structure and functions of cell.
- c Tissues and their classification.
- d Basic introduction of body systems.

**UNIT-II Skeleto Muscular Systems**

- a. Classification of Skeletal system.
- b. Types and structure of bones.
- c. Different types of joints.
- d. Classification of Muscle
- e. . Types of Muscles

**Unit III Respiratory and Digestive System**

- a) Meaning and types of Respiration, Organs of Respiratory System.
- b) Functions of Respiratory System, Vital capacity and its measurement. Mechanism of Respiration.
- c) Meaning, importance and organs of Digestive System.
- d) Functions, processes, mechanism of Digestive System.

**UNIT-IV**

- a. Circulatory System and Nervous System
- b. Meaning of the Circulatory System.
- c. Heart, its structure, functions.
- d. Cardiac Cycle. Meaning, functions compositions of Blood,
- e. Maintenance of Blood supply

**Books Recommended**

1. Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
2. Sedey Rod R.- Anatomy and Physiology
3. Stephens & Tate P. St. lous, Mosby, 1992
4. Tortora G. J. : Introduction to Human Body, Ed. 4<sup>th</sup> California, Addison, Wesley, 1996

**B.P.E.S /I/A/HC/03: ENGLISH****UNIT-I : Vocabulary**

- 1.1 Synonyms
- 1.2 Antonyms
- 1.3 Common abbreviations in use
- 1.4 One word substitution
- 1.5 Words Commonly Misspel
- 1.6 Idiomatic Comparisons or Similes
- 1.7 Word Formation by Prefix and Suffix

**UNIT-II : Common Errors & Transformations**

- 2.1 Common errors in sentences especially regarding number, gender, Pronouns, prepositions, articles, degrees etc.
- 2.2 Punctuation
- 2.3 Kinds of sentences - Assertive, Interrogative, Exclamatory, Imperative, Optative
- 2.4 Transformation of sentences
- 2.5 Tenses

**UNIT-III : Correspondence**

- 3.1 Personal Letters
- 3.2 Applications for leave, scholarship etc.
- 3.3 Invitations- Formal and Informal with reply
- 3.4 Notice Writing

**UNIT-IV :- Descriptive Writing**

- 4.1 Paragraph writing (50 words)
- 4.2 Essay writing (250 words)
- 4.3 Comprehension of unseen passage
- 4.4 Summary Writing

**REFERENCES**

- ❖ High School English Grammar – Wren & Martin
- ❖ How to write & speak better English –John Elisson Kahn, D. Phil.
- ❖ Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan
- ❖ Macmillan the Student’s companion – Wilfred D. Best.
- ❖ A remedial English grammar for foreign students – F.T. wood
- ❖ English Vocabulary in use – Michael McCarthy, Felicily O’Dell.
- ❖ Advanced English Grammar – Martin Haurings.
- ❖ G.O.E. Lydall, A practical Guide to précis Writing & indexing, London: Macdonald & Evans Ltd. (1955)

**B.P.E.S/I/A/SC/01: Historical Development of Sports Movements (Elective Subject)**

**UNIT -Introduction**

- A. Physical Education in Ancient Civilization with reference to  
i) India ii) Greece iii) Rome iv) Egypt.
- B. Development of Physical Education & sports during 20<sup>Th</sup> Century with special reference to i) U.S.A. ii) Sweden iii) Germany iv) Olympics v) Asian Games.

**UNIT - II Sports Bodies of India**

- Physical Training for teacher working in school & college
- Movement of Akhadash & Vyayam Shalas.
- Central Advisory Board of Physical Education
- Sports authority of India (Sai)
- Awards National & state level.
- All India council of sports
- SNIPES, NSNIS, LNIPE.
- Nehru Yuwak Kendra

**UNIT - III A Study of the development of Physical Education sports & Games in Maharashtra with reference to**

- a) Pune International marathon  
b) The present Organization set up in state.  
c) Important schemes and activities including indigenous activities.  
d) Role of Voluntary Physical Education & sports Bodies in state...

**UNIT - IV Youth welfare & Youth Services:-**

- a) Concept of youth welfare & Youth work.  
b) Youth organization in India  
c) Programmers under youth development  
d) Youth services such as secreting & guiding N.C.C. N.S.S., Civil defense & scout & Guide movement.

**Reference**

1. Manual of Physical Education of India - D.G. Wakharkar
2. A World History of Physical Education - Van Ten Micher
3. History of Physical Education C.W. Hyensmith
4. A Brief History of Physical Education -Emmel A Rice & John L Hutchinson
5. Physical Education in ancient India - Dr. S.H. Deshpande.

**B.P.E.S /I/A/SC/01: First Aid****UNIT -I**

- a) Meaning and definition of first aids and its importance in sports
- b) Types of first aids and its objectives
- c) First aids box and its management
- d) Role and qualification of first aider

**Unit-II**

- a) Common sports injuries in different parts of body
- b) First aids for sports injuries
- c) Common causes of sports injuries and its prevention
- d) RICE & Bandage

**UNIT - III**

- a) Definition of safety education and its significant
- b) Aims and objectives of safety education
- c) Identify causes of accidents & List types and sources of accidents
- d) Safety measures at
  - Home
  - Road
  - School
  - Community

**UNIT – IV**

- a) Describe and demonstrate the management of the following:-
  - Stings and Snake bites
  - Fracture
  - Nose bleeding
  - Electric shocks and other shocks
- b) Fevers:-
  - Definition of fever
  - signs of fever
  - first Aid for fever
  - Management of fever.
- c) Fainting- Definition and causes of fainting, first aid for fainting
- d) Drowning/Near-drowning:- Definition of drowning, definition of near-drowning
- e) first aid for drowning/near drowning.

**Reference :**

- Guyton, A.C. (1996). Textbook of Medical Physiology, 9th edition. Philadelphia: W.B. Saunders.



- Hunter, M. dictionary for physical educators. In H. M. Borrow & R. McGee, (Eds.), A Practical approach to measurement in Physical Education (pp. 573-74). Philadelphia: Lea & Febiger.

## **Semester II**

## B.P.E.S /II/A/HC/01: **Physiology of Exercise**

### **UNIT-I Introduction**

- a. Definition and importance of physiology and Exercise physiology
- b. Essential properties of living being.
- c. Effect of exercise on various system of the body.
  - a) Circulatory system
  - b) Respiratory system
  - c) Muscular system

### **UNIT-II**

#### **1. Cardiac functions and Blood**

- a. Cardiac cycle and its function in human body.
- b. Control of cardiac function.
- c. Blood pressure and it's regulation in human body.

#### **2. Kidney**

- a) Role of kidney in human body
- b) Function of kidney

#### **3. Physiology terminology**

a) Second wing	b) Second wing
c) Second wing	d) oxygen debt
e) $VO_2$ max	f) Vital capacity
g) Athletic heart	

### **Unit III**

#### **1. Nervous system**

- a) Definition of Nervous system, role of nerve fibers
- b) Parts of Brain & spinal cord its functions,
- c) Central nervous system and peripheral nervous system**

#### **2. Endocrine system**

a) Pituitary gland	b) Thyroid
c) Parathyroid	d) Adrenal
e) Sex organ	

### **3. Environment effect on the body**

- a) High altitude
- b) Hot condition
- c) Cold condition

#### **UNIT-IV**

- a) Physical fitness and its components.
- b) Training, conditioning, and warm-up.
- c) Types of muscle contraction.
- d) Lactic acid and its influence on sports performance.
- e) First aids and sports injuries

#### **Books Recommended**

- Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
- Sedey Rod R.- Anatomy and Physiology
- Stephens & Tate P. St. lous, Mosby, 1992
- Tortora G. J. : Introduction to Human Body, Ed. 4<sup>th</sup> California, Addison, Wesley, 1996
- MariefEsclaine N. Human Anatomy and Physiology Ed. 3<sup>rd</sup> California, The Benjanin Cumming Co. 1991
- Fox Edward – Sports Physiology W B Soundrs Co. 1994

## B.P.E.S /II/A/HC/02: **Information Technology**

### **Unit I: Introduction of Computer**

1. History, application, characteristics, types of computer (Analog, Digital, Hybrid) and generations of Computer.
2. Physical structure of computer.
3. Role of computer in various fields
4. Need of computer in Physical Education.

### **Unit-II Component of Computer System: An Introduction of Hardware and Soft ware**

1. Components of computer system
2. CPU (CU, ALU and Main memory)
3. Input devices (Keyboard, Mouse and Track Ball, Touchpad, Joysticks, Touch Sensitive Screens, Data Scanning Device, Bar Code Readers, Optical Mark Reader (OMR) and Magnetic Ink Character Reader (MICR)
4. Output Devices (Monitor, Printer, LCD)
5. Hardcopy Devices (Printers and Plotter)
6. UPS and types of UPS
7. Operating System Programme Languages translator.
8. Application program/package

### **UNIT-III: USE OF COMPUTERS IN SCHOOLS**

1. Functional knowledge of operating computers–on/off, word processing, use of power point, excel
2. Computer as a learning tool
3. Effective browsing of the internet for discerning and selecting relevant information
4. Survey of educational sites based in India
5. Downloading relevant material
6. Cross collating knowledge from varied sources
7. Competencies in developing original software

### **UNIT IV: VISUALISING TECHNOLOGY-SUPPORTED LEARNING SITUATIONS**

1. Preparation of learning schemes
2. Interactive use of audio-visual programme
3. Developing PPT slide show for classroom use
4. Use of available software or CDs with LCD projection for subject learning interactions
5. Generating subject-related demonstrations using computer software

## B.P.E.S /II/A/HC/03: **Psychology of Sports**

### **UNIT- I Introduction to Sport Psychology**

1. Meaning and scope, Importance, relationship with other sport sciences,
2. Development of sport psychology in India.
3. Scope of Sports Psychology

### **UNIT-II Concept and meaning of motor learning**

1. Stages of learning transfer of training, assessment of learning and factors affecting of motor learning.
2. Growth & Development: Concept of growth & development,
3. Play and its Theories.

### **UNIT III Personality in Sport:**

1. Concept and definition of Personality
2. Modern perspective, (trait, humanistic, social cognitive and biological),
3. Dynamics of personality in sport Anxiety in Sports

### **UNIT-IV Psychological Preparation and Competition:**

1. Motivation and Techniques of Motivation
2. Phenomenon of competitive
3. Psychological preparation for competition (arousal regulation, imagery, self-confidence, goal setting, concentration.)
4. Short term psychological preparation (upcoming competition) Mind to muscle and muscle to mind relaxation techniques.

### **Reference**

1. Kamlesh, M.L. (2006). Educational Sport Psychology. New Delhi: Friend's publication
2. Cox Richard. (1998) Sports Psychology (W.C.B.)
3. Gill, Diance L. Psychological Dynamics of Sports (Illinois: Human Kinetics Publishers, 1986)
4. Silva, J.M. and Weinberg.(1984). Physiological Foundation of Sports. IL: Kinetics Publishers,
5. Suinn, Richard M. (1982) Psychology in Sports: Methods and Applications. New Delhi: Sujeet Publication.
6. Martens, Rainer. (1987). Coaches Guide to Sports Psychology. IL: Human Kinetics;
7. Roberts Glyn C. and et al. (1986). Learning Experiences in Sports Psychology. IL: Human Kinetics.
8. Alegaonkar, P.M. (1997). Sports Psychology Pune: Pune VidyarthiGriha.

B.P.E.S /II/A/SC/01: **Fitness and Wellness (Elective Subject)**

**FITNESS & WELLNESS**

**Unit-I**

- Definition of fitness & wellness, Components of fitness & wellness,
- Benefits of exercise & health, Fitness & wellness strategy,
- Fitness potential for popular sports, Fitness & wellness activities,
- Role of parents & community for the maintenance of fitness & wellness

**Unit-II –**

- Selection of machines for various parameters of health & wellness,
- Fitness center, Safety in gymnasium & sports field,
- Clothing & accessories, Carriers in fitness & wellness

**Unit-III –**

- Test, measurements & evaluation of fitness components, Cardiovascular endurance, Muscular strength, Muscular endurance, flexibility, body composition, agility, balance, co-ordination, speed, power, reaction time

**Unit-IV –**

- Assessment prior to fitness & wellness prescription,
- Principles of training, Training methods
- Diet prescription, Exercise prescription, Prescription for life style changes, Weight management
- Prevention of diseases through fitness & wellness, Diabetes & exercise, Cardiovascular diseases and exercise, Ageing and exercise, Addiction management- sustains abuse controls
- Stress management, Spiritual management

**Reference**

- Dougherty NJ et al (2002), Sport, Physical Activity and the Law. Sagamore Pub. Champaign. IL.
- Driskell JA and Wolinsky I (2002). Nutritional Assessment of Athletes. CRC Press. Boca Raton. Fla.
- Greenberg JS Diutriman GB and Oakes BM (2004). Physical Fitness and Wellness: Changing the way you look, feel and perform. Human Kinetics. Champaign. IL.
- Hoeger WW & Hoeger S (2007). Fitness & Wellness. Thomson Wadsworth.
- Maughan RJ Burke LM and Coyle EF (2004). Food, Nutrition and Sports Performance II: The International Olympic Committee Consensus on Sports Nutrition. Routledge. New York.
- Siedentop D (2004). Introduction to physical education, Fitness and sports. McGraw Hill. Boston

**B.P.E.S /II/A/SC/02: Adapted Physical Education (Elective Subject)****Unit 1: An Introduction to Adapted Physical Education**

- a) Meaning, Need and Importance of Adapted Physical Education and Sports
- b) Purpose, Aims and Objectives of Adapted Physical Education and Sports
- c) Program organization of Adapted Physical Education and Sports
- d) Adapted Sports- Para Olympics

**Unit 2: Development of Individual Education Program (IEP)**

- a) The student with a disability
- b) Components and Development of IEP.
- c) Principles of Adapted Physical Education and Sports
- d) Role of Physical Education teacher
- e) Teaching style, method & approach in teaching Adapted Physical Education

**Unit 3: Developmental Considerations of an Individual**

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

**Unit 4: Individual with unique need and activities**

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need
- 4.5 Role of games and sports in Adapted Physical Education

**Reference**

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. Adapted Physical Education in the Mainstream. (4th Edition) Love Publishing Company.
3. Houner, L.D. Integrated Physical Education- A guide for the elementary classroom teacher.
4. Winnick, J. P. (2005). Adapted Physical Education and Sports. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. Dynamics Physical

**Semester III**



## B.P.E.S /III/A/HC/01 :Kinesiology

### Unit-I : Introduction To Kinesiology

1. Meaning, aim & objectives, importance of kinesiology for physical education and sports
2. Fundamental concepts: Centre of gravity, line of gravity, axis and planes of motion, fundamental starting positions,
3. terminology of fundamental movements, and classification of muscles

### UNIT-II :Location& Action

1. Types of Joints
2. Location & Action of Muscles at Various Joints:- a) Upper extremity – shoulder girdle, shoulder joints, elbow joint b) Neck, trunk (Lumbothoracic region)
3. Lower extremity – Hip joint, knee joint, ankle joint
4. Muscular analysis of fundamental movements:- Walking, running, jumping, throwing, catching, pulling, pushing, striking, hangine

### UNIT-III Laws of Motion

1. Define mass, weight, force, pressure work, power energy, impulse, moments, impact, friction,
2. Newton's laws of motion
3. Angular kinetics: moment of inertias, conservation of moments, transfer of moments, levers, equilibrium

### UNIT-IV Motion

1. Meaning, aims, objectives and importance, types of motion, linear motion & angular motion
2. Linear kinematics: Speed, velocity acceleration uniform accelerated motion and projectile motion
3. Angular kinematics: Angular sped, angular velocity, angular acceleration and relationship between linear and angular motion

### Reference

- Bartlett, R. (2007). Introduction to Sports Biomechanics.Routledge Publishers, USA.
- Blazeovich, A. (2007). Sports Biomechanics.A& C Black Publishers, USA.
- Breer&Zarnicks (1979).Efficiency of human movement. WIB Sounders Co. USA.
- Hamill, J. and Knutzen, K.M. (2003).Biomechanical Basis of Human Movement.Lippincott Williams and Wilkins, USA.
- Hay (1993). The biomechanics of sports techniques prentice hall inC New Jersey

## B.P.E.S/III/A/HC/02: **METHODS OF TEACHING IN PHYSICAL EDUCATION**

### **UNIT I : Introduction of Teaching**

1. Meaning of teaching, coaching, officiating and as a career in Physical Education & Sports
2. Meaning and need for methods,
3. Factors effecting teaching method.

### **UNIT II Teaching methods**

1. Teaching methods and its Types- command, demonstration, imitation, discussion, part- whole, whole- part-whole, explanation and recitation
2. Techniques of presentation: personal and technical preparation.

### **UNIT III Class management**

1. Class management: techniques, formations, command (types and techniques)
2. factors effecting class management
3. Lesson Plan: Need, construction, Introduction development, skill/recreation

### **UNIT IV**

1. Qualification and qualities of a coach,
2. Personnel in physical education/sports.
3. Teaching Aids: Need and Importance, Types of teaching aids.
4. Fundamental skills of athletics, aquatics, badminton, basketball, cricket, football, hockey, handball, kabaddi, KhoKho, volleyball and Judo, Yoga Assanas,

### **References**

- Capel, S. et al Editors (2006). A Practical Guide to Teaching Physical Education. Routledge Publishers, USA.
- Graham, G.M. (2009). Children Moving : A Reflective Approach to Teaching Physical Education. 8th Ed. McGraw Hill, USA
- Gupta R. (2010). SharirikShiksha Mein ShikhshanPradhyogiki. Friends Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (1999).Lesson Plan in Physical Education &Sports.R.D.P. Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (2004).SharirikShiksha Mein Path Yojna.SahyogPrakashan. New Delhi
- Kamlesh ML (2005). Methods in Physical Education.Friends. Delhi.

## B.P.E.S /III/A/HC/03: **Health Education**

### **Unit-I Health**

1. Health-meaning, dimensions of health and their interrelationships,
2. Importance of health for individual, family, community and nation;
3. Factors influencing health,
4. Spectrum of health

### **Unit II Health Education**

1. Health Education- meaning, scope
2. Aims and objectives of Health Education
3. Principles, methods and media used in health education
4. Hygiene- personal hygiene, food hygiene, environmental hygiene-meaning, need and importance; associated practices related to maintenance and promotion of health

### **Unit-II Foods and Nutrition-**

1. Misconceptions about food, essential body nutrients- functions, food sources, balanced diet, diet prescription
2. Communicable and Non-communicable diseases- meaning, distinction between communicable and non-communicable diseases.
3. Communicable diseases- their mode of spread and prevention of diarrhea diseases, typhoid, malaria, STD Respiratory disease ; non-communicable diseases- causes and prevention of diabetes, CVD, cancers, renal diseases and respiratory diseases.

### **Unit-III Contemporary health problems of college youth-**

1. Alcohol, drugs, use of tobacco (chewing, sniffing, smoking)- their harmful effects substance abuse management
2. National health programmes- components of existing national health programmes

### **Unit IV Health Agencies:**

- 1 Introduction to Organizational and Administrative set-up of Health System in India
  - National level
  - State Level
  - District Leve
2. Steps of Planning of Health Education Programme
3. Internationals health agencies- WHO, UNICEF, Red Cross- their constitution and role in promoting health

### **Reference**

- Anspaugh DJ Ezell G and Goodman KN (2006).
- Teaching Today's Health. Mosby Publishers. Chicago. USA

- Balayan D (2007). Swasthya Shiksha Evam Prathmik Chikitsa. Khel Sahitya. Delhi.

B.P.E.S /III/A/SC/01: **Sports Entrepreneur (Elective)**

### **Unit I: Introduction to Sports Entrepreneurship**

1. Concept of entrepreneurship, innovation & knowledge management in sport
2. Business Planning Process - The business plan as an entrepreneurial tool
3. Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

### **Unit II : Introduction to Finance in Sports**

1. The Four Domains of Sports Marketing, Marketing Through Sports
2. Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition,
3. Business Model Canvas and Drafting Business Proposal for Funding Agency.

### **Unit II. Management of Physical Education and sports**

1. Meaning, Need and scope of management of Physical Education
2. Principles of Sports Management
3. Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

### **Unit IV: Organization of co-curricular activities and Physical Education programmes.**

1. Physical Education Budget : Need, Importance, procedure and principles of budget making,
2. Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness – demonstration, play days, sports rallies, sports exhibitions
3. Organization of National days (15<sup>th</sup> August & 26<sup>th</sup> January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics
4. Ceremonies of competition – Opening, closing and victory

### **References:**

- Sports Marketing By Melissa Jane Johnson Morgan Jane

- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.

**B.P.E.S/III/A/SC/02: Professional Preparation in Physical Education (Elective)**

**Unit I- Foundation OF Professional Preparation**

- 1 Meaning of Professional
- 2 Components of Professional Preparation.
- 3 Contribution of physical education in attaining ideals of Indian democracy.
- 4 Forces and factors affecting educational policies and Programme.

**UNIT-II Historical Perspective**

1. Historical review of Professional Preparation in India.
2. Professional courses being offered in professional preparation colleges in India.
3. Professional Preparation in Physical Education in USA, USSR and UK.
4. Beginning of Professional Preparation in the world.

**UNIT-III Under-Graduate preparation of professional personnel.**

- 1 Purposes, Admission Requirements of Undergraduate preparation.
- 2 Theory, Teaching practice and practical.
- 3 Professional competencies to be developed.
- 4 Post-Graduate Preparation.
- 5 Methods of instruction.
- 6 Professional relations.

**UNIT-IV Teacher and Teaching**

- 1 Teaching as a career.
- 2 Basic Qualities of a successful teacher.
- 3 Preparation of the specialized physical education teacher.
- 4 Types of teaching jobs.
- 5 Types of non-teaching jobs.

**Reference**

1. A Professional Career in Physical Education. (Englewood Cliffs, N.J. Prentice Hall, Inc. 1963.)
2. Jensen, R. Clayne, Administrative Management of Physical Education and Athletic Programmes. (Philadelphia Lea and Febiger, 1983.)
3. Snyder and Scott. Professional Preparation in Health, Physical Education and Recreation. (Connecticut, Greenwood press, Westport, 1971).
4. Bucher, C.A Foundations of Physical Education (Saint Louis) : The C.V. Mosby Company, 1975), Ed. 7.

5. Aahper publication: Professional Preparation in Dance, Physical Education  
Recreation Education Safety Education and School health  
Education, Washington, Aahper pub. 1974 Borozne Joseph & Pechar Stanley

## **Semester IV**

B.P.E.S /IV/A/HC/01: **EVENT MANAGEMENT**

### **Unit-1**

Meaning of Events, classification of events, Event Management, Designing an Event- 5C"s (Conceptualization, Costing, Canvassing, Customization, Carrying out).

Key Elements of Events- (Event Infrastructure, Organizers, Clients, Target Audience, Media, and Venue).

### **Unit-II**

Managing Sports Events- Planning, Organizing, Coordinating and Controlling Pre events,

During the Events & Post Events issues. Sponsors, Sports Management Companies, Spectators, Sports personalities, Media etc. Sports Management Companies- Introduction, Role, Scope of Work, Service rendered to the clients, Ways of Functioning- Team work, Departments etc.

### **Unit-III**

Sources of funds available for sports: Broadcasting:- What is broadcasting, The basics of sports broadcasting rights, Media providers:-Who are the media providers, How do they fund sports

Sponsorship:-Meaning of sponsorship, Sports and sponsorship, Major sponsors in sports

Team sponsors and individual sponsors, Endorsement, Sports and celebrity endorsement

### **Unit-IV**

Sports and advertisements Advertisement Suggested Readings

Advertisement and brand choice Aiming the right target, Top sports ad companies

Firms and their advertisement choices, Effects of advertisement, gate money

Budgetary Control in sports

Role of Mass Media in Event Promotion.- Introduction to different Sports Media (Television channels, Sports Magazines etc.) Popular Sports Channels Operating in India- ESPN STAR SPORTS, ZEE SPORTS, TEN SPORTS, DD SPORTS, and NEO SPORTS etc. Spectators control, Importance of Spectators for Sports & Games. Human resource management.

### **Reference**

- Chakraborty S (1998). Sports Management. Sports Publications. Delhi.
- Kamlesh ML (2000). Management Concept in Physical Education and Sport. Metropolitan Book Co. Pvt. Ltd. New Delhi.
- Kilkenny, S. (2007). The Complete Guide to Successful Event Planning. Atlantic Publishing Co., USA.
- Roy SS (1995). Sports Management. Friends Publications. Delhi.



## B.P.E.S /IV/A/HC/02 : **Sports Sociology**

### **1. Introduction to Social Science**

- 1.1 Introduction & Meaning of Social Sciences.
- 1.2 Scope of Sociology and its relation with other subjects of Social Sciences.
- 1.3 Defining Society, Community, Association, Institutions, Customs;
- 1.4 Man as a Social animal;
- 1.4 Effect of various social forces on personality development;
- 1.5 Origin and growth of society & Culture.

### **2. Social Structure, Organization and Institutions :**

- 2.1 Socialization, social codes and social control, groups (primary and secondary, crowds and public, family, kinship and marriage;
- 2.2 Social stratification, social class and caste, social mobility;
- 2.3 Economical and political institutes for society;
- 2.4 Cultural and religious institutions;
- 2.5 Concept, factors and process of socio-cultural changes.

### **3. Main Features of Indian Society and Rural Scene:**

- 3.1 Demographic profile, social elements;
- 3.2 Religions pluralism – Hindu, Muslim, Christian and Tribal;
- 3.3 Linguistic Pluralism;
- 3.4 Indian policy – secularism, democracy, social justice;
- 3.5 Indian Rural Scene:
  - 3.5.1 Indian village, rural family, rural education;
  - 3.5.2 Indian village community, rural stratification;
  - 3.5.3 Community development projects and Panchayati-Raj;
  - 3.5.4 Trends in Rural change.

### **4. Sport and Society:**

- 4.1 Meaning and definition of sport sociology;
- 4.2 Sport as a social occurrence;
- 4.3 Socialization through games and sports;
- 4.4 Relationship between family and sport participation;
- 4.5 Relationship between politics and sports;
- 4.6 Social Stratification and sports;
- 4.7 Sports as a social phenomenon.

### **Reference**

- ❖ Iyec, Mac. R.M. and Page Charles H. Society (London : McMillan & C., 1974).
- ❖ Ogburn, William F. and Nimkoff, Meyer F., Hand Book of Sociology (New Delhi : Eurasia Publishing House Ltd., 1972).
- ❖ Loy, Lohn W. Dr. and Kenyon, Gerald S. Sports Culture and Society (Philadelphia : The MacMillan Co. 1969).

**B.P.E.S / IV / A/ HC/03: Environment Science**

1. **Introduction:**
  - 1.1 Multi – Disciplinary nature of environmental studies.
  - 1.2 Definition, Scope and Importance of environmental studies.
  - 1.3 Concept of environmental education.
  - 1.4 Historical Background of environmental education.
2. **Natural Resources and related environmental issues:**
  - 2.1 Forest Resources:
    - 2.1.1 Use and over exploitation, deforestation
    - 2.1.2 Timber extraction, mining, dams and their effects on forests and tribal people.
  - 2.2 Water Resources
  - 2.3 Flood Resources:
    - 2.3.1 World food problems
    - 2.3.2 Changes caused by agriculture and overgrazing
    - 2.3.3 Effects of modern agriculture
    - 2.3.4 Fertilizer-pesticide problems.
  - 2.4 Energy Resources:
    - 2.4.1 Growing energy needs
    - 2.4.2 Renewable and non-renewable energy sources
    - 2.4.3 Use of alternate energy sources.
  - 2.5 Land Resources:
    - 2.5.1 Land as a resource
    - 2.5.2 Land degradation
    - 2.5.3 Man induced Land Slides
    - 2.5.4 Soil erosion and desertification
  - 2.6 Role of an individual in conservation of Natural Resources.
- 3.1 **Ecosystem:**
  - 3.1.1 Concept, structure and function of an Ecosystem
  - 3.1.2 Producers, consumers and decomposers.
  - 3.1.3 Energy flow in the ecosystem
  - 3.1.4 Food chains, food Webs and ecological pyramids.

## 4.1 Environmental Pollution:

4.1.1 Definition, effects and control measure of:

- 4.1.1.1 Air Pollution
- 4.1.1.2 Water Pollution
- 4.1.1.3 Soil Pollution
- 4.1.1.4 Marine Pollution
- 4.1.1.5 Noise Pollution
- 4.1.1.6 Thermal Pollution
- 4.1.1.7 Nuclear Hazards

4.1.2 Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

4.1.3 Role Disaster Management: Floods, earthquake, cyclone and Land slides.

## **REFERENCES**

- ❖ Agrawal, K.C. Environmental Biology ( Bikaner: Nidhi Publishers Ltd.) 2001.
- ❖ Cunningham, W.P., and others. Environmental Encyclopedia (Mumbai: Jaico Publishers Home) 2001.
- ❖ Hawkins, R.E. Encyclopedia of Indian Natural History (Bombay : Natural History Society)
- ❖ Heywood, V.H. and Watson V.M; Global biodiversity Assessment (U.K: Cambridge University Press), 1995.
- ❖ Jadhav, H. and Bhosale, V.M. Environmental Protection and Laws (Delhi:Himalaya Pub. House), 1995.
- ❖ Mc Kinney, M.L. and school, R.M Environmental Science system and solution (web enhanced Ed.) 1996.
- ❖ Miller T.G. Jr. Environmental Science (Wadsworth Publishing Co.)
- ❖ Odum, E.P. Fundamentals of Ecology (U.S.A: W.B Saunders Co.) 1971.
- ❖ Rao, M.N. &Datta, A.K. Waste Water Treatment (Oxford & IBH Publication Co. Pvt. Ltd.)1987
- ❖ Townsend C.and others, Essentials of Ecology (Black well Science).

## B.P.E.S /IV/A/SC/01: **FITNESS INSTRUCTOR**

### **Unit-I Introduction to health and fitness**

Health goals, fitness goals, performance goals, components of physical fitness and performance, behaviours that support fitness and performance, taking control of personal health and fitness, factors to consider prior to physical activity, exercise requirement for prevention of premature health problems, how to promote physical activity promotion of physical activity adherence

### **Unit-II Foundation to health fitness instructions:**

Energy cost of physical activity, measurement of energy expenditure, significance of cardiovascular fitness, risks of testing cardio respiratory fitness, components of health related and fitness related fitness

### **Unit-III Healthy body composition**

Measurement of body fat calculating target body weight, LBM and Body fat,

Muscular strength and endurance:- health fitness requirements, assessment of strength and muscular endurance

Flexibility: Importance of flexibility in health and fitness, factors affecting range of movement (ROM) spine and hip joint, flexibility and low back function

**Unit-IV Exercise prescription:** foundation of prescribing exercise, general guidelines for cardio-respiratory fitness programmes, determining intensity, general exercise testing, exercise programme selection, exercise prescription for body weight management

Muscular strength and endurance training: fundamental principles, types of strength training, muscular training modes, intensity and frequency. Overreaching and overtraining

Flexibility training: exercise considerations for improving flexibility, prophylactic exercise for improving low back function

### **Reference**

- **Anspaugh, D.J. and G. Exell (2004) Teaching To-day's Health**, Pearson Benjamin Cummings. San Francisco. California.USA.
- **Bishop JG (2005).Fitness through Aerobics Person-** Benjamin Cummings. San Francisco. California.USA.
- **Donatelle RJ (2006).Access to Health. Pearson Benjamin Cummings. San Francisco. California.USA.**
- **Hoeger WW and Hoeger S (2007).Fitness and Wellness.**Thomson-Wadsworth, Belmont. California. USA.

B.P.E.S /IV/A/SC/02: **Sports Industry**

**SPORTS INDUSTRY**

**Unit-I**

Introduction, history in relation to „sports goods industry“ in India, Industrial relations in India, Peculiar characteristic, i.e. Hand Made Goods, Involving skilled workers-piece rated wages, Policy- five year plans for production, export strategy and potential

**Unit-II**

Sports Industry in Europe-USA, Canada and ASIA & other parts of the world, Major sports-World wide-Europe, ASIA & India including some local games, development of sports

**Unit-III**

Future need for mechanization to improve quality, Evaluation of management thought, planning-nature, objective, promises, strategies & tactical plan

**Unit-IV**

Organizations-Principles, structure, management, levels, quality control, Personnel management- recruitment selection, training, performance

**Unit-V**

Direction/controlling- production control, material control, quality control, sales distribution-government departments, whole sellers & retailers

**Reference**

- **Field S. (2008). Managing Your Career in the Sports Industry.**Checkmark Books. Belmont. California. U.S.A.
- **Kaing NH and Sakai K (2001).New Patterns of Industrial Globalisation.**OECD Publishers. U.S.A.
- **Kraft JP (2009).Leisure Economy 1960-1985; Students in sports Industry &Society.**Johns Hopkins University Press. U.S.A.
- **Likert R (1961).New Patterns of Management.**McGraw Hill. New York. U.S.A.

**Semester V**

## B.P.E.S /V/A/HC/01: **Correctives in Physical Education**

### **Unit-I**

1. Definition of Remedial, physiotherapy and corrective exercises.
2. Concept of posture, its meaning and characteristics of correct and incorrect posture.
3. Causes of incorrect posture
4. Necessity and importance of correct posture.
5. Principles of correct posture.
6. Tests for correct posture.

### **Unit-II**

1. Classification of posture : a. Good Type b. Bantom Type c. Fatigue Type
2. Postural deformities and their causes : a. Kyphosis b. Lordosis c. Scoliosis d. Bow legs e. Knock knee f. Flat foot
3. Preventive and remedial measures for postural defects :
  - a. Psychological and habitual consideration in preventing and correcting postural defects.
  - b. Corrective exercises for various postural defects.
  - c. Physiotherapist treatment in correcting postural defects.

### **Unit-III**

1. Massage: **a.** Meaning, definition and a brief history of massage.  
**b.** Massage as means of relaxation and points to be considered while giving massage. **c.** General effects of massage.
2. Classification of the manipulation and movements in the massage :
3. Effleurage and stroking i. Petrissage ii. Percussion / Tapotement  
iii. Vibration and shaking.
4. Effects of manipulation and movements on the different systems of human body.

### **Unit-IV**

- Classification of positions : a. Fundamental positions b. Derived positions c. Modified positions
- Classification of exercises along with their practical instructions : a. Free mobility exercises b. Assisted exercise c. Resisted exercises

### **Reference Books:**

1. Smith Lara K. and Others, "Srunnstrem's Clinical Kinesiology", Jaypee Brothers P.B. No- 7193 New Delhi 1998.
2. J.L. Rathoore, "Corrective Physical Education", Philadelphia W.B. Saunders Co. 1968.
3. P.G. Rasch and R.K. Burke, "Kinesiology and Applied Anatomy", Lee and Febriger, Philadelphia 1978.
4. Singh Ajmer et.al, "Essentials of Physical Education", Kalyani Publishers, Ludhiana, Second revised addition 2008.

## B.P.E.S /V/A/HC/02 : **Test measurement and Evaluation**

### **UNIT-I**

- Introduction to test, measurement and evaluation and their importance in the field of physical education
- Test constructions:- a) general consideration b) physical fitness/ efficiency test

### **UNIT – II**

- Meaning and importance of statistics in the field of physical education, “population” and “sample” “random sampling”
- Meaning of data, kinds of data- continuous and discrete Frequency distribution, construction of frequency tables, mean, median and mode.

### **UNIT –III**

- Measures of variability range, quartile, deviation, standard Deviation, co-efficient of variation
- Normal probability curve and meaning, uses its principles, Diagrammatic represent action

### **UNIT-IV**

- Physical fitness testing: components of physical fitness
- Strength test: - Kraus Weber strength test, Muscular Endurance test: Cardiopulmonary test:
- Endurance Test, Harvard step test.
- Anthropometric Measurements:- Weight, height, sitting height, chest circumference, thigh circumference, calf circumference, skin fold biceps, triceps, sub scapular and supra iliac.
- Measurement of skills, games and sports-Johnson badminton test, Brady volleyball test, McDonald soccer test, Cornish Handball test, Hockey skill test- SAI hockey Test

### **Reference**

- Acsm’s (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
- BalyanSunita (2006). Sharirk Shiksha main Parikshanevnmnmaapan. Khel Sahitya. Delhi.
- Barrow &Mc Gee s Practical Measurement and Assessment.
- Barrow H.M. and McGee R. (1979).A Practical Approach to Measurement in Physical Education.Lea&Febiger, Philadelphia. U.S.A.



## B.P.E.S /V/A/HC/03: **Yoga Education**

### **UNIT- I**

Origin of yoga, definition and scope of yoga, limitations and misconceptions, importance of yoga in physical education and other fields

### **UNIT- II**

Historical development of yoga in India.

Types of Yoga:- Hatha yoga, laya yoga, mantra yoga, bhakti yoga, karma yoga, jnana yoga, raj yoga

### **UNIT- III**

Patanjali yoga sutras- yama, niyama, asana, pranayama

Pratyahar- Benefits & utilities of these. Astanga yoga- Definition, objectives, dharna, dhyana, Samadhi & their psychological impact.

Shatkarm/cleansing process/ yogic methods and personal hygiene.

### **UNIT- IV**

Asanas: Types, importance of asanas in special reference to Physical Education & Sports.

Differentiate between asanas and exercise.

Pranayama and importance of pranayama in special reference to Physiological effects

Bandhas, mudras and their physiological effects.

### **UNIT- V**

Disease wise treatment through yoga therapy- Asthma, high & low B.P, diabetes, obesity, heart disease, insomania, arthritis, backache, female disease and importance of vegetarianism in yogic diet

### **SUGGESTED READINGS**

- Day P. (1986). Yoga Illustrated Dictionary. Jaico Pub. House. New Delhi.
- Debnath M ( 2007). Basic Core Fitness Through Yoga And Naturopathy. Sports Publication. New Delhi.
- Kumar ER (1988). Heal Yourself With Yoga: Specific Disease. Taraporevala. Bombay.
- Shanti KY (1987).The Science of Yogic Breuthiay (Pranayana). D.B. Bombay.
- Sharma JP and Ganesh S (2007). Yog Kala Ek Prichya. Friends. New Delhi
- Sharma JP (2007).Manavjeevanevamyoga.Friends Pub. New Delhi.
- Sharma Jai Prakash AndSehgalMadhu (2006).Yog-Shiksha.Friends. Delhi.
- Singh MK And Jain P (2008). Yoga aurmanoranjan.KhelSahitya Kendra. New Delhi.

## B.P.E.S /V/A/SC/01: **GYM MANAGEMENT**

### **UNIT-I**

Concept of nutrition and health, balanced diet, dietary aids and gimmicks, Energy and activity, calculating calorie intake and expenditure

Obesity, anorexia and related health problems – measurements and management, Weight management programmes

### **UNIT-II**

Understanding of various forms of aerobics- floor aerobics, step – aerobics, weight, Aerobics and aqua aerobics, Training effects of aerobic fitness on various physiological systems namely skeletal Muscular, circulatory and respiratory

Improvement of aerobic fitness, Aerobic fitness programme

### **UNIT-III**

Location and Establishment of gym (Publicity, policy, reception, information, Registration, offer of programmes), Procurement, placement & maintenance of gym, Equipments , Marketing, clientage, Enrolments, record keeping, social activities, Public Relations, Individualized/group grooming programme, basic concepts of financial management

Gym-instructor – qualification, qualities, pay-roll, Performance – evaluation, grooming and presentation, Introduction to different exercise equipment, Gym management – Costing, Balance sheet, Promotional plans

### **UNIT-IV**

Measurement of Weight and Height, Calculating BMI (Body Mass Index ), Measurement of Fitness Components Flexibility (Sit and Reach Test, Hip Bend and Toe Touch), Strength (Sit-Ups, Leg-Raise for Minimal Strength), Cardiovascular Endurance (One-mile run, Physical Efficiency test, Harvard step test),

Self- evaluation –Personal Health and Well-being

### **UNIT-V**

Exercise schedules – Aerobics, Fitness and Weight Management

### **Reference**

- Carol K A. and Mary M. Y (2009).“Methods of Group Exercise Instruction” McGraw Hill. New York. U.S.A.
- Sheela K (2009).Fitness, Aerobics & Gym Operations.KhelSahitya Kendra. New Delhi.
- Taylor, D. and Nichols, D.S. (2010). The Brand Gym : A Practical Workout. Wiley Publishers, USA.
- Time Life Books..(2004).Gym Workout. London Times Life Books
- Wayne L Westcott (2007).“Strength Training”. Thomas R. Bachle. Benjamin Cummings. U.S.A.

## B.P.E.S V/A/SC/02 :SPORTS JOURNALISM

### UNIT-I

Meaning, scope and changing trends of journalism in sports

Historical development & role of print and electronic media in sports promotion

### UNIT-II

Language – vocabulary, spellings, figure of speech , dialect, grammar, punctuation

Fundamentals of a sports story/ news

### UNIT-III

Organizational set-up of a news paper- printing, process sequences of operations in the printing of a news paper/journals.

Introduction of various sports organization and agencies- Olympic Games, Asian games, commonwealth games, awards and trophies.

### UNIT-IV

Theory and principles of advertising in sports

Public relations in sports, press release, conferences

Research tools for developing a sports story

Process of news paper publishing and management

### Reference

- **AamidorA (2003).Real Sports Reporting.Indiana University Press. Valparaiso. Indiana. U.S.A.**
- **Ahuja, B.N (1988).Theory and Practice of Journalism.Surjeet. Delhi.**
- **Andrews P (2005). Sports Journalism: A Practical Introduction. Sage Publications Ltd. Delhi.**
- **Boyle R (2006). Sports Journalism: Context and Issues. Sage Publications Ltd.**
- **Kamath, MV (1980).Professional Journalism.K.S.K. New Delhi..**
- **Steen (2007). Sports Journalism: A Multimedia Primer (Paperback). Routledge. London**
- **Wilstein S (2001).Associated Press Sports Writing Handbook. McGraw-Hill.**

**Semester VI**

## B.P.E.S /VI/A/HC/01: **Basic of Sports Training**

### **UNIT I: Introduction**

- Meaning and Definitions of Sports Training.
- Meaning of terms: Coaching, Teaching, Conditioning and Training.
- Aim and Tasks of Sports Training.
- Characteristics of Sports Training.
- Principles of Sports Training.
- Systematization of Sports Training.
  - Beginner
  - Intermediate.
  - High Performance.

### **UNIT-II: Training Load**

- Definition and Types of Training Load.
- Features/Factors of Training Load
- Principles of Intensity and Volume of Stimulus.
- Over Load.
- Meaning and types of over load.
- Causes of over load.
- Symptoms of over load.
- Tackling of over load.
- Judgment of Training Load.

### **UNIT-III :- Strength**

- Concept and types of Strength.
- Factors determining Strength.
- Methods of strength training.
- Management of strength training programme.

### **Endurance**

- Concept and types of endurance.
- Factors determining endurance.
- Methods of endurance training.

### **Speed**

- Concept and Classification of Speed.
- Factors determining speed.
- Methods of developing speed abilities.
- Reaction speed
- Speed of movement.
- Acceleration speed
- Sprinting speed.

- Speed endurance.

#### **UNIT-IV : Technical Training**

- Definition of Technique and Skill.
- Importance of Technique.
- Process of Skill Learning.
- Methods of Technique Training.

#### **Tactical Training**

- Concept of Tactics and Strategy.
- Methods of Tactical Training.

#### **Planning**

- Concept of Training Plan.
- Principles of Planning.
- Types of Training Plan.

#### **Periodization**

- Meaning and Importance of Periodization.
- Periods of Training Year.
- Aim and Contents of Periods.
- Types of Periodization.

#### **REFERENCES**

- ❖ Dick W. Frank, Sports Training Principles 4<sup>th</sup> ed. (London: A&C Black Ltd.), 2002.
- ❖ Harre, D. Principles of Sports Training (Berlin: Sport Veulag), 1982.
- ❖ Matveyev, L.P. Fundamentals of Sports Training (Moscow :Progress Publishers) 1977.
- ❖ Singh, Hardayal. Science of Sports Training (New Delhi: DVS Publications), 1991.
- ❖ Uppal, A.K. Principles of Sports Training (Delhi: Friends Publication) 2001.
- ❖ Tudor B. Bompa&Mihal C. Carera, Periodiation Training for Sports, Human Kinetics,2005 (IInd Edition)
- ❖ YograjThani, Sports Training, Sports Publication-2003
- ❖ K. Chandra Shekar, Sports Training, KhelSahitya Kendra -2004

## B.P.E.S /VI/A/HC/01: **STRESS MANAGEMENT**

### **Unit-I**

Definition of stress and anger, Causes of stress and anger, two main emotions of stress-fear and anger, Daily life stressors, Process of stress and anger- Psycho Physiology of stress

### **Unit-II**

Adaptation to stress-Reframing of habitual stress resistance, Occupational stress, Peer stress (Students stress), Family stress, Stress & elderly

### **Unit-III**

Stress & drug abuse

Stress related diseases- i) Sleep disorder, ii) Eating disorder, iii) Sexual and emotional disorder, iv) Other stress related diseases, v) Stress & Spirituality

### **Unit-IV**

Self awareness and stress management, Muscular tension reduction, Emotional tension reduction, Stress free living, Stress free examination, Stress management through physical activity, Stress management through recreation

### **Unit-V**

Anger management- Redford William's 12 steps of anger management

Stress management- behavior modification, time management, coping strategy

Relaxation technique- i) Diaphragmatic breathing, ii) Meditation, iii) Progressive muscle relaxation, iv) Yoga, v) Mental imagery, vi) Music therapy, vii) Massage therapy

## **SUGGESTED READINGS**

- Adrain F & Herrick E. and Sharp P (1998). Anger Management. Routledge Publishing. Florence. Kentucky. U.S.A.
- Allen E (2008). Stress Management for Dummies. For Dummies Publishers. U.S.A.
- Davis M. et al (2008). The Relaxation and Stress Reduction workbook. Harbinger Publications, USA.
- Greenberg J.S. (2008). Comprehensive stress management. McGraw Hill, USA
- Hipp E. (2008). Fighting Invisible Tigers : Stress Management for Teens. Free Spirit Publishing, USA.
- Mac W. (2007). Anger and Stress Management. God's Way. Calvary Press, USA.
- Petee F (2006). Anger Management. Pentagon. Press. New York. U.S.A.
- Swate Y B (2009). Anger Management. Sage Publication. New Delhi.

**B.P.E.S /VI/A/HC/01: EDUCATIONAL TECHNOLOGY****UNIT-I : Introduction to Educational Technology**

- 1.1 Definition
- 1.2 Educative Process
- 1.3 The Teacher of Yesterday & Today
- 1.4 An outline of Teaching method used then and now
- 1.5 Use of sensory organ in the process of learning and remembering
- 1.6 Communication:
  - 1.6.1 Types of Communication
  - 1.6.2 Communication Cycle
  - 1.6.3 Communication in the Class room

**UNIT-II Teaching Aids:**

- 2.1 Importance of Teaching Aids
- 2.2 Criteria for selecting Teaching Aids
- 2.3 Difference between Teaching Method and Teaching Aid
- 2.4 Broad classification of Teaching Aids
  - 2.4.1 Audio Aids
  - 2.4.2 Visual Aids
  - 2.4.3 Audio-Visual Aids
  - 2.4.4 Effectiveness of Edger Dale's cone classification
- 2.5 Advantage and suggestions for effective use of selected teaching Aids.
  - 2.5.1 Verbal
  - 2.5.2 Chock Board
  - 2.5.3 Charts
  - 2.5.4 Models
  - 2.5.5 Slide Projector
  - 2.5.6 Over Head Projector
  - 2.5.7 Motion Picture
  - 2.5.8 Self Experiment and Projects.

**UNIT-III New Teaching Techniques and Innovations – I:**

- 3.1 Art of questioning and answering
  - 3.1.1 Purpose of Questioning
  - 3.1.2 Classification of Questioning
  - 3.1.3 Techniques of asking questions
- 3.2 Programmed Learning
  - 3.2.1 Concept of Programmed learning
  - 3.2.2 Fundamental Principles of Programmed learning



3.2.3 Steps involved in preparation of Programme

3.3 Team Teaching

3.3.1 Meaning

3.3.2 Guiding principles of Team Teaching

3.3.3 Advantage of Team Teaching.

#### UNIT-IV **New Teaching Techniques and INNOVATIONS – II :**

4.1 Micro Teaching

4.1.1 Concept and Features of Micro Teaching

4.1.2 Micro Teaching Verses Traditional Teaching

4.1.3 Steps in Micro Teaching

4.1.4 Principles of Micro Teaching

4.1.5 Micro Teaching Skills

4.1.6 Limitation of Micro Teaching

4.2 Simulation Teaching

4.2.1 Meaning of Simulation

4.2.2 Types of activities in simulation

4.2.3 Steps in Simulation

4.2.4 Advantages of Simulation

4.2.5 Limitations of Simulation

#### **REFERENCES**

- ❖ K. Sampath, A. Pannirselvam and S. Santhanam. Introduction to Educational Technology (New Delhi: Sterling Publishers Pvt. Ltd.) : 1981.
- ❖ Bhatia and Bhatia. The Principles and Methods of Teaching (New Delhi :Doaba House), 1959.
- ❖ Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.
- ❖ Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982
- ❖ Kozman, Cassidy and kJackson. Methods in Physical Education (W.B. Saunders Company, Philadelphia and London), 1952.
- ❖ Singh, Ajmer and other. Modern Text Book of Physical Education, Health and Sports, (KalyaniPublishers,Ludhiana)2000.
- ❖ AmitaBhardwaj, New Media of Educational Planning".Sarup of Sons, New Delhi-2003
- ❖ Prof. Ramesh Chandra, DitelAneja,"Corporate Global Environment", Usha Books, Delhi 2004.
- ❖ MohitChakravarty,"Education in the 4 Century" KalpanPublication' Delhi2005.
- ❖ V.C. Pandey, Educational Technology" Usha Books Delhi -2005.
- ❖ Sarita, Monika Tomar,"Delhi, 2004
- ❖ JagannathMohanty, "Educational Technology" Deep & Deep Publication. Pvt. Ltd. New Delhi.2003

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## B.P.E.S /VI/A/SC/01: **Recreation in Physical Education**

### **UNIT-I Introduction to Recreation**

- 1.1 Meaning, Definitions and characteristics of Recreation
- 1.2 Importance of Recreation
- 1.3 Misconceptions about Recreation
- 1.4 Scope of Recreation

### **UNIT-II Influence of Recreation in Social Institutions.**

- 2.1 Family
- 2.2 Educational institutions
- 2.3 Community/ Cultural
- 2.4 Religious organizations

### **UNIT-III Planning for Recreation**

- 3.1 Planning criteria and objectives of Recreation facilities
- 3.2 Different types of indoor and outdoor Recreation for Urban and Rural population
- 3.3 Operation and maintenance of different Recreation area and facilities
- 3.4 Sources of funding of Recreational activities

### **UNIT-IV Programmes in Recreation**

- 4.1 Criteria and principles of selecting a programme
- 4.2 Classification of Recreational activities:
  - 4.2.1 Indoor and outdoor activities
  - 4.2.2 Water activities
  - 4.2.3 Cultural activities
  - 4.2.4 Literary activities
  - 4.2.5 Nature and outing
  - 4.2.6 Social events
  - 4.2.7 Adventure activities
- 4.3 Hobbies – Introduction to hobbies and types of hobbies.
- 4.4 Agencies providing Recreation.
- Camping and leadership**
- 4.5 Aim, objectives and importance of Camping.
- 4.6 Organization and types of Camp.
  - Selection and layout of camp site.
  - Camping leadership.
- 4.7 Types and functions of Recreation leaders.
- 4.8 Qualification, Qualities and training & Recreation leaders.

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- ❖ VannierMaryhalen, “Methods and Material in Recreation leadership: Philadelphia.” W.B. Sounders company, 1959.

## B.P.E.S /VI/A/SC/02: **ART OF DAILY SCHEDULING**

### **Unit-I**

Introduction:- Meaning and definition of Daily Schedule, art, science, management of time, shortage of time for daily activities

Types of daily activities: requirement of daily activities for various domains of personality, essential categories of daily activities, correct decision making to include all types of daily activities with in fixed 24 hours

### **Unit-II**

Art of living, art of scheduling, art and science of principles of time management, acronym and daily prayers, methods of recalling and rechecking daily activities

Attitudes and art of daily schedules: right knowledge of daily activities, developing correct attitude by learning the art of behaviour change, transdental theory of behaviour changes, relation between attitude and behaviour change

### **Unit-III**

Understanding the concept of perfection of nature, relation between nature known as superpower or god in religious terms, predisposing, enabling and reinforcing factors for strengthening the art of daily schedules

Cognition and daily schedules: necessity of right attitude and right information of essential components of daily schedules. Enlisting activities needed daily, relation between qualitative and quantitative balances

### **Unit-IV**

Alternative daily schedule patterns: effect of culture, race, gender and age on daily schedules, fundamentals of art of daily schedules, listing alternative daily schedules for different categories of human being based on culture, race. Gender, age, and geographical locations

Factors helping adherence to daily schedule: self responsibility, knowledge to body requirements, important body systems requiring daily attention

Analysis of lifestyles: role of active lifestyle and wellness activities, factors helping to promote daily schedules

Barriers to daily schedules – peer pressures, careless environment of , firm no to harmful barriers like smoking, drugs, alcohol and irresponsible sex urge

Wellness and daily schedules: art of inclusion of all wellness parameters to daily schedules, namely meditation, foods, right physical activities, right hygienic habits, right environmental care, right injury preventing behaviours, right decision towards sex, entertainment recreation, rest, sleep

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**BHARATI VIDYAPEETH DEEMED UNIVERSITY**  
(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India )

**COLLEGE OF PHYSICAL EDUCATION**

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

**REACCREDITED 'A' GRADE BY NAAC**



**Bachelor of Physical Education**

**(B.P.Ed.)**

**(4 Semester Programme)**

**CURRICULUM FRAMEWORK**

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR  
B. P. ED. (FOUR SEMESTERS)  
CHOICE BASED CREDIT SYSTEM (CBCS)**

**Preamble:** Bachelor of Physical Education (B. P. Ed.) two years (Four Semesters Choice Based Credit System) B.P.Ed programme is a professional B.P.Ed programme meant for preparing teachers of physical education in classes VI to X and for conducting physical education and sports activities in classes XI and XII.

B. P. Ed. B.P.Ed programme shall be designed to integrate the study of childhood, social context of Physical Education, subject knowledge, pedagogical knowledge, aim of Physical Education and communication skills. The B.P.Ed programme comprises of compulsory and optional theory as well as practical courses and compulsory school internship.

**Course Outcome**

1. Bachelor of Physical Education (B. P. Ed.) two years (Four Semesters Choice Based Credit System) programme is a professional programme meant for preparing teachers of Physical Education in classes VI to X and for conducting Physical Education and sports activities in classes XI and XII.
2. The course prepares the leaders in Physical Education who act as Mentors and Motivators for School children in inculcating healthy and hygienic habits.
3. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
4. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
5. To prepares Experts who can work with various Sports Federations/Organisations/Leagues/Media Houses.

**Intake, Eligibility and Admission Procedure:**

The Intake, Eligibility and Admission Procedure are as per the NCTE norms and standards.

**Eligibility**

**(a)** Bachelor's degree in any discipline with 50% marks and having at least participation in the Inter-College/Inter-Zonal/District/School competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

**Or**

**(b)** Bachelor's degree in physical education with 45%marks.

**Or**

(c) Bachelor's degree in any discipline with 45%marks and studied physical education as compulsory/elective subject.

**Or**

(d) Bachelor's degree with 45%marks and having participated in national/Inter University/State competitions or secured 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> position in Inter College/Inter-Zonal/District/School competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

**Or**

(e) Bachelor's degree with participation in International competition or secured 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> position in National/Inter-University competition in sports and games as recognized by the AIU/IOA/SGFI/Govt. of India. (Sports participation in last 05 years.)

**Or**

(f) Graduation with 45%marks and at least three years of teaching experience (for deputed in-service candidates i.e. trained physical education teachers/coaches).

The relaxation in the percentage of marks in the qualifying examination and in the reservation of seats for SC/ST/OBC and other categories shall be as per the rules of the Central Government/State Government, whichever is applicable.

**Age:-**

For General category candidates the upper age limit is 32 years as on 1<sup>st</sup> July of the academic year. Age relaxation for SC, ST and OBC candidate will be given according to the rules and regulation of Bharati Vidyapeeth University and GOI

**Number of seats:-**

50 (Fifty) seats are approved by NCTE Bhopal for B.P.Ed. course.

**Note:-**

\*Married girl is eligible for admission to B.P.Ed. programme. But, it is also compulsory for her to sign an undertaking that she will discontinue the B.P.Ed programme at once for at least one academic year, if she gets pregnant during the course of study. She can join back afresh from the beginning of the semester keeping the guidelines pertaining to the maximum duration of the course in mind.

\*No differently-abled candidate is eligible for the admission in B.P.Ed. Course.

**Admission procedure:-**

Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

<b>a- Physical fitness test</b>	<b>50 marks</b>
<b>b- Written test</b>	<b>30 marks</b>
<b>c- Interview</b>	<b>10 marks</b>
<b>d- Sports achievement</b>	<b>10 marks</b>



The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at Bharati Vidyapeeth Deemed University College of Physical Education

There shall be Physical Fitness Test (modified AAHPER/CNADIAN/OR ANYOTHER fitness test) of 50 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

- (A) Theory Paper comprising of 30 multiple-choice questions of 30 minutes duration carrying 30 marks. Questions shall be based on Aptitude Test, Current Affairs and General Knowledge about sports.
- (B) Interview comprising of 10 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education
- (C) Sports Participation Weightage :- Candidate shall be given maximum 10 marks weightage on the basis of their sports participation in any one of the following level:

<b>Participation</b>	<b>Marks</b>
➤ <b>International:</b>	<b>10</b>
➤ <b>Senior National championship/ National Games:</b>	
1st Place :	<b>10</b>
2nd Place :	<b>08</b>
3rd Place :	<b>07</b>
Participation:	<b>05</b>
➤ <b>All India Inter-Zonal Inter University Competitions:</b>	
1st Place :	<b>08</b>
2nd Place :	<b>07</b>
3rd Place :	<b>06</b>
Participation:	<b>05</b>
➤ <b>Zonal Inter University Competitions/Junior National Competitions:</b>	
1st Place :	<b>07</b>
2nd Place :	<b>06</b>
3rd Place :	<b>05</b>
Participation:	<b>04</b>
➤ <b>Senior State Championship/Rural national games/Woman Festival:</b>	
1st Place :	<b>05</b>
2nd Place :	<b>04</b>
3rd Place :	<b>03</b>
Participation:	<b>02</b>

**Note:-**

\*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (**AIU**) and/or School Games Federation of India (**SGFI**).

\*The obtained position must be during last five academic sessions.

\*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; the candidate shall not get any marks for sports weightage.

**Medical examination:-**

Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern office.

**Course fee**

The course fee Rs 80,000/- shall be deposited in Four installments ie.

<b>Semester</b>	<b>Installment</b>	<b>Month</b>	<b>Amount</b>
1 <sup>st</sup>	1 <sup>st</sup>	July- At the time of admission	Rs.20,000
2 <sup>nd</sup>	2 <sup>nd</sup>	December	Rs 20,000
3 <sup>rd</sup>	3 <sup>rd</sup>	June	Rs.20,000
4 <sup>th</sup>	4 <sup>th</sup>	December	Rs.20,000

The mode of **DD/Banker's cheque** in favor of the **The Pricipal ,Bharati Vidyapeeth (Deemed to be) University, College of Physical Education, or candidate can deposit cash in Bharati Bank in prescribed bank account of the college through Challan obtaining from College office .**

**Duration:** The B.P.Ed programme shall be of duration of two academic years, that is, four semesters. However, the students shall be permitted to complete the B.P.Ed programme requirements within a maximum of three years from the date of admission to the programme.

The student, who discontinue the B.P.Ed programme after one year or more semesters due to extraordinary circumstances, are allowed to continue and complete the B.P.Ed programme with due approval from the principal .

**SCHEME OF EXAMINATION FOR B.P.ED. (4 SEMESTERS)**  
**(2015-2017)**

**Semester wise Distribution of Marks & Credits**

		Sem-I	Sem-II	Sem-III	Sem-IV	Total
<b>Part-A: Theory Courses</b>	<b>Marks</b>	400	400	400	200	<b>1500</b>
	<b>Credits</b>	16	16	16	8	<b>60</b>
<b>Part-B: Activity Courses (Games/Sports)</b>	<b>Marks</b>	400	300	300	400	<b>1300</b>
	<b>Credits</b>	8	6	6	8	<b>26</b>
<b>Part- C: Game/ Sport Specialization</b>	<b>Marks</b>	100	100	100	100	<b>400</b>
	<b>Credits</b>	2	2	2	2	<b>8</b>
<b>Part D -: Teaching Ability and Internship</b>	<b>Marks</b>	--	100	100	300	<b>400</b>
	<b>Credits</b>	--	2	2	6	<b>8</b>
<b>Grand Total</b>	<b>Marks</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>3600</b>
	<b>Credits</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>24</b>	<b>102</b>

**NOTES:**

- Each Theory Course shall have 4 Units and 3 hrs. duration final examination except Sports Specialization which will have 3 units in each semester and 2-hour duration semester-end examination.
- The pattern of Semester-end question papers shall be:
  - 2.1. For papers having Max. Marks- 60 : [12+12+12+12+(4x3)=60 marks]**  
For University examination each question paper shall consist of 9 questions (8 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units). The candidate will attempt any one question from each unit (4 questions of 12 marks each from first 8 questions). The 9th question will be compulsory consisting 4 short notes of 3 marks each.
- For Internal Assessment of Theory Courses one Mid Semester Test of 30 marks for each course will be conducted by the college. For the mid semester test each question paper (of 30 marks) shall consist of 5 questions (4 long answer questions from first two unit and 1 combined question of 2 short notes from both units). The candidate will attempt any one question from each unit (2 questions of 12 marks each from first 4 questions). The 5th question will be compulsory consisting 2 short notes of 3 marks each. In addition, the teacher concerned shall conduct one open book examination consisting of 10 marks and submit the marks to the college exam department.

4. For Semester-end Examination in Activity Courses, the breaks-up of 100 Marks shall be as follows:

-	Skill proficiency/playing ability	:	80
-	Diary / Record book	:	20

5. For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:

-	Skill proficiency/playing ability	:	60
-	Written Test	:	40

6. For internship, student needs to complete 150 hrs. as a physical education teacher in schools and also needs to prepare day to day lesson plan. Every day lesson plan will be evaluated and signed by School Administrator/Principal. Student needs to submit a report on his or her internship with the lesson plan duly signed by School Administrator/Principal. School Administrator/Principal will also be asked to give marks to the student according to his performance after the internship gets over. The break-up of 300 Marks shall be as follows

-	School Administrator Report	:	100 marks
-	Lesson Plan	:	100 marks
-	Viva-Voce	:	100 marks

## CURRICULUM FRAMEWORK FOR B.P.ED.

**(4 SEMESTERS 2015-2017)**

### **B.P.Ed. I-Semester (July 2015 to November 2016)**

#### **PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/I/A/HC/01	Introduction & History of Physical Education	60	40	100	64	4
BPEd/I/A/HC/02	Anatomy, Physiology and Exercise Physiology	60	40	100	64	4
BPEd/I/A/HC/03	Computer Application & Communicative Skills in Physical Education	60	40	100	64	4
BPEd/I/A/SC/01 BPEd/I/A/SC/02	<b>Select anyone of the following:</b> *Development of Sports Movements *First Aid & Safety Education	60	40	100	64	4
<b>Total</b>		<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**NOTE:HC-** Hard Core/Compulsory Course; **SC-** Soft Core/Elective Course.

#### **PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/I/B/HC/01	Conditioning	100	48	2
BPEd/I/B/HC/02	Track and Field (Running events)	100	48	2
BPEd/I/B/SC/01-04	<b>Select anyone Activity/ Game/Sport from each Group* (B1 and B2 – the offer shall depend on administrative feasibility).</b>	100X2	48X2	2X2
<b>Total</b>		<b>400</b>	<b>--</b>	<b>08</b>

**\*\*Groups of Activity/Game/Sport:** (Should be other than Sport Specialization).

Activity Group-B1		Activity Group-B2	
Activity Code	Activity	Activity Code	Activity
BPEd/I/B/SC/01	Basketball	BPEd/I/B/SC/03	Table Tennis
BPEd/I/B/SC/02	Volleyball	BPEd/I/B/SC/04	Tennis

**PART-C: GAME/SPORT SPECIALIZATION:** A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
BPEd/I/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport - sessional only)	100	48	2

**NOTE:** SCC- Soft Core Compulsory.

## B.P.Ed. II-Semester (December 2015 to April 2016)

### PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/II/A/HC/01	Educational & Sports Psychology	60	40	100	64	4
BPEd/II/A/HC/02	Methodology of Teaching in Physical Education	60	40	100	64	4
BPEd/II/A/HC/03	Sports Training	60	40	100	64	4
BPEd/II/A/SC/01	<b>Select anyone of the following:</b> *Fitness, Wellness and Sports Nutrition	60	40	100	64	4
BPEd/II/A/SC/02	*Adapted Physical Education					
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

### PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/II/B/HC/01	Track & Field-I (Field Events)	100	48	2
BPEd/II/B/HC/03	Light Apparatus	100	48	2
BPEd/II/B/SC/01-04	<b>Select anyone Activity/ Game/ Sport from Group-B3*</b> (The offer shall depend on administrative feasibility).	100	48	2
	Total	<b>300</b>	<b>144</b>	<b>06</b>

\*Group of Activity/Game/Sport: (Should be other than Sport Specialization).

Activity Group-B3			
Activity Code	Activity	Activity Code	Activity
BPEd/II/B/SC/01	Handball	BPEd/II/B/SC/03	Kho- Kho
BPEd/II/B/SC/02	Cricket	BPEd/II/B/SC/04	Weight Lifting

**PART-C: GAME/SPORT SPECIALIZATION:** (Continued from Semester-I)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
BPEd/II/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

**PART-D: TEACHING ABILITY AND INTERNSHIP-I (ACTIVITY TEACHING):**

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
BPEd/II/C/HC/01	Teaching Lessons (students shall conduct minimum 5 teaching lessons at the Institute itself in different activities like Marching, Calisthenics and Rhythmic Activities).	100	48	2



## B.P.Ed. III-Semester (July 2016 to November 2016)

### PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/III/A/HC/01	Measurement & Evaluation in Physical Education	60	40	100	64	4
BPEd/III/A/HC/02	Kinesiology & Biomechanics	60	40	100	64	4
BPEd/III/A/HC/03	Yoga and Health Education	60	40	100	64	4
BPEd/III/A/SC/01	Select anyone of the following: *Sports Entrepreneur, Marketing & Sports Management	60	40	100	64	4
BPEd/III/A/SC/02	*Professional Preparation in Physical Education					
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

### PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/III/B/HC/01	Conditioning	100	48	2
BPEd/III/B/HC/02	Judo	100	48	2
BPEd/III/B/HC/03	<b>Select anyone Activity/ Game/ Sport from Group-B4*</b> (The offer shall depend on administrative feasibility).	100	48	2
	<b>Total</b>	<b>300</b>	<b>94</b>	<b>6</b>

\*Group of Activity/Game/Sport: (Should be other than Sport Specialization).

Activity Group-B4			
Activity Code	Activity	Activity Code	Activity
BPEd/III/B/SC/01	Yoga	BPEd/II/B/SC/03	Aerobics

**PART-C: GAME/SPORT SPECIALIZATION:** (Different from Semester - I & II)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
BPEd/III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

**PART-D: TEACHING ABILITY AND INTERNSHIP-II (ACTIVITY TEACHING):**

(Continued from Semester - II)

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
BPEd/III/C/HC/01	Teaching Practice	100	60	2

## B.P.Ed. IV-Semester (December 2016 to April 2017)

### PART-A: THEORY COURSES:

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
BPEd/IV/A/HC/02	Sports Medicine, Physiotherapy and Rehabilitation	60	40	100	64	4
BPEd/IV/A/HC/03	Research and Statistics in Physical Education	60	40	100	64	4
	<b>Total</b>	<b>120</b>	<b>80</b>	<b>200</b>	<b>128</b>	<b>8</b>

### PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):

Activity Code	Name of Activity	University Exam	Class	Credits
BPEd/IV/B/HC/01	Kabaddi	100	48	2
BPEd/IV/B/HC/02	Weight Training	100	48	2
BPEd/IV/B/HC/03	Gymnastics	100	48	2
BPEd/IV/B/HC/03	Camping, Hiking and Tracking	100	48	2
	<b>Total</b>	<b>400</b>	<b>192</b>	<b>8</b>

### PART-C: GAME/SPORT SPECIALIZATION: (Continued from Semester - III)

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

### PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):

Activity Code	Name of Area	University Exam	Class	Credits
BPEd/III/C/HC/01	Internship	300	150	6

**(Choice Based Credit System)**

**Standard of Passing:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

<b>Range of Marks (Out of 100)</b>	<b>Grade</b>	<b>Grade Point</b>
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks ≤ 80	A+	9
60 ≤ Marks ≤ 70	A	8
55 ≤ Marks ≤ 60	B+	7
50 ≤ Marks ≤ 55	B	6
40 ≤ Marks ≤ 50	C	5
Marks ≤ 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

**Formula to calculate Grade Points (GP)**

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex  $x$ -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x)+1

particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.Ed programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA - 10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA + 20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA - 20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA - 110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA - 300	If $9.50 \leq \text{CGPA} \leq 10.00$

#### **Award of Honours:**

A student who has completed the minimum credits specified for the B.P.Ed programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

**Educational Tour/Camp:** In addition to the above rules the student must fulfill the following requirements to acquire the degree which is mandatory. Educational Tour or Leadership Camp organized by the College of Physical Education of at least 07 days. The students shall contribute separately for these activities.

# **B.P.Ed**

# **Semester I**

## **BPEd/I/A/HC/01: Introduction & History of Physical Education**

### **Subject Outcome:-**

1. Students will understand the concept of Philosophy and philosophy of physical education to acquaint student with the different Philosophies along with their implications in Physical education.
2. Students will understand the concept of Sociology and to acquaint student the implications of Physical education and sports in society.
3. Students will understand the concept of Education and Physical Education
4. Students will get acquainted with historical perspective as influence on physical education, Abroad and in India.
5. Students will get acquainted with different Issues, challenges and opportunities in Physical education & sports

### **Unit – 1: Introduction**

Meaning, Definition and Scope of Physical Education  
 Aims and Objective of Physical Education  
 Importance of Physical Education in present era.  
 Misconceptions about Physical Education.  
 Relationship of Physical Education with General Education.  
 Physical Education as an Art and Science.

### **Unit- II – Historical Development of Physical Education in India**

Indus Valley Civilization Period. (3250 BC – 2500 BC)  
 Vedic Period (2500 BC – 600 BC)  
 Early Hindu Period (600 BC–320 AD) & Later Hindu Period (320AD-1000AD)  
 Medieval Period (1000 AD – 1757 AD) British Period (Before 1947)  
 Physical Education in India (After 1947)  
 Contribution of Akhadas and Vyayamshalas  
 Y.M.C.A. and its contributions.

### **Unit- III- Foundation of Physical Education**

Philosophical foundation:  
 Idealism, Pragmatism, Naturalism, Realism, Humanism,  
 Existentialism and Indian Philosophy and Culture.  
 Fitness and wellness movement in the contemporary perspectives  
 Sports for all and its role in the maintenance and promotion of fitness.

### **Unit-IV- Principles of Physical Education**

Biological, Growth and development, Age and gender characteristics, Body Types  
 Anthropometric differences , Psychological, Learning types, learning curve Laws and principles of learning, Attitude, interest, cognition, emotions and sentiments. Sociological, Society and culture, Social acceptance and recognition, Leadership  
 Social integration and cohesiveness

### **References:**

- Bucher, C. A. (n.d.) *Foundation of Physical Education*. St. Louis: The C.V. Mosby Co.
- Deshpande, S. H. (2014). *Physical Education in Ancient India*. Amravati: Degree college of Physical Education.(Maharashtra)
- Mohan, V. M. (1969). *Principles of Physical Education*. Delhi: Metropolitan Book Dep.
- Nixon, E. E. & Cozen, F.W. (1969). *An introduction to Physical Education*. Philadelphia: W.B. Saunders Co.
- Obertuffer, Delbert(1970) *Physical Education*. New York: Harper & Brothers Publisher.



## **BPEd/I/A/HC/02: Anatomy, Physiology and Exercise Physiology**

### **Subject Outcome:-**

1. Students will understand the basic structure and function of the human body
2. Students will understand the effect of exercise on the different systems
3. Students will understand the normal movements of the body
4. Students will understand how body gets fuel for its working.

### **Unit – 1 Introduction**

Brief introduction of Anatomy and Physiology  
 Need and importance of anatomy and physiology  
 Organization of Living organism  
 Essential Properties of living cell

### **Unit – II Skeletal System, Digestive System and Respiratory system**

#### **Skeletal System**

General structure of the bone, various kinds of bones, functions of the bones.  
 Joints, their structure, and their movements

#### **Digestive System**

Organs and its function in digestive system  
 Process of digestion in human body

#### **Respiratory system**

Organs and its function in respiratory system  
 Types of respiration

### **Unit – III Cardiovascular System and Nervous system**

#### **Cardiovascular System**

Heart, its location, structure and function.  
 Mechanism of blood circulation.  
 Blood pressure, cardiac output, cardiac cycle, heart rate, pulse rate and athletes heart.

#### **Nervous system**

Organs of nervous system  
 Function of brain  
 Function of spinal cords  
 Types of nervous system

### **Unit – IV- Effect of Exercise on Various Systems**

Cardio – respiratory system  
 Skeletal system  
 Muscular System  
 Digestive and Excretory system  
 Nervous system

**References:**

- D. (1979). A Christine, M. D., (1999). *Physiology of Sports and Exercise*. USA: Human Kinetics.
- Conley, M. (2000). *Bioenergetics of Exercise Training*. In T.R. Baechle, & R.W. Earle, (Eds.), *Essentials of Strength Training and Conditioning* (pp. 73-90). Champaign, IL: Human Kinetics.
- Gupta, A. P. (2010). *Anatomy and Physiology*. Agra: Sumit Prakashan.
- Gupta, M. and Gupta, M. C. (1980). *Body and Anatomical Science*. Delhi: Swaran Printing Press.
- Guyton, A.C. (1996). *Textbook of Medical Physiology*, 9th edition. Philadelphia: W.B. Saunders.

## **BPEd/I/A/HC/03: Computer Application & Communicative Skills in Physical Education**

### Learning Outcome

1. Understand concept of information and communication technology in physical education field
2. Analyse sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Offer Hands on Knowledge in information and communication Technology .

### **Unit I: Introduction of Computer**

1. History, application, characteristics, types of computer (Analog, Digital, Hybrid) and generations of Computer.
2. Physical structure of computer.
3. Role of computer in various fields
4. Need of computer in Physical Education.

### **Unit-II Component of Computer System: An Introduction of Hardware and Software**

1. Components of computer system
2. CPU (CU, ALU and Main memory)
3. Input devices (Keyboard, Mouse and Track Ball, Touchpad, Joysticks, Touch Sensitive Screens, Data Scanning Device, Bar Code Readers, Optical Mark Reader (OMR) and Magnetic Ink Character Reader (MICR)
4. Output Devices (Monitor, Printer, LCD)
5. Hardcopy Devices (Printers and Plotter)
6. UPS and types of UPS
7. Operating System Programme Languages translator.
8. Application program/package

### **UNIT III Effective Communication**

#### **A) The Seven C's of the Effective Communication**

#### **B) Communication: Its interpretation**

- i)** Basics **ii).** Nonverbal Communication **iii).** Barriers to Communication

### **UNIT IV Business Communication and Writing**

#### **A) Business Communication at Work Place**

- i)** Letter Components and Layouts **ii).** Planning a letter **iii).** Process of Letter writing **iv).** Email Communication **v).** Memo and Memo Reports **vi).** Employment Communication **vii).** Notice Agenda and Minutes of Meeting **vii).** Brochures

#### **B) Report Writing**

i). Effective Writing ii). Types of Business Reports iii). Structure of Reports iv). Gathering Information v). Organization of the Material vi). Writing Abstracts and Summaries vii) Writing Definitions viii). Visual Aids ix). User Instruction Manual

**Reference**

- Koneru Aruna, Professional Communication McGraw Hill Pub. 1998, New Delhi
- Murphy Herta, Herbert W Hilderbrandt, Jane P Thomas Effective Business Communication, 1997, McGraw Hill
- Petit Lesikkar, Business Communication, 1994, McGraw Hill
- Willey, Communication Skills Handbook, Summers Willey Pub. India
- Rai and Rai, Business Communication, 1999, Himalaya Publishing House, Mumbai.

**BPEd/I/A/SC/01: Development of Sports Movements (Elective)****Subject Outcome:-**

1. Students will understand the concept of Philosophy and philosophy of physical education to acquaint student with the different Philosophies along with their implications in Physical education.
2. Students will understand the concept of Sociology and to acquaint student the implications of Physical education and sports in society.
3. Students will understand the concept of Education and Physical Education
4. Students will get acquainted with historical perspective as influence on physical education, Abroad and in India.
5. Students will get acquainted with different Issues, challenges and opportunities in Physical education & sports

**UNIT - I A) Physical Education in Ancient Civilization with reference to**

- I) India ii) Greece iii) Rome IV) Egypt.
- B) Development of Physical Education & sports during 20 Th Century with special reference to 1) U.S.A. ii) Sweden iii) Germany iv) Olympics v) Asian Games.

**UNIT - II Physical Education in India during 20<sup>th</sup> century**

- a) Physical Training for teacher working in school & college.
- b) Movement of Akhadas & Vyayam Shalas.
- c) Central Advisory Board of Physical Education.
- d) All India council of sports.
- e) SNIPES, NSNIS, LNIPE.
- f) Sports authority of India ( sai)
- g) Nehru yuwak Kendra.
- h) Awards National & state level.

**UNIT - III A Study of the development of Physical Education sports & Games in Maharashtra with reference to**

- a) The present Organization set up in state.
- b) Important schemes and activities including indigenous activities.
- c) Role of Voluntary Physical Education & sports Bodies in state...

**UNIT - IV Youth welfare & Youth Services:-**

- a) Concept of youth welfare & Youth work.
- b) Youth organization in India
- c) Programmers under youth development
- d) Youth services such as secreting & guiding N.C.C. N.S.S., Civil defense & scout & Guide movement.

**Reference**

- 1) Manual of Physical Education of India - D.G. Wakharkar
- 2) A World History of Physical Education - Van Ten Micher
- 3) History of Physical Education C.W. Hyensmith
- 4) A Brief History of Physical Education - Emmel A Rice & John L Hutchinson
- 5) Physical Education in ancient India - Dr. S.H. Deshpande.

**BPEd/I/A/SC/02: First Aid & Safety Education (Elective)****Subject Outcome:-**

1. Students will understand classification of sports injuries and its first aid and immediate management.
2. Students will know the basics of therapeutic modalities and its physiological effects.
3. Students will know the process of rehabilitation
4. Students will understand good and bad posture, postural deformities, its causes and management.
5. Students will understand nutrition and diet plan pre, during and post competition.
6. Students will know the general first aid.

**UNIT - I**

- a) Meaning and definition of first aids and its importance in sports
- b) Types of first aids and its objectives
- c) First aids box and its management
- d) Role and qualification of first aider

**Unit-II**

- a) Common sports injuries in different parts of body
- b) First aids for sports injuries
- c) Common causes of sports injuries and its prevention
- d) RICE & Bandage

**UNIT - III**

- a) Definition of safety education and its significant
- b) Aims and objectives of safety education
- c) Identify causes of accidents & List types and sources of accidents
- d) Safety measures at
  - Home
  - Road
  - School
  - Community

**UNIT - IV**

- a) Describe and demonstrate the management of the following:-
  - Stings and Snake bites
  - Fracture
  - Nose bleeding
  - Electric shocks and other shocks
- b) Fevers:-
  - Definition of fever
  - signs of fever
  - first Aid for fever
  - Management of fever.
- c) Fainting- Definition and causes of fainting, first aid for fainting
- d) Drowning/Near-drowning:- Definition of drowning, definition of near-drowning
- e) first aid for drowning/near drowning.

**Reference :**

- Guyton, A.C. (1996). Textbook of Medical Physiology, 9th edition. Philadelphia: W.B. Saunders.
- Hunter, M. dictionary for physical educators. In H. M. Borrow & R. McGee, (Eds.), A Practical approach to measurement in Physical Education (pp. 573-74). Philadelphia: Lea & Febiger.

# B.P.Ed

# Semester II



**BPEd/II/A/HC/01: Educational & Sports Psychology****Subject Outcome:-**

1. Students will know about psychology and sports Psychology.
2. Students will understand Human behavior and learning patterns of individuals.
3. Students will know learning process and different theories based on learning
4. Students will acquire theoretical perspectives and develop understanding of stages of human development with special reference to Motor Development for Skill Learning in Sport and PE.
5. Students will be aware about different attributes affecting learning and development process.
6. Students will understand range of cognitive capacities in learners.
7. Students will understand the Cognitive and higher mental processes involved in learning in sports and Physical Education.
8. Students will understand the differences of personality among various types of sports and its importance for character building.

**UNIT-I : Introduction of Sports Psychology**

- 1.1 Meaning, Scope of Sports Psychology
- 1.2 Importance of Sports Psychology for Physical Education teacher and Coach
- 1.3 Human behavior, Urge and instincts.

**UNIT-II: Cognitions Process and higher mental Processes in Physical Activities**

- 2.1 Learning: Definitions, Meaning and Types (Primary, Associate & Concomitant)
- 2.2 Laws of Learning and Transfer of Training
- 2.3 Meaning of Sensation & Perception, Thinking and Attention. 2.4 Fatigue.

**UNIT-III : Growth and Development and Personality**

- 3.1 Meaning and Concept of Motor Development
- 3.2 Motor Development during Childhood, Adolescence
- 3.3 Concept of personality and Personality traits of sportsmen.
- 3.4 Adjustment and maladjustment and causes of maladjustment.

**UNIT-IV : Individual Differences**

- 4.1 Meaning of Individual differences.
- 4.2 Heredity and Personality and their role in individual differences.
- 4.3 Interaction of Heredity and Environment.
- 4.4 Various Status of an Individual
- 4.5 Other Causes of individual differences.

**Reference**

1. Kamlesh, M.L. (2006). Educational Sport Psychology. New Delhi: Friend's publication
2. Cox Richard. (1998) Sports Psychology (W.C.B.)
3. Gill, Diance L. Psychological Dynamics of Sports (Illinois: Human Kinetics Publishers,1986)
4. Silva, J.M. and Weinberg. (1984). Physiological Foundation of Sports. IL: Kinetics Publishers,
5. Suinn, Richard M. (1982) Psychology in Sports: Methods and Applications. New Delhi: Sujeet Publication.
6. Martens, Rainer. (1987). Coaches Guide to Sports Psychology. IL: Human Kinetics;
7. Roberts Glyn C. and et al. (1986). Learning Experiences in Sports Psychology. IL: Human Kinetics. 8. Alegaonkar, P.M. (1997). Sports Psychology Pune: Pune Vidyarthi Griha.

## **BPEd/II/A/HC/02: Methodology of Teaching in Education & Physical Education**

### **Subject Outcome:-**

1. To understand the place of Physical Education in school curriculum.
2. To acquaint the learner with different methods of teaching physical activities.
3. To acquaint the students with planning, objectives of different types of lessons.
4. To acquaint the learner with organizing and conducting various types of tournaments and athletic meet.
5. To acquaint the learner with the constructions and marking of track and field events

### **Unit -I Introduction**

- I) Aims and Objectives of Physical Education.
- ii) Place of Physical Education in Curriculum.
- iii) Principles of Learning Process.
- iv) Principles of Teaching Process.

### **Unit -II Methods and importance of Teaching**

Orientation, Demonstration, Imitation, Command, Exploration, Set Drill, Progressive Part, Observation, Verbal Explanation, Whole- Part- Whole, Formal informal.

### **Unit III Procedure of Teaching Presentation Technique -**

- I) Personal Preparation
- ii) Technical Preparation.
- iii) Steps and characteristics of Presentation.
- iv) Principle of classes Management.
- v) Factors affecting class management.

### **Unit IV - Lesson Planning -**

- i) Micro Teaching - importance and skills.
- ii) Types of lesson - General & Specific
- iii) Planning and importance of lesson.
- iv) Teaching Aids- Importance Types and uses.

### **References**

- Capel, S. et al Editors (2006). A Practical Guide to Teaching Physical Education. Routledge Publishers, USA.

- Graham, G.M. (2009). Children Moving : A Reflective Approach to Teaching Physical Education. 8th Ed. McGraw Hill, USA
- Gupta R. (2010). SharirikShiksha Mein ShikhshanPradhyogiki. Friends Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (1999).Lesson Plan in Physical Education &Sports.R.D.P. Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (2004).SharirikShiksha Mein Path Yojna.SahyogPrakashan. New Delhi
- Kamlesh ML (2005). Methods in Physical Education.Friends. Delhi.

**BPEd/II/ A/HC/03: Sports Training****Subject Outcome:-**

1. To understand the basic concept and principles of officiating and coaching of different games and sports.
2. To enable the students to understand the rules, regulations and officiating of different games and sports.
3. To acquaint the students with the duties and responsibilities of an officials and coaches.
4. To acquaint the students with dimensions and actual markings of different play fields, courts and arenas.
5. To understand the concept, principles and forms of sports training

**UNIT – I Sports Training & Training Load**

- 1.1 Sports Training, Definition, Meaning, Aim & Tasks.
- 1.2 Coaching, Meaning, Aim and Objectives.
- 1.3 Principles of Sports Training.
- 1.4 Load, Intensity, Density, Duration and Frequency.
- 1.5 Over Load, Fatigue causes, symptoms and remedial measures.

**UNIT – II Development of Motor Components:**

- 2.1 Strength: Definition, Importance & Classification, Methods of Development.
- 2.2 Endurance: Definition, Importance & Classification, Methods of Development.
- 2.3 Speed: Definition, Importance & Classification, and Methods of Development.
- 2.4 Flexibility: Definition, Importance & Classification, Methods of Development.
- 2.5 Coordinative Abilities: Definition, Importance & Classification, Methods of Development.

**UNIT – III Technical & Tactical Preparation:**

- 3.1 Technique: Meaning & Definition and Importance, Stage of technical Development, correction of faults.
- 3.2 Methods of Technique Training.
- 3.3 Strategy & Tactics: Meaning, Importance.
- 3.4 Methods of Tactical Training.
- 3.5 Principles of Attack & Defence.

**UNIT – IV Planning and Periodisation:**

- 4.1 Meaning and Importance.

4.2 Types of Plan: Short term, Medium term and long-term training Programme.

4.3 Periodisation: Meaning & Importance.

4.4 Types of Periodisation.

**References:**

1. Bunn, Johan D: The Art of Officiating Sports.
2. Lawther, J.D.: Psychology of Coaching.
3. Bunn, J, N.: Scientific Principles of Coaching.
4. Kamlesh, M.I. : Methods in Physical Education.
5. Singh, H.: Scientific Principles of Sports Training.

## **BPEd/II/A/SC/01 : Fitness, Wellness and Sports Nutrition (Elective Subject)**

### **Subject Outcome:-**

1. Students will understand the concept of physical activity, exercise, fitness, and wellness and will be able to recognize the long term benefits of maintaining a high level of wellness for living in today's world.
2. Students will know the dimensions of wellness and strategies to improve them
3. Students will know the physiological benefits of exercise, physical activity, physical fitness and wellness
4. Students will understand the concept of overweight, obesity & their management.

### **Unit I Physical Fitness**

- a. Definition, meaning and concept of Physical fitness, Physical Activity and Exercise
- a. Components of HRPF, SRPF and Physical fitness
- b. Definition and concept of wellness and holistic health
- c. Factors affecting Physical Fitness and wellness

### **Unit II Doping and Nutrition**

- a. Prevention and first-aid for common sports injuries
- b. Nutrition-components, balance diet and diet for athlete
- c. Meaning and definition of doping, ergogenic aids

### **Unit III Development of Fitness**

- a. Benefits of physical fitness and exercise and principles of physical fitness
- b. Calculation of fitness index level 1-4
- c. Waist-hip ratio larger heart rate, BMI and types and principles of exercise (FITT)
- d. Methods of training – Continues, Interval, Circuit, Fartlek and Plyometric

### **Unit IV Wellness and Weight Management**

- a. Concept, meaning and Components of wellness
- b. Manipulation of energy balance to Induce weight loss and weight gain
- c. Methods of Weight Management
- d. Concept, types and causes of obesity and its management

### **REFERENCES :**

- 1 Alexandria, V. (1989). *Fitness for Life*. Virginia : Time Life book.

- 2 Anne, R. (1995). **Health & Social Care**. UK : Thomas Nelson & Sons Ltd.
- 3 Bates M. (2008). **Health Fitness Management** (2<sup>nd</sup> Ed.) USA : Human Kinetics.
- 4 Bean, Anita. (1999). **Food For Fitness**. London : A & C Black
- 5 Beashel P., & Taylor, J. (1996). **Advanced Studies in Physical Education and Sports**. UK : Thomas Nelson & Son Ltd.
- 6 Bouchard, C. M. & Robert, P.L. (1997). **Genetics of Fitness and Physical Performance**. USA : Human Kinetics.



## **BPed/II/A/SC/02 : Adapted Physical Education**

### **Subject Outcome:-**

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

### **Unit 1: Introduction to Adapted Physical Education**

- 1.1 Meaning, Need and Importance of Adapted Physical Education and Sports
- 1.2 Purpose, Aims and Objectives of Adapted Physical Education and Sports
- 1.3 Program organization of Adapted Physical Education and Sports
- 1.4 Adapted Sports- Para Olympics

### **Unit 2: Development of Individual Education Program (IEP)**

- 2.1 The student with a disability
- 2.2 Components and Development of IEP.
- 2.3 Principles of Adapted Physical Education and Sports
- 2.4 Role of Physical Education teacher
- 2.5 Teaching style, method and approach in teaching Adapted Physical Education

### **Unit 3: Developmental Considerations of an Individual**

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

### **Unit 4: Individual with unique need and activities**

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need
- 4.5 Role of games and sports in Adapted Physical Education

### **Reference**

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. Adapted Physical Education in the Mainstream. (4th Edition) Love Publishing Company.

3. Houner, L.D. Integrated Physical Education- A guide for the elementary classroom teacher.
4. Winnick, J. P. (2005). Adapted Physical Education and Sports. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. Dynamics Physical Education for Elementary School Children. (11th Edition). Allyn and Bacon Publishing.

# **B.P.Ed**

## **Semester III**

**BPEd/III/A/HC/01: Measurement & Evaluation in Physical Education****Subject Outcome:-**

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests.

**Unit- I Introduction to Test & Measurement & Evaluation**

Meaning of Test & Measurement & Evaluation in Physical Education

Need & Importance of Test & Measurement & Evaluation in Physical Education

Principles of Evaluation

**Unit- II Criteria; Classification and Administration of test**

Criteria of tests, scientific authenticity (reliability, objectivity, validity)

Type and classification of Test, Administration of test

**Unit- III Physical Fitness Tests**

AAHPER youth fitness test

National physical Fitness Test

Indiana Motor Fitness Test

JCR test

U.S Army Physical Fitness Test

**Unit- IV Sports Skill Tests**

Badminton Skill test

Basketball Skill test

Soccer Skill test

Volleyball Skill test

Hockey Skill test

**REFERENCES:**

1. Andrew and Jackson : Instructors manual, measurement, evaluation in Physical Education, Allanta Dullas, Geneva, 1981.
2. Banmgartner and Jackson : Measurement for Evaluation in Physical Education, Instructor's Manual, Houghton Mifflin Col. Boston, 1975.

3. Barrow and Rosemary Mc. Gee : Practical Approach to Measurement in Physical Education, Lea and Febiger, Philadelphia,1979.
4. Bosco J.S. and F.G. William : Measurement and Evaluation Fitness and Sports, Prentice Hall, New Jersey, Inc. 1983.
5. Clarke, Harison and Clark H. David : Application of Measurements in Physical Education, Prentice Hall, Englewood Cliff, New Jersey, 1987.
6. Eckert H.M. : Practical Measurement of Physical Performance, Lea and Febiger, Philadephic,1974.
7. Garretl, H. E. and Woodward : Statistics in Psychology and Education, Greenwood Press, Westport,1966.

## **BPEd/III/A/HC/02 : Kinesiology & Biomechanics**

### **Subject Outcome:-**

1. To understand the nature and scope of Biomechanics in Physical Education & Sports.
2. To understand the importance of movement analysis, kinesiological analysis and biomechanical Analysis.
3. To understand the knowledge regarding antagonistic and agonistic muscles in the movements.
4. To gain knowledge of the application of mechanical principles to fundamental skills and sports techniques.
5. To understand basic mathematical problems related to motion, force and levers.

### **Unit – I Introduction to Kinesiology and Sports Biomechanics**

Meaning and Definition of Kinesiology and Sports Biomechanics  
 Importance of Kinesiology and Sports Biomechanics to Physical Education Teacher, Athletes and Sports Coaches.  
 Terminology of Fundamental Movements  
 Fundamental concepts of following terms – Axes and Planes, Centre of Gravity, Equilibrium, Line of Gravity

### **Unit – II Fundamental Concept of Anatomy and Physiology**

Classification of Joints and Muscles  
 Types of Muscle Contractions  
 Posture – Meaning, Types and Importance of good posture.  
 Fundamental concepts of following terms- Angle of Pull, All or None Law, Reciprocal

### **Unit – III Mechanical Concepts**

Force - Meaning, definition, types and its application to sports activities  
 Lever - Meaning, definition, types and its application to human body.  
 Newton's Laws of Motion – Meaning, definition & its application to sports activities.  
 Projectile – Factors influencing projectile trajectory.

### **Unit – IV Kinematics and Kinetics of Human Movement**

Linear Kinematics – Distance and Displacement, speed and velocity, Acceleration  
 Angular kinematics – Angular Distance and Displacement, Angular Speed and velocity, Angular Acceleration.  
 Linear Kinetics – Inertia, Mass, Momentum, Friction.  
 Angular Kinetics – Moment of inertia, Couple, Stability.

### **Reference:**

- Bunn, J. W. (1972). *Scientific principles of coaching*. Englewood Cliffs, N.J.: Prentice Hall Inc.
- Hay, J. G. & Reid, J. G. (1982). *The anatomical and mechanical basis of human motion*. Englewood Cliffs, N.J.: prentice Hall Inc.
- Hay, J. G. & Reid, J. G. (1988). *Anatomy, mechanics and human motion*. Englewood Cliffs, N.J.: prentice Hall Inc.
- Hay, J. G. (1970). *The biomechanics of sports techniques*. Englewood Cliffs, N.J.: Prentice Hall, Inc.
- Simonian, C. (1911). *Fundamentals of sport biomechanics*. Englewood Cliffs, N.J.: Prentice Hall Inc.
- Deshpande, S.H. (1995) *Manav Kriya Vigyan (Hindi)*, H.V.P. Mandal, Amravati.

### **BPEd/III/A/HC/03 : Yoga and Health Education**

#### **Subject Outcome:-**

1. To understand the concept and nature of yoga along with its historical background.
2. To gain knowledge regarding the application of yoga to Physical Education and Sports.
3. To understand the anatomy and Physiology of Asanas and Pranayamas.
4. To acquire the skills needed to understand and to overcome environmental problems.
5. To gain knowledge regarding the effect of yogic practices on health aspects.

#### **Unit – I Introduction of Yoga**

Meaning and Definition of Yoga

Aims and Objectives of Yoga

Yoga in Early Upanisads

The Yoga Sutra: General Consideration

Need and Importance of Yoga in Physical Education and Sports

#### **Unit - II: Foundation of Yoga**

Yoga in the Bhagavadgita - Karma Yoga, Raj Yoga, Jnana Yoga and Bhakti Yoga

The Astanga Yoga: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi

Effect of Asanas and Pranayama on various systems of the body

#### **Unit – III Health Education**

Concept, Dimensions, Spectrum and Determinants of Health

Definition of Health, Health Education, Health Instruction, Health Supervision

Aim, objective and Principles of Health Education

Health Service and guidance instruction in personal hygiene

#### **Unit – IV Health Problems in India**

Communicable and Non Communicable Diseases

Obesity, Malnutrition, Adulteration in food, Environmental sanitation,

Explosive Population,

Personal and Environmental Hygiene for schools

Objective of school health service, Role of health education in schools

Health Services – Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

#### **References:**

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- Gharote, M. L. & Ganguly, H. (1988). *Teaching methods for yogic practices*. Lonawala: Kaivalyadham.
  - Shankar, G.(1998). *Holistic approach of yoga*. New Delhi: Aditya Publishers.
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**BPEd/III/A/SC/01: Sports Entrepreneur, Marketing & Sports Management  
(Elective)**

**Subject Outcome:-**

1. Identify the skills and knowledge base needed to foster entrepreneurial activity for individuals based on the experiences of successful sports entrepreneurs as well as assess and discuss the challenges they have faced.
2. Critically discuss ways in which entrepreneurial-minded individuals can thrive in large sports organizations despite the tendency of such organizations to resist innovation and to favor the status quo or only seek marginal gains.
3. Demonstrate an understanding of, and identify, new opportunities and translate them into viable business solutions or opportunities

**Unit I: Introduction to Sports Entrepreneurship**

Concept of entrepreneurship, innovation and knowledge management in sports.  
Business Planning Process - The business plan as an entrepreneurial tool  
Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

**Unit II : Introduction to Sports Marketing**

The Four Domains of Sports Marketing, Marketing Through Sports ,  
Marketing concepts – traditional and modern; Selling vs. marketing; Marketing mix; Marketing environment.

Sponsorship: Introduction , Sponsorship: Developing and Selling the Proposal

**Unit II. Management of Physical Education and sports**

Meaning, Need and scope of management of Physical Education

Principles of Sports Management

Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

**Unit IV: Organization of co-curricular activities and Physical Education programmes.**

Physical Education Budget : Need, Importance, procedure and principles of budget making,

Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness – demonstration, play days, sports rallies, sports exhibitions

Organization of National days (15<sup>th</sup> August & 26<sup>th</sup> January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics

Ceremonies of competition – Opening, closing and victory

**References:**

- Sports Marketing By Melissa Jane Johnson Morgan Jane
- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.
- Broyles, F. J. & Robert, H. D. (1979). *Administration of sports, Athletic programme: A Managerial Approach*. New York: Prentice hall Inc.
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- Bucher, C. A. (1983). *Administration of Physical Education and Athletic programme*. St. Louis: The C.V. Mosby Co.
- Earl, F. Z, & Gary, W. B. (1963). *Management competency development in sports and physical education*. Philadelphia: W. Lea and Febiger.
- Kozman, H.C. Cassidy, R. & Jackson, C. (1960). *Methods in Physical Education*. London: W.B. Saunders Co.
- Pandey, L.K. (1977). *Methods in Physical Education*. Delhi: Metropolitan Book Depot

## **BPEd/III/A/SC/02: Professional Preparation in Physical Education (Elective)**

### **Subject Outcome:-**

1. Students will develop understanding of the profession of Physical Education.
2. Students will be able to deal with issues experienced by Physical Education teachers.
3. Students will recognize that learning to teach is a lifelong process.
4. Students will develop a comprehensive view of Physical Education from a global perspective.
5. Students will understand the domains & hidden dimensions of Physical Education.
6. Students will Demonstrate basic knowledge & awareness about inclusion, differently-abled students & describe steps to inclusion.

### **UNIT I: Foundation of Professional Preparation**

- 1.1 Meaning of Professional
- 1.2 Components of Professional Preparation.
- 1.3 Contribution of physical education in attaining ideals of Indian democracy.
- 1.4 Forces and factors affecting educational policies and Programme.

### **UNIT-II Historical Perspective**

- 2.1 Historical review of Professional Preparation in India.
- 2.2 Professional courses being offered in professional preparation colleges in India.
- 2.3 Professional Preparation in Physical Education in USA, USSR and UK.
- 2.4 Beginning of Professional Preparation in the world.

### **UNIT-III Under-Graduate preparation of professional personnel.**

- 3.1 Purposes, Admission Requirements of Undergraduate preparation.
- 3.2 Theory, Teaching practice and practical.
- 3.3 Professional competencies to be developed.
- 3.4. Post-Graduate Preparation.
- 3.5 Purposes & Admission requirements.
- 3.6 Methods of instruction.
- 3.7 Professional relations.

### **UNIT-IV Teacher and Teaching**

- 4.1 Teaching as a career.
- 4.2 Basic Qualities of a successful teacher.
- 4.3 Preparation of the specialized physical education teacher.
- 4.4 Types of teaching jobs.
- 4.5 Types of non-teaching jobs.

### **Reference**

- 1) A Professional Career in Physical Education. (Englewood Cliffs, N.J. Prentice Hall, Inc. 1963.)

- 2) Jensen, R. Clayne, Administrative Management of Physical Education and Athletic Programmes. (Philadelphia Lea and Febiger, 1983.)
- 3) Snyder and Scott. Professional Preparation in Health, Physical Education and Recreation. (Connecticut, Greenwood press, Westport, 1971).
- 4) Bucher, C.A Foundations of Physical Education (Saint Louis) : The C.V. Mosby Company, 1975), Ed. 7.
- 5) Aahper publication: Professional Preparation in Dance, Physical Education Recreation Education Safety Education and School health Education, Washington, Aahper pub.1974
- 6) Borozne Joseph & Pechar Stanley: Administration & Supervision for Safety in sports, Washington,Aaphper pub. 1977.
- 7) Aahper pub: Profession preparation in Safety Education and School health Education, Washington Aahper Pub.1974.

# **B.P.Ed**

# **Semester IV**

## **BPEd/IV/ A/HCS/01: Sports Medicine, Physiotherapy and Rehabilitation**

### **Subject Outcome:-**

1. Students will understand classification of sports injuries and its first aid and immediate management.
2. Students will know the basics of therapeutic modalities and its physiological effects.
3. Students will know the process of rehabilitation
4. Students will understand good and bad posture, postural deformities, its causes and management.
5. Students will understand nutrition and diet plan pre, during and post competition.

### **Unit – I Sports Medicine**

- Meaning and concept of sports medicine
- Aim and objective of sports medicine
- Role of Sports trainers and physician in team

### **Unit-II Common Sports injuries**

- Types of sports injuries and their causes
- Common regional injuries and their management – shoulder, elbow, wrist, knee and ankle
- Low back problem cause, symptom and its management in sports
- First aid – meaning and its concepts
- Athletic bandage and massage – Its classification, indications & contra-indications, general principles of massage

### **Unit – III Athletic Care and Rehabilitation**

- Meaning of Physiotherapy and Rehabilitation
- Diagnosis of injuries – signs and symptoms of injuries
- Different forms of Hydrotherapy and Thermotherapy – hot and cold packs, whirlpool, contrast bath, infrared, short wave diathermy and ultrasound

### **Unit – IV Drugs and Doping**

- Meaning of drugs and doping
- Wada and Nada
- Types of doping and its advantage and disadvantage
- Types of dope test

### **References:**

- D. (1979). A Christine, M. D., (1999). *Physiology of Sports and Exercise*. USA: Human Kinetics.

- Conley, M. (2000). *Bioenergetics of Exercise Training*. In T.R. Baechle, & R.W. Earle, (Eds.), *Essentials of Strength Training and Conditioning* (pp. 73-90). Champaign, IL: Human Kinetics.
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- Gupta, A. P. (2010). *Anatomy and Physiology*. Agra: Sumit Prakashan.
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- Guyton, A.C. (1996). *Textbook of Medical Physiology*, 9th edition. Philadelphia: W.B. Saunders.
- Hunter, M. *dictionary for physical educators*. In H. M. Borrow & R. McGee, (Eds.), *A Practical approach to measurement in Physical Education* (pp. 573-74). Philadelphia: Lea &Febiger.
- Karpovich, P. V. (n.d.). *Physiology of Muscular Activity*. London: W.B. Saunders Co.

## **BPEd/IV/A/HC/02: Research and Statistics in Physical Education**

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.

### **Unit-I Introduction to Research**

Definition of Research

Need and importance of Research in Physical Education and Sports.

Scope of Research in Physical Education & Sports.

Classification of Research

Research Problem, Meaning of the term, Location and criteria of Selection of Problem, Formulation of a Research Problem, Limitations and Delimitations.

### **Unit-II Survey of Related Literature**

Need for surveying related literature.

Literature Sources, Library Reading

Research Proposal, Meaning and Significance of Research Proposal.

#### **Preparation of Research proposal / project.**

Research Report: A group project is to be undertaken by a small batch of students under the supervision of a teacher, wherein it is expected to survey school facilities of physical education, health assessment, programme evaluation, fitness status of the students, staff and other stakeholders etc. and submit the report to the institution.

### **Unit-III Basics of Statistical Analysis**

Statistics: Meaning, Definition, Nature and Importance

Class Intervals: Raw Score, Continuous and Discrete Series, Class Distribution, Construction of Tables, Graphical Presentation of Class Distribution: Histogram, Frequency Polygon, Frequency Curve. Cumulative Frequency Polygon, Ogive, Pie Diagram

### **Unit- IV Statistical Models in Physical Education and Sports**

Measures of Central Tendency: Mean, Median and Mode-Meaning, Definition, Importance, Advantages, Disadvantages and Calculation from Group and Ungrouped data

Measures of Variability: Meaning, importance, computing from group and ungroup data

Percentiles and Quartiles: Meaning, importance, computing from group and ungroup data

### **References:**

- Best, J.W. (1963). *Research in education*. U.S.A.: Prentice Hall.
- Bompa, T. O. & Haff, G. G. (2009). *Periodization: theory and methodology of training, 5<sup>th</sup> ed.* Champaign, IL: Human Kinetics.



- Brown, L. E., & Ferrigno, V. A. (2005). *Training for speed, agility and quickness*, 2<sup>nd</sup> ed. Champaign, IL: Human Kinetics.
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- Verma, J. P. (2000). *A text book on sports statistics*. Gwalior: Venus Publications.

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**  
(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India )

**COLLEGE OF PHYSICAL EDUCATION**  
Dhankawadi, Pune-411 043 (Maharashtra),  
Tel.020-24373741

**REACCREDITED 'A' GRADE BY NAAC**



**Master of Physical Education**  
(M.P.Ed)-2Years

**(4 Semester Programme)**

**Curriculum Framework & Syllabus**

**CURRICULUM FRAMEWORK**

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR M.P.  
ED. TWO YEARS PROGRAMME (FOUR SEMESTERS)  
CHOICE BASED CREDIT SYSTEM (CBCS)**

**Preamble:** The Master of Physical Education (M.P.Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.

The M.P.Ed. programme is designed to integrate the study of childhood, social context of Physical Education, subject knowledge, pedagogical knowledge, aim of Physical Education and communication skills. The programme comprise of compulsory and optional theory, Specialization and Teaching Practice

### **Programme Outcome**

1. The Master of Physical Education (M.P. Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.
2. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
3. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
4. To prepares Experts who can work with various Sports Federations/Organisations/Leagues/Media Houses.

**Intake, Eligibility and Admission Procedure:** The Intake, Eligibility and Admission Procedure are as per the NCTE norms and standards.

**Eligibility**

(a) Bachelor of physical education (B.P.Ed.) or equivalent with at least **50% marks.**

**Or**

(b) A candidate, who has passed any one of B.Ed (Phy.Edu), B.P.E. (4 yrs) or any other equivalent degree.

**Number of seats:** As approved by NCTE for M.P.Ed. Course.

**Note:-**

\*Married girl is eligible for admission to M.P.Ed. programme. But, it is also compulsory for her to sign an undertaking that she will discontinue the programme at once for at least one academic year, if she gets pregnant during the course of study. She can join back afresh from the beginning of the semester keeping the guidelines pertaining to the maximum duration of the course in mind.

\*No differently-abled candidate is eligible for the admission in M.P.Ed. programme.

**Admission procedure:** Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

<b>a- Written test</b>	<b>50 marks</b>
<b>b- Sports proficiency test</b>	<b>30 marks</b>
<b>c- Interview</b>	<b>10 marks</b>
<b>d- Sports achievement</b>	<b>10 marks</b>

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at College of Physical Education, Bharati Vidyapeeth University.

- (A) **Theory Paper** comprising of 50 multiple-choice questions of one and half hours duration carrying 50 marks. Questions shall be based on B.P.Ed. course.
- (B) There shall be **Physical Fitness** of 30 marks will be conducted by Internal Examiners of College of physical education.
- (C) **Interview** comprising of 10 marks will be conducted by Internal Examiners of College of Physical Education

**(D) Weightage :-** Candidate shall be given maximum 10 marks weightage on the basis of their sports participation in any one of the following level:

<b>Participation</b>	<b>Marks</b>
➤ <b>International:</b>	<b>10</b>
➤ <b>Senior National championship/ National Games:</b>	
1st Place :	<b>10</b>
2nd Place :	<b>08</b>
3rd Place :	<b>07</b>
Participation:	<b>05</b>
➤ <b>All India Inter-Zonal Inter University Competitions:</b>	
1st Place :	<b>08</b>
2nd Place :	<b>07</b>
3rd Place :	<b>06</b>
Participation:	<b>05</b>
➤ <b>Zonal Inter University Competitions/Junior National Competitions:</b>	
1st Place :	<b>07</b>
2nd Place :	<b>06</b>
3rd Place :	<b>05</b>
Participation:	<b>04</b>
➤ <b>Senior State Championship/Rural national games/Women festival:</b>	
1st Place :	<b>05</b>
2nd Place :	<b>04</b>
3rd Place :	<b>03</b>
Participation:	<b>02</b>

**Note:-**

\*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (AIU) and/or School Games Federation of India (SGFI).

\*The obtained position must be during last five academic sessions.

\*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; candidate shall not get any marks for sports weightage.

**Medical examination:** Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern College

**Course fee:** It has been decided by the B.O.S. that the convener of the B.O.S. is authorized to submit the proposal of the M.P.Ed Fees Structure to the University Authorities with consultation with the Internal members of B.O.S.

**Duration:** The M.P.Ed programme shall be of duration of two academic years, that is, four semesters. However, the students shall be permitted to complete the programme requirements within a maximum of 4 years from the date of admission to the programme.

The student, who discontinues the programme after one year or more semesters due to extraordinary circumstances, are allowed to continue and complete the programme with due approval from the Principal.

**The CBCS System:** M.P.Ed Programmes shall run on Choice Based Credit System (CBCS). It is an instructional package developed to suit the needs of students, to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

**Course:** The term course usually referred to, as 'papers' is a component of a M.P.Ed programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise Lectures/ tutorials/laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of the

**Courses of Programme:** The M.P.Ed. Programme consists of a number of courses, the term 'Course' applied to indicate a logical part of subject matter of the programme and is invariably equivalent to the subject matter of a "paper" in the conventional sense. The following are the various categories of courses suggested for the M.P.Ed. Programme.

**a) Theory:**

Core Course

Elective Course

**b) Practicum:**

**c) Specialization**

**d) Teaching Practices:**

### **Programme Outcome**

1. The Master of Physical Education (M.P. Ed.) two years (Four Semesters, Choice Based Credit System) programme is a professional programme meant for preparing Physical Education Teachers for senior secondary (Class XI and XII) level as well as Assistant

Professor/Directors/Sports Officers in Colleges/Universities and teacher educators in College of Physical Education.

2. To prepare the leaders who can work in Health and Fitness Industry as Fitness and Wellness experts.
3. To prepare Sports Experts in various capacities like Trainers, Physiotherapists, Rehabilitation Experts, Sports Counsellors, Game Officials, Scorers, Referees etc.
4. To prepares Experts who can work with various Sports Federations/Organizations/Leagues/Media Houses

**Semesters:** An academic year is divided into two semesters. Each semester will consist of 17-20 weeks of academic work equivalent to 100 actual teaching days. The odd semester may be scheduled from July to November/December and even semester from November / December to April/May.

**Credits:** The term 'Credit' refers to a unit by which the programme is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or one and half hours of practical work/field work per week. The term 'Credit' refers to the weight given to a course, usually in relation to the instructional hours assigned to it. The total minimum credits, required for completing a M.P.Ed. Programme is 90 credits and for each semester 20 credits. Total Number of hours required to earn 1 credit is 20-25 hrs in theory and 30 hrs in Practical.

**Condonation:** Student must have 75% of attendance in each course for appearing the examination. Students who have 74% to 65% of attendance shall apply for condonation in the prescribed form along with the Medical Certificate or proof of participation in intercollege or inter university competitions. Students who have 64% to 50% of attendance shall apply for condonation in prescribed form along with the Medical Certificate. Students who have below 50% of attendance are not eligible to appear for the examination.

### Provision of Bonus Credits Maximum 06 Credits in each Semester

S. No.	Special Credits for Extra Co-curricular Activities	Credit
1.	Sports Achievement at State level Competition (Medal Winner)	1
	Sports Achievement National level Competition (Medal Winner)	2
	Sports participation International level Competition	4
2.	Inter Uni. Participation (Any one game)	2
3.	Inter College Participation (min. two game)	1
4.	National Cadet Corps / National Service Scheme	2
5.	Blood donation / Cleanliness drive / Community services	2
6.	Mountaineering - Basic Camp, Advance Camp / Adventure Activities	2
7.	Organization / Officiating - State / National level in any two game	2
8.	News Reposting / Article Writing / book writing / progress report writing	1
9.	Research Project by any funding agencies	4

Students can earn maximum **06 Bonus credits** in each semester by his/her participation in the above mentioned activities duly certified by the Head of the institution / Department. **This Bonus credit will be used only to compensate loss of credits in academic activities.**

#### Examinations:

- i. There shall be examinations at the end of each semester, for first semester in the month of November /December: for second semester in the month of April/May. A candidate who does not pass the examination in any course(s) shall be permitted to appear in such failed course(s) in the subsequent examinations to be held in November/December or April/May.
- ii. A candidate should get enrolled /registered for the first semester examination. If enrollment/registration is not possible owing to shortage of attendance beyond condonation limit / rules prescribed OR belated joining OR on medical grounds, such candidates are not permitted to proceed to the next semester. Such candidates shall redo the semester in the subsequent term of that semester as a regular student; however, a student of first semester shall be admitted in the second semester, if he/she has successfully kept the term in first semester.

#### Pattern of Question Papers:



**A) For papers having Max. Marks- 60: [12+12+12+12+(4x3)=60 marks]**

For University examination each question paper shall consist of 9 questions (2 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units). The candidate will attempt any one question from each unit. The 5<sup>th</sup> question will be compulsory consisting 4 short notes of 3 marks each.

**B) For Semester-end Examination in Activity Courses, the breaks-up of 100**

**Marks shall be as follows:**

- Skill proficiency/playing ability : 60
- Diary / Record book : 40

**C) For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:**

- P=(Practical) Skill proficiency : 60
- IA=(Internal Assessment)Written Test : 40

**D) For Lesson Plan, student needs to complete perform lesson at college itself.-**

Lesson Plan : 100 marks

- P=(Practical) Skill proficiency : 60
- IA=(Internal Assessment)Written Test : 40

**Examiners:** There will be one internal and one external examiner based on the Game specialization that is from **Athletics, badminton, basketball, cricket, football, handball, kabaddi, kho-kho, table-tennis, volleyball and yoga.**

**Evaluation:** The performance of a student in each course is evaluated through continuous internal assessment (CIA), one test of 20 marks and of one to two hours duration is to be conducted around 10-14 weeks of academic work from the start of each semester; evaluation is to be done in terms of percentage of marks with a provision for conversion to grade point. If, any student is not able to give the internal test due to Medical reason or participation in inter college or inter university competitions, the concerned course teacher must conduct the student examination within a month time (there is no provision for seeking improvement of internal assessment). The marks obtain in CIA is added with end semester examination and will be consolidated at the end of course. The components for continuous internal assessment are;

<b>Internal Test</b>	20 Marks
<b>Seminar / Lab Practical / presentations</b>	5 Marks
<b>Open Book Test</b>	5 Marks
<b>Attendance</b>	10 Marks
<b>Total</b>	<b>40 Marks</b>

Attendance shall be taken as a component of continuous assessment, although the students should have minimum 75% attendance in each course. In addition to continuous evaluation component, the end semester examination, which will be written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 30:70. The evaluation of practical work, wherever applicable, will also be based on continuous internal assessment and on an end-semester practical examination.

<b>Attendance in Percentage</b>	<b>Marks</b>
Above 95	10
95-90	8
89-85	6
84-80	4
79-75	2
Below 75	0

**Minimum Passing Standard:** The minimum passing standard for CIA (Continuous Internal Assessment) and External Examinations shall be 40%, i.e. 16 marks out of 40 marks and 24 marks out of 60 marks respectively for theory courses. The minimum passing for both CIA & external examination shall be 50%, i.e. 20 marks out of 40 and 30 marks out of 60 marks for the practical courses.

**Grading:** Once the marks of the CIA (Continues Internal Assessment) and SEA (Semester End Assessment) for each of the courses are available, both (CIA and SEA)

will be added. The marks thus obtained for each of the courses will then be graded as per details provided in **Letter Grades and Grade Points table** from the first semester onwards the average performance within any semester from the first semester is indicated by Semester Grade Point Average (**SGPA**). while continuous performance (including the performance of the previous semesters also) starting from the first semester is indicated by Cumulative Grade Point Average (**CGPA**). These two are calculated by the following formula:

(i) **SGPA(S<sub>i</sub>)**  $S_i = \frac{\sum(C_i \times G_i)}{\sum C_i}$

where C<sub>i</sub> is the number of credits of the i<sup>th</sup> course and G<sub>i</sub> is the grade point scored by the student in the i<sup>th</sup> course.

(ii) The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.  $CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$

Where S<sub>i</sub> is the SGPA of the i<sup>th</sup> semester and C<sub>i</sub> is the total number of credits in that semester.

(iii) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcript or certificate or marksheet.

**Classification of Final Results:** For the purpose of declaring a candidate to have qualified for the Degree of Master of Physical Education in the First class / Second class / Pass class or First class with Distinction, the marks and the corresponding CGPA earned by the candidate in Core Courses will be the criterion. It is further provided that the candidate should have scored the First / Second Class separately in both the grand total and end Semester (External) examinations.

**Award of the M.P.Ed. Degree:** A candidate shall be eligible for the award of the degree of the M.P.Ed. Only if he/she has earned the minimum required credit including Bonus Credits of the programme prescribed above.

**A.T.K.T.:** A candidate may be allowed to take admission in succeeding year of the course irrespective of number of papers/ practical events in which he/she fails. It is mandatory that the whole course shall be completed within a period of 4 years from the date of admission. Failing which candidate name will be removed from college.

## (Choice Based Credit System)

### Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0(40% of marks) at UE and also a minimum grade point of 5.0(40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

<b>Range of Marks (Out of 100)</b>	<b>Grade</b>	<b>Grade Point</b>
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks ≤ 80	A+	9
60 ≤ Marks ≤ 70	A	8
55 ≤ Marks ≤ 60	B+	7
50 ≤ Marks ≤ 55	B	6
40 ≤ Marks ≤ 50	C	5
Marks ≤ 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### **Formula to calculate Grade Points (GP)**

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex  $x$ -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/ $x$ )+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/ $x$ )+1

Two kinds of performance indicators, namely, the semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.E.S programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA -10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA +20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA -20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA -110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA -300	If $9.50 \leq \text{CGPA} \leq 10.00$

### Award of Honors:

A student who has completed the minimum credits specified for the M.P.Ed programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

**Note:**

1. SGPA is calculated only if the candidate passes in all the courses i.e. get minimum C grade in all the courses.
2. CGPA is calculated only when the candidate passes in all the courses of all the previous and current semesters.
3. The cumulative grade point average will be calculated as the average of the SGPA of all the semesters continuously, as shown above.
4. For the award of the class, CGPA shall be calculated on the basis of:
  - Marks of each Semester End Assessment and
  - Marks of each Semester Continuous Internal Assessment for each course.
5. The final Class for M.P.Ed. Degree shall be awarded on the basis of last CGPA (grade) from all the one to four semester examinations.

**Grievance Redressal Committee:** The college/department shall form a Grievance Redressal Committee for each course in each college/department with the course teacher / Principal / Director and the HOD of the faculty as the members. This Committee shall solve all grievances of the students.

**Revision of Syllabi:** Syllabi of every course should be revised according to the NCTE.

- Revised Syllabi of each semester should be implemented in a sequential way.
- In courses, where units / topics related to governmental provisions, regulations or laws, that change to accommodate the latest developments, changes or corrections are to be made consequentially as recommended by the Academic Council.
- All formalities for revisions in the syllabi should be completed before the end of the semester for implementation of the revised syllabi in the next academic year.
- During every revision, up to twenty percent of the syllabi of each course should be changed so as to ensure the appearance of the students who have studied the old (unrevised) syllabi without any difficulties in the examinations of revised syllabi.
- In case, the syllabus of any course is carried forward without any revision, it shall also be counted as revised in the revised syllabi.

**Miscellaneous:**

1. The procedural details may be given by the university from time to time.
2. Any unforeseen problems/difficulties may be resolved by Vice Chancellor, whose decision in the matter shall be final.
3. The provision of any order, rules or regulation in force shall be inapplicable to

the extent of its inconsistency with these regulations.

### Semester-I

<b>Part- A Theoretical Course</b>						
<b>Course Code</b>	<b>Title of the papers</b>	<b>Total No of Class</b>	<b>Credits</b>	<b>Internal Assessment</b>	<b>University Exam</b>	<b>Total</b>
<b>Core Course</b>						
SOE/PE/C-501	Research Method in Physical Education	64	4	40	60	100
SOE/PE/C-502	Physiology of Exercise & Sports	64	4	40	60	100
SOE/PE/C-503	Psychology of Sports	64	4	40	60	100
<b>Elective course(Anyone)</b>						
SOE/PE/E-501	Sports technology/	64	4	40	60	100
SOE/PE/E-502	Adapted Physical Education					
<b>Part - B Practical Course</b>						
SOE/PE/P -501	Conditioning	96	4	40	60	100
SOE/PE/P -502	Lab Practical (Sports Psychology, Biomechanics & Kinesiology, Test & Measurement	96	4	40	60	100
<b>Part - C Specialization</b>						
SOE/PE/S -501	Games Specialization	96	4	40	60	100
<b>Part - D Teaching Practices</b>						
SOE/PE/T -501	Game Specialization Teaching Lesson theory Sports	96	4	40	60	100
	<b>Total</b>	40	32	320	480	800



## Semester-II

<b>Part- A Theoretical Course</b>						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
<b>Core Course</b>						
SOE/PE/C -601	Statistics for Research in Physical Education	64	4	40	60	100
SOE/PE/C -602	Kinesiology & Biomechanics	64	4	40	60	100
SOE/PE/C-603	Science of Sports Training & Advanced Coaching	64	4	40	60	100
<b>Elective course (Anyone)</b>						
SOE/PE/E-601	Athletic care and Rehabilitation	64	4	40	60	100
SOE/PE/E -602	Sports Journalism & Mass Media					
<b>Part - B Practical Course</b>						
SOE/PE/P-601	Pilot Study	96	4	40	60	100
SOE/PE/P -602	Measurement & Evaluation	96	4	40	60	100
<b>Part - C Specialization</b>						
SOE/PE/S-601	Games Specialization	96	4	40	60	100
<b>Part - D Teaching Practices</b>						
SOE/PE/T -601	Game Specialization Practical Lesson Plan (5 Lesson)	96	4	40	60	100
	<b>Total</b>		32	320	480	800

### Semester-III

<b>Part- A Theoretical Course</b>						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
<b>Core Course</b>						
SOE/PE/C-701	Professional preparation	64	4	40	60	100
SOE/PE/C -702	Management in PE & Sports	64	4	40	60	100
SOE/PE/C -703	Measurements and Evaluation in Physical Education	64	4	40	60	100
<b>Elective Course (Anyone)</b>						
SOE/PE/E-701	Information and communication technology in physical education	64	4	40	60	100
SOE/PE/E-702	Health Education and Sports Nutrition					
<b>Part - B Practical Course</b>						
SOE/PE/P -701	Conditioning	96	4	40	60	100
SOE/PE/P -703	Lab Practical (Sports Psychology, Biomechanics & Kinesiology, Test and Measurement)	96	4	40	60	100
<b>Part - C Teaching Practices</b>						
SOE/PE/T -701	Teaching Lesson theory	96	4	40	60	100

### Semester-IV

<b>Part- A Theoretical Course</b>						
Course Code	Title of the papers	Total no of Class	Credits	Internal Assessment	University Exam	Total
<b>Core Course</b>						
SOE/PE/C-801	Sports Medicine	64	4	40	60	100
SOE/PE/C-802	Pedagogy of Physical Education	64	4	40	60	100
SOE/PE/C-803	Sports Entrepreneur	64	4	40	60	100
<b>Elective Course (Anyone)</b>						
SOE/PE/E-801	Dissertation	64	4	40	60	100
SOE/PE/E-802	Exercise Prescription & Fitness Management					

**Note:-**

- 1. Games specialization will be given in following Games and sports: Athletics, basketball, cricket, football, handball, hockey, kabaddi, kho-kho, table-tennis, volleyball and yoga. Student will select One Game specialization for I and II semester**
2. Teaching theory lesson plan will consist of 5 lessons from theory subject of Master degree which will be taken on college students itself.

**SCHEME OF EXAMINATION FOR M.P.ED**  
**(4 SEMESTERS)**

**Semester wise Distribution of Marks & Credits**

		Sem-I	Sem-II	Sem-III	Sem-IV	Total
<b>Part-A: Theory Courses</b>	<b>Marks</b>	400	400	400	400	<b>1600</b>
	<b>Credits</b>	16	16	16	16	<b>64</b>
<b>Part-B:        Practical (Games/Sports)</b>	<b>Marks</b>	200	200	200		<b>600</b>
	<b>Credits</b>	8	8	8		<b>24</b>
<b>Part-C: Game/Sport Specialization</b>	<b>Marks</b>	100	100			<b>200</b>
	<b>Credits</b>	4	4			<b>8</b>
<b>Part D -: Teaching Ability</b>	<b>Marks</b>	100	100	100		<b>300</b>
	<b>Credits</b>	4	4	4		<b>12</b>
<b>Grand Total</b>	<b>Marks</b>	<b>800</b>	<b>800</b>	<b>700</b>	<b>400</b>	<b>2700</b>
	<b>Credits</b>	<b>32</b>	<b>32</b>	<b>28</b>	<b>16</b>	<b>108</b>

Semester I

## **SOE/PE/C-501: Research Process In Physical Education**

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.
5. Apply the systematic methods in writing research thesis

### **UNIT I - Introduction**

Meaning and Definition of Research - Need, Nature and Scope of research in Physical Education. Classification of Research, Location of Research Problem, Criteria for selection of a problem, Qualities of a good researcher.

### **UNIT II - Methods of Research**

Descriptive Methods of Research; Survey Study, Case study, Introduction of Historical Research, Steps in Historical Research, Sources of Historical Research: Primary Data and Secondary Data, Historical Criticism: Internal Criticism and External Criticism.

### **UNIT III - Experimental Research**

Experimental Research - Meaning, Nature and Importance, Meaning of Variable, Types of Variables. Experimental Design - Single Group Design, Reverse Group Design, Repeated Measure Design, Static Group Comparison Design, Equated Group Design, Factorial Design.

### **UNIT IV - Sampling**

Meaning and Definition of Sample and Population. Types of Sampling; Probability Methods; Systematic Sampling, Cluster sampling, Stratified Sampling. Area Sampling - Multistage Sampling. Non- Probability Methods; Convenience Sample, Judgement Sampling, Quota Sampling.

### **Research Proposal and Report**

Cauterization of Thesis / Dissertation, Front Materials, Body of Thesis - Back materials. Method of Writing Research proposal, Thesis / Dissertation; Method of writing abstract and full paper for presenting in a conference and to publish in journals ,Mechanics of writing Research Report, Footnote and Bibliography writing.

### **Reference:**

- Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc  
Clarke David. H & Clarke H, Harrison (1984) Research processes in Physical Education, New Jersey; Prentice Hall Inc.  
Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illinois;

Human Kinetics;

Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports

Rothstein, A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc

Subramanian, R, Thirumalai Kumar S & Arumugam C (2010) Research Methods in Health, Physical Education and Sports, New Delhi; Friends Publication

## **SOE/PE/C-502: PHYSIOLOGY OF EXERCISE AND SPORTS**

### Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

### **UNIT I – Skeletal Muscles and Exercise**

Macro & Micro Structure of the Skeletal Muscle, Chemical Composition, Sliding Filament theory of Muscular Contraction. Types of Muscle fiber Muscle Tone, Chemistry of Muscular Contraction – Heat Production in the Muscle, Effect of exercises and training on the muscular system.

### **UNIT II – Cardiovascular System and Exercise**

Heart Valves and Direction of the Blood Flow – Conduction System of the Heart – Blood Supply to the Heart – Cardiac Cycle – Stroke Volume – Cardiac Output – Heart Rate – Factors Affecting Heart Rate – Cardiac Hypertrophy – Effect of exercises and training on the Cardio vascular system.

### **UNIT III – Respiratory System and Exercise**

Mechanics of Breathing – Respiratory Muscles, Minute Ventilation – Ventilation at Rest and During Exercise. Diffusion of Gases – Exchange of Gases in the Lungs –Exchange of Gases in the Tissues – Control of Ventilation – Ventilation and the Anaerobic Threshold. Oxygen Debt – Lung Volumes and Capacities – Effect of exercises and training on the respiratory system.

### **UNIT IV – Metabolism and Energy Transfer**

Metabolism – ATP – PC- Anaerobic Metabolism – Aerobic Metabolism – Aerobic and Anaerobic Systems during Rest and Exercise. Short Duration High Intensity Exercises – High Intensity Exercise Lasting Several Minutes – Long Duration Exercises.

### **Climatic conditions and sports performance and ergogenic aids**

Variation in Temperature and Humidity – Thermoregulation – Sports performance in hot climate, Cool Climate, high altitude. Influence of: Amphetamine, Anabolic steroids, Androstenedione, Beta Blocker, Choline, Creatine, Human growth hormone on sports performance. Narcotic, Stimulants: Amphetamines, Caffeine, Ephedrine, Sympathomimetic amines. Stimulants and sports performance.

### **Reference:**

Amrit Kumar, R, Moses. (1995). Introduction to Exercise Physiology. Madras:



PoompugarPathipagam.

BeotraAlka, (2000) Drug Education Handbook on Drug Abuse in Sports: Sports Authority of India Delhi.

Clarke, D.H. (1975). Exercise Physiology. New Jersey: Prentice Hall Inc., Englewood Cliffs.

David, L Costill. (2004). Physiology of Sports and Exercise.Human Kinetics.

Fox, E.L., and Mathews, D.K. (1981).The Physiological Basis of Physical Education and Athletics. Philadelphia: Sanders College Publishing.

Guyton, A.C. (1976). Textbook of Medical Physiology. Philadelphia: W.B. Sanders co.

Richard, W. Bowers. (1989). Sports Physiology. WMC: Brown Publishers.

## **SOE/PE/C-503: SPORTS PSYCHOLOGY**

### Learning outcomes

1. Explain group mechanisms and group psychology in a sports context
2. Reflect upon motivational psychology as applied to sports activities
3. Formulate relevant constructs of exercise psychology
4. Demonstrate the ability to discuss sociological theories, concepts, and ideas in large and small groups and to express empirically as well as theoretically-based opinions.
5. To apply core sociological theories to specific social problems in order to analyse social problems

### **UNIT I - Introduction**

Meaning, Definition, History, Need and Importance of Sports Psychology. Present Status of Sports Psychology in India. Motor Learning: Basic Considerations in Motor Learning- Motor Perception - Factors Affecting Perception - Perceptual Mechanism. Personality: Meaning, Definition, Structure - Measuring Personality Traits. Effects of Personality on Sports Performance.

### **UNIT II - Motivation**

Meaning & Definition, Types of Motivation: Intrinsic, Extrinsic. Achievement Motivation: Meaning, Measuring of Achievement Motivation. Anxiety: Meaning and Definition, Nature, Causes, Method of Measuring Anxiety. Competitive Anxiety and Sports Performance. Stress: Meaning and Definition, Causes. Stress and Sports Performance. Aggression: Meaning and Definition, Method of Measurement. Aggression and Sports Performance. Self-Concept: Meaning and Definition, Method of Measurement.

### **UNIT III - Goal Setting**

Meaning and Definition, Process of Goal Setting in Physical Education and Sports. Relaxation: Meaning and Definition, types and methods of psychological relaxation. Psychological Tests: Types of Psychological Test: Instrument based tests: Pass-along test - Tachistoscope - Reaction timer - Finger dexterity board - Depth perception box - Kinesthesiometer board. Questionnaire: Sports Achievement Motivation, Sports Competition Anxiety.

### **UNIT IV - Sports Sociology**

Meaning and Definition - Sports and Socialization of Individual Sports as Social Institution. National Integration through Sports. Fans and Spectators: Meaning and definition, Advantages and disadvantages on Sports Performance. Leadership: Meaning, Definition, types. Leadership and Sports Performance.

#### **Group Cohesion**

Group: Definition and Meaning, Group Size, Groups on Composition, Group Cohesion,

Group Interaction, Group Dynamics. Current Problems in Sports and Future Directions - Sports Social Crisis Management - Women in Sports: Sports Women in our Society, Participation pattern among Women, Gender inequalities in Sports.

**References:**

Jain. (2002), Sports Sociology, Heal Sahety Kendre Publishers.

Jay Coakley. (2001) Sports in Society - Issues and Controversies in International Education, Mc-Craw Seventh Edn.

John D Lauther (2000) Psychology of Coaching. New Jersy: Prenticce Hall Inc.

John D. Lauther (1998) Sports Psychology. Englewood, Prentice Hall Inc.

Miroslaw Vauks& Bryant Cratty (1999).Psychology and the Superior Athlete. London: The Macmillan Co.

Richard, J. Crisp. (2000). Essential Social Psychology. Sage Publications.

## **SOE/PE/E-501: SPORTS TECHNOLOGY**

### **Learning Objectives:**

1. To enable students to learn the fundamental of sports technology.
2. To equip the students to learn the technology used in sports.
3. To understand the different types of playfield surfaces, sports equipment's and its advantages.
4. To familiarize the students with the latest technology involved in sports and games.

### **Unit I - Sports Technology**

Meaning, definition, purpose, advantages and applications, General Principles and purpose of instrumentation in sports, Workflow of instrumentation and business aspects, Technological impacts on sports.

### **Unit II - Science of Sports Materials**

Adhesives- Nano glue, nanomoulding technology, Nano turf. Foot wear production, Factors and application in sports, constraints. Foams- Polyurethane, Polystyrene, Styrofoam, closed-cell and open-cell foams, Neoprene, Foam. Smart Materials - Shape Memory Alloy (SMA), Thermo chromic film, High-density modeling foam.

### **Unit III - Surfaces of Playfields**

Modern surfaces for playfields, construction and installation of sports surfaces. Types of materials - synthetic, wood, polyurethane Artificial turf. Modern technology in the construction of indoor and outdoor facilities. Technology in manufacture of modern play equipments. Use of computer and software in Match Analysis and Coaching.

### **Unit IV - Modern equipment**

Playing Equipments: Balls: Types, Materials and Advantages, Bat/Stick/ Racquets: Types, Materials and Advantages. Clothing and shoes: Types, Materials and Advantages. Measuring equipments: Throwing and Jumping Events. Protective equipments: Types, Materials and Advantages. Sports equipment with nano technology, Advantages.

#### **Training Gadgets**

Basketball: Ball Feeder, Mechanism and Advantages. Cricket: Bowling Machine, Mechanism and Advantages, Tennis: Serving Machine, Mechanism and Advantages, Volleyball: Serving Machine Mechanism and Advantages. Lighting Facilities: Method of erecting Flood Light and measuring luminous. Video Coverage: Types, Size, Capacity, Place and Position of Camera in Live coverage of sporting events.

### **References:**

- Charles J.A. Crane, F.A.A. and Furness, J.A.G. (1987) "Selection of Engineering Materials" UK: Butterworth Heiremann.
- Finn, R.A. and Trojan P.K. (1999) "Engineering Materials and their Applications" UK: Jaico

Publisher.

John Mongilo, (2001) "Nano Technology 101 "New York: Green wood publishing.

Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.

Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982

## **SOE/PE/E-502: ADAPTED PHYSICAL EDUCATION**

### **Learning outcome**

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

### **Unit 1: An Introduction to Adapted Physical Education**

- 1.1 Meaning, Need & Importance of Adapted Physical Education and Sports
- 1.2 Purpose, Aims and Objectives of Adapted Physical Education and Sports
- 1.3 Program organization of Adapted Physical Education and Sports
- 1.4 Adapted Sports- Para Olympics

### **Unit 2: Development of Individual Education Program (IEP)**

- 2.1 The student with a disability
- 2.2 Components and Development of IEP.
- 2.3 Principles of Adapted Physical Education and Sports
- 2.4 Role of Physical Education teacher
- 2.5 Teaching style, method & approach in teaching Adapted Physical Education

### **Unit 3: Developmental Considerations of an Individual**

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

### **Unit 4: Individual with unique need and activities**

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need

#### 4.5 Role of games and sports in Adapted Physical Education

##### **Reference**

1. Beverly, N. (1986). *Moving and Learning*. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. *Adapted Physical Education in the Mainstream*. (4th Edition) Love Publishing Company.
3. Houser, L.D. *Integrated Physical Education- A guide for the elementary classroom teacher*.
4. Winnick, J. P. (2005). *Adapted Physical Education and Sports*. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. *Dynamics Physical*

## Semester II



## **SOE/PE/C-601: STATISTICS FOR RESEARCH IN PHYSICAL EDUCATION**

### **Learning Outcome**

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

### **UNIT I - Introduction**

Meaning and Definition of Statistics. Function, need and importance of Statistics. Types of Statistics. Meaning of the terms, Population, Sample, Data, types of data. Variables; Discrete, Continuous. Parametric and non-parametric statistics.

### **UNIT II - Data Classification, Tabulation and Measures of Central Tendency**

Meaning, uses and construction of frequency table. Meaning, Purpose, Calculation and advantages of Measures of central tendency - Mean, median and mode.

### **UNIT III - Measures of Dispersions and Scales**

Meaning, Purpose, Calculation and advances of Range, Quartile, Deviation, Mean Deviation, Standard Deviation, Probable Error. Meaning, Purpose, Calculation and advantages of scoring scales; Sigma scale, Z Scale, Hull scale

### **UNIT IV - Probability Distributions and Graphs**

Normal Curve, Meaning of probability- Principles of normal curve - Properties of normal curve. Divergence from normality - Skewness and Kurtosis. Graphical Representation in Statistics; Line diagram, Bar diagram, Histogram, Frequency Polygon, O give Curve.

### **Inferential and Comparative Statistics**

Tests of significance; Independent "t" test, Dependent "t" test - chi - square test, level of confidence and interpretation of data. Meaning of correlation - co-efficient of correlation - calculation of co- efficient of correlation by the product moment method and rank difference method. Concept of ANOVA and ANCOVA.

### **References:**

Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc

Clark D.H. (1999) Research Problem in Physical Education 2<sup>nd</sup> edition, Eaglewood Cliffs, Prentice Hall, Inc.

Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illinois; Human Kinetics;

Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports, New Delhi

Rothstain A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc

Sivaramakrishnan. S. (2006) Statistics for Physical Education, Delhi; Friends Publication

## **SOE/PE/C-602: KINSESIOLGY AND BIOMECHANICS**

### **Learning Outcomes**

1. Analyze and explain the mechanisms underlying biomechanical, physiological, and psychological changes that occur during after acute and chronic exercise.
2. Understand mechanical principles can be applied to the analysis of human movement to assess and improve performance and reduce risk of injury.
3. Know effectiveness of human movement using mechanical principles.

### **UNIT I - Introduction**

Meaning, nature, role and scope of applied kinesiology and Sports Biomechanics. Meaning of Axis and Planes, Dynamics, Kinematics, Kinetics, Statics Centre of gravity -Line of gravity plane of the body and axis of motion, Vectors and Scalars.

### **UNIT II - Muscle Action**

Origin, Insertion and action of muscles: Pectoralis major and minor, Deltoid, Biceps, Triceps (Anterior and Posterior), Trapezius, serratus, Sartorius, Rectus femoris, Abdominis, Quadriceps, Hamstring, Gastrocnemius.

### **UNIT III - Motion and Force**

Meaning and definition of Motion. Types of Motion: Linear motion, angular motion, circular motion, uniform motion. Principles related to the law of Inertia, Law of acceleration, and law of counter force. Meaning and definition of force- Sources of force - Force components .Force applied at an angle - pressure -friction -Buoyancy, Spin - Centripetal force - Centrifugal force.

### **UNIT IV - Projectile and Lever**

Freely falling bodies - Projectiles -Equation of projectiles stability Factors influencing equilibrium - Guiding principles for stability -static and dynamic stability. Meaning of work, power, energy, kinetic energy and potential energy. Leverage -classes of lever - practical application. Water resistance - Air resistance -Aerodynamics.

**Movement Analysis:** Analysis of Movement, Equipment's used for Analysis, Methods of analysis - Qualitative, Quantitative, Predictive,

### **References:**

Deshpande S.H. (2002). Manav Kriya Vigyan - Kinesiology (Hindi Edition) Amravati :Hanuman Vyayam Prasarak Mandal.

Hoffman S.J. Introduction to Kinesiology (Human Kinesiology publication Inc. 2005

Thomas. (2001). Manual of structural Kinesiology, New York: McGraw Hill.

Uppal, A (2004), Kinesiology in Physical Education and Exercise Science, Delhi Friends publications.

Williams M (1982) Biomechanics of Human Motion, Philadelphia; Saunders Co.

## **SOE/PE/C-603: SCIENCE OF SPORTS TRAINING AND ADVANCED COACHING**

### Learning Outcomes

1. Understand training as performance based science
2. Explain different means and methods of various training
3. Prepare training schedule for various sports and games
4. Appraise types of periodization for performance development
5. Create various training facilities and plans for novice to advance performers

### **UNIT I**

Introduction Sports training: Definition – Aim, Characteristics, Principles of Sports Training, Meaning of Coaching, Definition, Aim Characteristics, Principles of coaching, Over Load: Definition, Causes of Over Load, Symptoms of Overload, How to tackle over load, Judgement of Training load

### **UNIT II**

Sports Training, various Sports Training Methods: Continuous Training Method, Interval Training Method, Repetition Method, Circuit Training Method, Fartlek Training Method, Weight Training Method, and Plyometric Training Method. Components of Physical Fitness, Development of Physical fitness. Endurance, Strength, speed, flexibility, Co-ordinative Abilities

### **UNIT III**

Preparing for Competitions-Build-up competitions, Main Competition, Competition Frequency & Psychological Preparation, Training Plan: Macro Cycle, Meso-Cycle. Short Term Plan and Long Term Plans - Periodisation: Meaning, Single, Double and Multiple Periodisation, Preparatory Period, Competition Period and Transition Period.

### **UNIT IV**

Preparing lesson Plan, significance of lesson plan, Types of lesson plan, principles of lesson plan, contents in lesson plan, time allotment

Definition of Doping – Side effects of drugs – Dietary supplements – IOC list of doping classes and methods. Blood Doping – The use of erythropoietin in blood boosting – Blood doping control – The testing programmes – Problems in drug detection – Blood testing in doping control – Problems with the supply of medicines Subject to IOC regulations : over-

the- counter drugs (OTC) – prescription only medicines (POMs) – Controlled drugs (CDs).  
Reporting test results – Education

**References:**

Bunn, J.N. (1998) *Scientific Principles of Coaching*, New Jersey Engle Wood Cliffs, Prentice Hall Inc.

Cart, E. Klafs & Daniel, D. Arnheim (1999) *Modern Principles of Athletic Training* St. Louis C. V. Mosphy Company

Daniel, D. Arnheim (1991) *Principles of Athletic Training*, St. Luis, Mosby Year Book

David R. Mottram (1996) *Drugs in Sport*, School of Pharmacy, Liverpool: John Moore University

Hardayal Singh (1991) *Science of Sports Training*, New Delhi, DVS Publications

Jensen, C.R. & Fisher A.G. (2000) *Scientific Basic of Athletic Conditioning*, Philadelphia

## **SOE/PE/E-601: ATHLETIC CARE AND REHABILITATION**

### Learning outcomes

1. Understand the primary responsibilities the sports trainer has in preventing sports injuries and providing initial care for injured athletes.
2. Demonstrate the basics of sport first aid during and after game situation.
3. Recognize and appropriately treat common sports injuries and conditions from onset through rehabilitation.
4. Identify and apply knowledge of anatomy to the design and execution of research studies.

### **Unit I – Corrective Physical Education**

Definition and objectives of corrective physical Education. Posture and body mechanics, Standards of Standing Posture. Value of good posture, Drawbacks and causes of bad posture. Posture test – Examination of the spine.

### **Unit II – Posture**

Normal curve of the spine and its utility, Deviations in posture: Kyphosis, lordosis, flat back, Scoliosis, round shoulders, Knock Knee, Bow leg, Flat foot. Causes for deviations and treatment including exercises.

### **Unit III – Rehabilitation Exercises**

Passive, Active, Assisted

Resisted exercise for Rehabilitation

Stretching, PNF techniques and principles.

### **Unit IV – Massage**

Brief history of massage – Massage as an aid for relaxation – Points to be considered in giving massage – Physiological, Chemical, Psychological effects of massage – Indication / Contra indication of Massage – Classification of the manipulation used massage and their specific uses in the human body – Stroking manipulation: Effleurage – Pressure manipulation: Petrissage Kneading (Finger, Kneading, Circular) ironing Skin Rolling – Percussion manipulation: Tapotement, Hacking, Clapping, Beating, Pounding, Slapping, Cupping, Poking, Shaking Manipulation, Deep massage.

### **Sports Injuries Care, Treatment and Support**

Principles pertaining to the prevention of Sports injuries – care and treatment of exposed and unexposed injuries in sports – Principles of apply cold and heat, infrared rays – Ultrasonic, Therapy – Short wave diathermy therapy. Principles and techniques of Strapping and

Bandages.

**References:**

Doherty. J. Meno. Wetb, Moder D (2000) Track & Field, Englewood Cliffs, Prentice Hal Inc.

Lace, M. V. (1951) Massage and Medical Gymnastics, London: J & A Churchill Ltd.

McOoyand Young (1954) Tests and Measurement, New York: Appleton Century.



## **SOE/PE/E-602: SPORTS JOURNALISM AND MASS MEDIA**

### **Learning Outcome**

1. Know how to seek accreditation to sporting events and to report on such events.
2. Demonstrate analytic skills in relation to reporting sporting events
3. Produce a number of assignments that demonstrate their own style and perception of events

### **UNIT I - Introduction**

Meaning and Definition of Journalism, Ethics of Journalism – Canons of journalism- Sports Ethics and Sportsmanship – Reporting Sports Events. National and International Sports News Agencies.

### **UNIT II - Sports Bulletin**

Concept of Sports Bulletin: Journalism and sports education – Structure of sports bulletin – Compiling a bulletin – Types of bulletin – Role of Journalism in the Field of Physical Education: Sports as an integral part of Physical Education – Sports organization and sports journalism – General news reporting and sports reporting.

### **UNIT III - Mass Media**

Mass Media in Journalism: Radio and T.V. Commentary – Running commentary on the radio – Sports expert's comments. Role of Advertisement in Journalism. Sports Photography: Equipment- Editing – Publishing.

### **UNIT IV - Report Writing on Sports**

Brief review of Olympic Games, Asian Games, Common Wealth Games World Cup, National Games and Indian Traditional Games. Preparing report of an Annual Sports Meet for Publication in Newspaper. Organization of Press Meet.

Sports organization and Sports Journalism – General news reporting and sports reporting. Methods of editing a Sports report. Evaluation of Reported News. Interview with and elite Player and Coach.

### **Reference:**

Ahiya B.N. (1988) Theory and Practice of Journalism: Set to Indian context Ed3. Delhi :Surjeet Publications

Ahiya B.N. Chobra S.S.A. (1990) Concise Course in Reporting. New Delhi: Surjeet Publication

Bhatt S.C. (1993) Broadcast Journalism Basic Principles. New Delhi. Haranand Publication  
Dhananjay Joshi (2010) Value Education in Global Perspective. New Delhi: Lotus Press.  
MohitChakrabarti (2008): Value Education: Changing Perspective, New Delhi: Kanishka  
Publication.

## Semester III

## **SOE/PE/C-701: PROFESSIONAL PREPARATION**

### **Learning outcome**

- 1 Students will develop understanding of the profession of Physical Education.
2. Students will be able to deal with issues experienced by Physical Education teachers.
3. Students will recognize that learning to teach is a lifelong process.
4. Students will develop a comprehensive view of Physical Education from a global perspective.
5. Students will understand the domains & hidden dimensions of Physical Education.
6. Students will Demonstrate basic knowledge & awareness about inclusion, differently-abled students & describe steps to inclusion

### **Unit 1: The profession**

- 1.1 Meaning, criteria & evaluation of profession
- 1.2 A professional & professionalism in Physical Education & sports
- 1.3 Physical Education as a profession
- 1.4 Legal regulation of profession

### **Unit 2: Professional Preparation**

- 2.1 Historical perspectives
- 2.2 Policy perspectives
- 2.3 Theoretical perspectives
- 2.4 Nature & content of professional preparation programs

### **Unit 3: Professional Development**

- 3.1 Meaning & process
- 3.2 Growth on the job- in service concept
- 3.3 Self appraisal & parameter influencing self appraisal
- 3.4 Guiding principles & professional relations
- 3.5 Qualifications & duties, responsibilities & job profiles of school Phy. Edu. teachers, directors of Physical Education in colleges & university

### **Unit 4: Curriculum**

- 4.1 Meaning, importance & fundamental principles of curriculum planning
- 4.2 Writing the curriculum guide
- 4.3 Physical Education curriculum models
- 4.4 Implementing the Physical Education curriculum

### **Suggested Reading:**

1. Kiran Sandhu (2004). Professional preparation and career development in Physical Education and sports. New Delhi: Friends publication.
2. Kiran Sandhu (2004). Trends and developments in Professional preparation in Physical Education and sports. New Delhi: Friends publication.

3. Barrow, H.M. (1983). *Man & movement* (3rd Ed.). Philadelphia: Lea & Febiger.
4. Buchor, C. A. & Wuest, D. A. (1987). *Foundations of Physical Education and sports*. St. Louis: Times mirror / Mosby college publication.
5. Kelly, L. E. & Melograno, V. J. (2004). *Developing the Physical Education curriculum*. Champaign: Human Kinetics.
6. Pangrazi, R.P. & Dauer, V. P. (1995). *Dynamic Physical Education for elementary school children* (11th Ed.). Boston: Allyn and Bacon.
7. Pangrazi, R.P. & Dauer, V.P. (1985). *Dynamic Physical Education curriculum & instruction for secondary school student*. Minnesota: Burgess publishing company.
8. Lombardo, B. & Wuest, D. (1994). *Curriculum & instruction the secondary school Physical Education experience*. St. Louis: Mosby
9. Kasat, G. & Karmarkar, A. K. (1996). *Professional preparation in Physical Education and sports*. Amravati: Kasat

## **SOE/PE/C-702: MANAGEMENT IN PHYSICAL EDUCATION AND SPORTS**

1. Students will know the basic concept of management of Physical Education and Sports in the school.
2. Students will know the basic methods and technique and its principles to manage the programme of competitions, intramurals the basic level of competitions.
3. Students will know the duties and responsibilities of manager
4. Students will know the budget management, school programme of Phy. Edu. and sports.

### **UNIT I**

Introduction, Definition of Sports Management, Need & Importance. Basic Principles and Procedures of Sports Management. Functions of Sports Management, Scope of Sports Management

### **UNIT II**

Introduction, Organisation at school level, Organisation at University level, Organisation at National level, basic guiding Principles for organizing physical education and sports Programmes in the Institutions, Intramurals need and importance, Organisation and Administration of Intramural Activities, Extra murals- General Objectives, Policies for Organisation and management of Extra mural Programmes, Management of Personnel.

### **UNIT III**

Introduction , Importance, types and need of Sports Equipments, Procurement of Equipment, Principles of Purchase Procedure, Quotations and tenders, Principles of Equipment Purchase, Important considerations in Selecting sports Equipment, Receiving, Stock Taking and Storing Equipment, Disposal of Equipment.

### **UNIT IV**

Introduction, Planning the Facilities, administrative Principles for Planning a Facility, General Principles for Planning the Facilities, Types of Facilities, Principles for planning the Indoor facility, Outdoor facilities, facility requirements, Planning, Construction and Management of sports infrastructure, guidelines for layout of sports infrastructure, Surface, Fencing, Drainage, lighting, Beautification, Management, Gymnasium,

Swimming Pool, Management of Indoor facilities, Management in Care and Maintenance of the facility.

**Reference:**

Aggarwal, J.C (1990). Curriculum Reform in India - World overviews, Doaba World Education Series - 3 Delhi: Doaba House, Book seller and Publisher.

Carl, E, Willgoose. (1982. Curriculum in Physical Education, London: Prentice Hall.

Chakraborty&Samiran. (1998) .Sports Management. New Delhi: Sports Publication.

John, E, Nixon & Ann, E, Jewett. (1964). Physical Education Curriculum, New York: The Ronald Press Company.

McKernan, James (2007) Curriculum and Imagination: Process, Theory, Pedagogy and Action Research,. U.K. Routledge

## SOE/PE/C-703: MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION

### Learning outcome

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests

### **Unit1: Basics of Measurement & Evaluation**

- 1.1 Concept Test, measurement, evaluation & assessment & its importance
- 1.2 Classification of test in Physical Education
- 1.3 Different tools of evaluation in Physical Education
- 1.4 Trends in evaluation in Physical Education
- 1.5 Criteria of test selection

### **Unit2: Construction & Standardization of tools**

- 2.1 Methods for testing Validity, Reliability & Objectivity
- 2.2 Construction of psychomotor test
- 2.3 Construction of Questionnaire and Opinionnaire
- 2.4 Administration of psychomotor test.
- 2.5 Concept, importance, construction & administrative concern of Rating scales

### **Unit3: Measuring fitness & sports skills**

- 3.1 Measurement of HRPF, SRPF, GMA & Motor educability.
- 3.2 Measurement of skills of various sports & games: Soccer, Handball, Tennis, Basketball, volleyball.
- 3.3 Testing of psychological variable.
- 3.4 Fitness assessment Tests for SCoursecial Population & older adults

### **Unit4: Test batteries & norms for evaluation**

- 4.1 Meaning & characteristics of Test batteries: AAHCOURSERD youth Fitness test, JCR, FITNESS GRAM & ACSM Fitness test
- 4.2 Factors affecting measurement in Physical Education.
- 4.3 Anthropometric measurement & somatoty Course.
- 4.4 Norm referenced tests & criterion referenced tests



**Reference :**

1. Miller, David. K. (2002). Measurement by the Physical Educator. New York: McGraw Hill companies.
2. John & Nelson (1998). Practical Measurements for Evaluation in Physical Education. Delhi: Surjit Publication.
3. Barrow, H.M.(1979).Practical Approach to Measurement in Physical Education. Ed.(3<sup>rd</sup> Ed.). Philadelphia: Lee & Febigeer,
4. Clarke, H. (1987). Application of Measurement in Health & Physical Education. Ed. (6<sup>th</sup> Ed.). New Jersey Prentic Hall,Inc 1987.
5. Kansal, D.K. (1996). Test & Measurement in Sports & Physical Education. New Delhi:.D.V.S.Publications
6. Acsm's (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
7. BalyanSunita (2006). SharirkShiksha main Parikshanevnmnaapan. Khel Sahitya. Delhi.
8. Barrow H.M. and McGee R. (1979). A Practical Approach to Measurement in Physical Education. Lea &Febiger, Philadelphia. U.S.A.

## **SOE/PE/E-701: INFORMATION AND COMMUNICATION TECHNOLOGY IN PHYSICAL EDUCATION**

### **Learning outcome**

1. Understand concept of information and communication technology in physical education field
2. Analyse sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Offer Hands on Knowledge in information and communication Technology

### **Unit I – Communication & Classroom Interaction**

Concept, Elements, Process & Types of Communication, Communication Barriers & Facilitators of communication  
Importance of ICT Need of ICT in Education  
Scope of ICT: Teaching Learning Process, Publication Evaluation, Research and Administration, Challenges in Integrating ICT in Physical Education

### **Unit II – Fundamentals of Computers**

Characteristics, Types & Applications of Computers Hardware of Computer: Input, Output & Storage Devices Software of Computer: Concept & Types  
Computer Memory: Concept & Types Viruses & its Management  
Concept, Types & Functions of Computer Networks Internet and its Applications Web Browsers & Search Engines Legal & Ethical Issues

### **Unit III – MS Office Applications**

MS Word: Main Features & its Uses in Physical Education  
MS Excel: Main Features & its Applications in Physical Education MS Access: Creating a Database, Creating a Table, Queries, Forms & Reports on Tables and its Uses in Physical Education  
MS Power Point: Preparation of Slides with Multimedia Effects MS Publisher: Newsletter & Brochure

### **Unit IV – ICT Integration in Teaching Learning Process**

Approaches to Integrating ICT in Teaching Learning Process  
Project Based Learning (PBL)  
Co-Operative Learning  
Collaborative Learning  
ICT and Constructivism: A Pedagogical Dimension  
**E-Learning & Web Based Learning**  
E-Learning

Web Based Learning  
Visual Classroom

**References:**

Douglas E. Comer, The Internet Book, Purdue University, West Lafayette in 2005.

Heidi Steel Low price Edition, Microsoft Office Word 2003- 2004.

Pradeep K. Sinha&Priti; Sinha, Foundations computing BPB Publications -2006. Rebecca Bridges Altman Peach pit Press, Power point for window, 1999.

Sanjay Saxena, Vikas Publication House, Pvt. Ltd. Microsoft Office for ever one, Second Edition-2006.

## SOE/PE/E-702: HEALTH EDUCATION AND SPORTS NURTITION

### Learning Outcomes

1. Understand the basic principles of Anatomy, Physiology and Health Education
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation. .
4. Remember and recall the definition of anatomy and physiology and co-relate the principles of physiology.
5. Appraise the effects of health condition during the training and practical sessions

### **Unit - I Health Education**

Concept, Dimensions, Spectrum and Determinants of Health

Definition of Health, Health Education, Health Instruction, Health Supervision, Aim, objective and Principles of Health Education

Health Service and guidance instruction in personal hygiene

### **Unit - II Health Problems in India**

Communicable and Non Communicable Diseases

Obesity, Malnutrition, Adulteration in food, Environmental sanitation, Explosive, Population,

Personal and Environmental Hygiene for schools

Objective of school health service, Role of health education in schools

Health Services - Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthful school environment, first- aid and emergency care etc.

### **Unit- III - Hygiene and Health**

Meaning of Hygiene, Type of Hygiene, dental Hygiene, Effect of Alcohol on Health, Effect of Tobacco on Health, Life Style Management, Management of Hypertension, Management of Obesity, Management of Stress

### **Unit - IV- Introduction to Sports Nutrition**

Meaning and Definition of Sports Nutrition, Role of nutrition in sports, Basic Nutrition guidelines, Nutrients: Ingestion to energy metabolism (Carbohydrate, Protein and Fat), Role of carbohydrates, Fat and protein during exercise.

#### **Nutrition and Weight Management**

Concept of BMI (Body mass index), Obesity and its hazard, Dieting versus exercise for weight control Maintaining a Healthy Lifestyle, Weight management program for sporty child, Role of diet and exercise in weight management, Design diet plan and exercise schedule for weight gain and loss.

### **References:**

Bucher, Charles A. "Administration of Health and Physical Education Programme". Delbert, Oberteuffer, et. al." The School Health Education".  
Ghosh, B.N. "Treaties of Hygiene and Public Health".  
Hanlon, John J. "Principles of Public Health Administration" 2003.  
Moss "Health Education" (National Education Association of U.T.A.)  
Nemir A. "The School Health Education" (Harber and Brothers, New York). Nutrition Encyclopedia, edited by Delores C.S. James, The Gale Group, Inc.

#### **Semester IV**

## **SOE/PE/C-801: SPORTS MEDICINE**

### **Learning Outcome**

1. Perform and report on the exploratory analysis of data collected using sports technology
2. Analyze sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Support a conclusion based upon quantitative prediction, performance and analysis of a sporting team, code, or gaming environment

### **UNIT I - Introduction**

Meaning, definition and importance of Sports Medicine, Definition and Principles of therapeutic exercises. Coordination exercise, Balance training exercise, Strengthening exercise, Mobilization exercise, Gait training, Gym ball exercise Injuries: acute, sub-acute, chronic. Advantages and Disadvantages of PRICE, PRINCE therapy, Aquatic therapy.

### **UNIT II - Basic Rehabilitation**

Basic Rehabilitation: Strapping/Tapping: Definition, Principles Precautions Contraindications. Proprioceptive neuromuscular facilitation: Definition hold, relax, repeated contractions. Show reversal technique exercises. Isotonic, Isokinetic, isometric stretching. Definition. Types of stretching, Advantages, dangers of stretching, Manual muscle grading.

### **UNIT III - Spine Injuries and Exercise**

Head, Neck and Spine injuries: Causes, Presentational of Spinal anomalies, Flexion, Compression, Hyperextension, Rotation injuries. Spinal range of motion. Free hand exercises, stretching and strengthening exercise for head neck, spine. Supporting and aiding techniques and equipment for Head, Neck and Spine injuries.

### **UNIT IV - Upper Extremity Injuries and Exercise**

Upper Limb and Thorax Injuries: Shoulder: Sprain, Strain, Dislocation, and Strapping. Elbow: Sprain, Strain, Strapping. Wrist and Fingers: Sprain Strain, Strapping. Thorax, Rib fracture. Breathing exercises, Relaxation techniques, Free hand exercise, Stretching and strengthening exercise for shoulder, Elbow, Wrist and Hand. Supporting and aiding techniques and equipment for Upper Limb and Thorax Injuries.

### **Lower Extremity Injuries and Exercise**

Lower Limb and Abdomen Injuries: Hip: Adductor strain, Dislocation, Strapping. Knee: Sprain, Strain, Strain, Strapping. Ankle: Sprain, Strain, Strapping. Abdomen: Abdominal wall, Contusion, Abdominal muscle strain. Free exercises - Stretching and strengthening exercise for Hip, knee, ankle and Foot. Supporting and aiding techniques and equipment for

Lower limb and Abdomen injures.

**References:**

- Christopher M. Norris. (1993). Sports Injures Diagnosis and Management for Physiotherapists. East Kilbride: Thomson Litho Ltd.
- James, A. Gould & George J. Davies.(1985). Physical Physical Therapy. Toronto: C.V. Mosby Company.
- Morris B. Million (1984) Sports Injuries and Athletic Problem. New Delhi: Surjeet Publication.
- Pande.(1998). Sports Medicine. New Delhi: Khel Shitya Kendra
- The Encyclopedia of Sports Medicine. (1998). The Olympic Book of Sports Medicine, Australia: Tittel Blackwell Scientific publications.

## **SOE/PE/C-802: PEDAGOGY OF PHYSICAL EDUCATION**

### Learning outcome

1. Students will use effective communication and pedagogical skills and strategies to enhance student engagement & learning.
2. Students will utilize assessments and reflection to foster student learning and to inform instructional decisions.
3. Students will inherit qualities essential to become effective professionals.
4. Students will understand the discipline

### **Unit 1: Systematic improvement in teaching skills**

- 1.1 Science & Art of teaching – Teaching, Learning, & Pedagogy, appropriate practices-goals & feedback
- 1.2 Stages of skill development in teaching, sources of help, expert PE teacher
- 1.3 Effective teacher- how are they identified? Active teachers, contextual variations of active teaching
- 1.4 What teachers do in PE? What students do in PE? Effective PE teaching

### **Unit 2: Assessing and improving teaching**

- 2.1 Assessment model, on-site assessment of teaching, steps in assessment process
- 2.2 Task system- ecology of PE, important concepts in ecological framework
- 2.3 Interpersonal skills in PE teaching – teacher-student interaction skills, effective communication skills
- 2.4 Legal, ethical & moral issues in teaching, promoting self growth in PE
- 2.5 Strategies for content development- factors affecting program level planning, differing visions of good in PE

### **Unit 3: Developing effective units of instructions**

- 3.1 Determining entry & exit levels, end of unit objectives, practical factors related to unit planning, constructing unit plan, writing instructional objectives
- 3.2 Generic instructional strategies- guided practice, independent practice, monitoring student performance
- 3.3 Instructional format- active teaching, task teaching, teaching through questioning, peer teaching, cooperative learning
- 3.4 Self-instructional formats- contracts, PSI, providing effective instruction for mainstream students

### **Unit 4: Measuring teaching & its outcomes**

- 4.1 Traditional methods for assessing teaching- intuitive judgment, eyeballing, anecdotal records, checklists, rating scale



4.2 Systematic observation records- event recording, duration recording, interval recording, group time sampling, self recording

4.3 Combining observation techniques, important decisions in developing observation strategies, building observation system

4.4 What to observe, training observers, calculating reliability of observation data, examples of observation system

**Suggested Readings:**

1. Siedentop, D. (1991). Developing teaching skills in Physical Education. Ca: Mayfield Publishing company

2. Mosston, M., Ashworth, S. (1994). Teaching Physical Education (4th Ed). NY: Macmillan College Publishing Company

3. Kelly, L.E., Nelogano, V.J. (2004). Developing the Physical Education curriculum. Champaign, IL: Human Kinetics

4. Hopple, C.J. (2005). Elementary Physical Education teaching & assessment- A practical guide. Champaign IL: Human Kinetic

## **SOE/PE/C-803: SPORTS ENTREPRENEUR**

### **Learning outcomes**

- Identify the skills and knowledge base needed to foster entrepreneurial activity for individuals based on the experiences of successful sports entrepreneurs as well as assess and discuss the challenges they have faced.
- Critically discuss ways in which entrepreneurial-minded individuals can thrive in large sports organizations despite the tendency of such organizations to resist innovation and to favor the status quo or only seek marginal gains.
- demonstrate an understanding of, and identify, new opportunities and translate them into viable business solutions or opportunities

### **Unit I: Introduction to Sports Entrepreneurship**

1. Concept of entrepreneurship, innovation & knowledge management in sports
2. Business Planning Process - The business plan as an entrepreneurial tool
3. Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

### **Unit II : Introduction to Finance in Sports**

1. The Four Domains of Sports Marketing, Marketing Through Sports
2. Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling & milestones, Value proposition,
3. Business Model Canvas & Drafting Business Proposal for Funding Agency.

### **Unit II. Management of Physical Education and sports**

1. Meaning, Need and scope of management of Physical Education
2. Principles of Sports Management
3. Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

### **Unit IV: Organization of co-curricular activities & Physical Education programmes**

1. Physical Education Budget : Need, Importance, procedure and principles of budget making,

2. Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness - demonstration, play days, sports rallies, sports exhibitions
3. Organization of National days (15<sup>th</sup> August & 26<sup>th</sup> January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics
4. Ceremonies of competition - Opening, closing and victory

**References:**

- Sports Marketing By Melissa Jane Johnson Morgan Jane
- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.

## **SOE/PE/E-801: DISSERTATION**

### Learning Outcome

1. Students will have basic knowledge of Research in Physical Education, Fitness & Sports to Student
2. Students will know the fundamentals of research
3. Students will be able to select research problem & know the steps of developing it
4. Students will understand methodology & research procedure
5. Students will know different sampling techniques & data collection tools
6. Students will know basic statistics & statistical techniques
7. Students will apply & interpret descriptive statistics
8. Students will recognize appropriate inferential statistical tool as per research method
9. Students will understand data processing

## **SOE/PE/E-802: EXERCISE PRESCRIPTION & FITNESS MANAGEMENT**

### **Learning objectives:**

- 1. To make the students understand the concepts of fitness**
  - 2. To equip the students to learn the tests to measure each component of fitness**
  - 3. To acquire the skills of pre exercise screening**
  - 4. To learn the principles of training**
  - 5. To equip the students to prescribe the exercise to the clients**
  - 6. To understand the fitness norms and prepare fitness report of the clients**
- Learning objectives:**

### **Unit 1: Basic Principles of Physical Fitness**

- 1.1. How much physical activity is enough? Benefits of physical activity
- 1.2. Health related components of physical fitness, skill related components of fitness
- 1.3. Principles of physical training: Specificity, progressive overload (FITT), Reversibility, individual difference
- 1.4. Designing your exercise program- guidelines for training, choosing activities for a balanced program

### **Unit 2: Developing fitness, improving quality of life**

- 2.2. Benefits of aerobic exercises, monitoring heart rate
- 2.3. Developing aerobic exercise program- setting goals, applying FITT, building & maintaining aerobic fitness
- 2.4. Benefits of muscular strength & endurance, assessing muscular strength & endurance, creating a successful strength training program
- 2.5. Applying FITT principle, weight machines versus free weights, weight training safety
- 2.6. Determinants of flexibility, benefits & additional potential benefits of flexibility & stretching exercises, Flexibility improvement- FITT principle

### **Unit 3: Developing a personal fitness plan**

- 3.1. Guidelines for personal fitness plan- set goals, select activity, set target, system of mini goals & rewards, lifestyle activity, monitoring, commitment
- 3.2. Putting plan into action, maintaining fitness program for life
- 3.3. Exercise guidelines for people with special concerns- arthritis, asthma, diabetes, heart disease, hypertension, obesity, and osteoporosis
- 3.4. Exercise guidelines for life stages- children & adolescents, pregnant women, older adults

#### **Unit 4: Behavior change & fitness management**

- 4.1. Psychosocial factors to consider, Behavioral change theories & exercise
- 4.2. Strategies to achieve fitness goals & maintaining fitness programs
- 4.3. Trends in weight loss, weight gain
- 4.4. Causes of obesity, implications of overweight & obesity
- 4.5. Underweight conditions & eating disorders

#### **Suggested Readings:**

1. Fahey, Insel, Roth (2004) Fit & well (6<sup>th</sup>Ed.) Boston: McGraw Hill co. Greenberg
2. Dintiman, Oakes. (2004). Physical fitness & wellness (3rd Ed.). IL: Human Kinetics
3. Howley& Franks (1997). Health fitness instructor's Handbook (3rd Ed.)IL: Human kinetics
4. ACSM (1998) ACSM's resource manual for guidelines for exercise testing & Prescription (3rd Ed.) Lippincott, Williams & Wilkins
5. Destine& Moore (2003) ACSM's exercise management for person's with chronic diseases & disabilities (2nd Ed.) IL: Human Kinetics

# **BHARATI VIDYAPEETH DEEMED UNIVERSITY**

(Established u/s 3 of UGC Act 1956, vide notification no. F9. 15.U.3 of Govt. of India )

## **COLLEGE OF PHYSICAL EDUCATION**

Dhankawadi, Pune-411 043 (Maharashtra), Tel.020-24373741

**REACCREDITED 'A' GRADE BY NAAC**



## **Master of Philosophy (M. Phil.) In Physical Education**

**CURRICULUM FRAMEWORK  
(2009-2010)**

# **BHARATI VIDYAPEETH UNIVERSITY**

## **Relevant Rules for Degree of Master of Philosophy (M. Phil.) In Physical Education**

### **1. Status :**

The M. Phil. Degree shall have the status of an intermediate Degree between the first Post-Graduate degree and Doctorate Degree. It will have both research and course components and will give the student adequate background for advanced research.

### **2. Learning Outcome**

- i.** The course would equip students of Gujarat with necessary qualification for lecturer in a college/ secondary teacher or principal / higher secondary teacher or principal.
- ii.** Use online resources, libraries, databases etc.
- iii.** Create/prepare research papers for Sports and Physical Education
- iv.** Present and publish research papers in field of Sports and Physical Education.
- v.** Research scholar comes out with his/her original research or translation under the guidance of respected faculties in the second term. 9 Documentation skills.
- vi.** Knowledge of Sports Medicine, Sports Psychology, Sports Sociology and Sports Management.
- vii.** Organize and participate in seminar, workshop, symposia, conference etc.
- viii.** Participate in group discussions.

### **3. Eligibility and Admission :**

An applicant seeking admission to the M. Phil. Course must have obtained a Master's Degree in Physical Education from this or any other recognized University.

Admission to the M.Phil. course shall be made on the basis of :

- 1) Satisfactory performance at the Masters Degree examination in Physical Education; and
- 2) The performance at a test conducted by the College / University concerned.



#### **4. Duration of the M.Phil. course :**

The M.Phil. Course can be done either on a full-time or on Vacational basis depending upon the availability of the programme in the College.

##### **(a) Full-time course:**

- 1.** The duration of the full-time M.Phil. course shall be 12 months.
- 2.** A full-time M.Phil. Student shall attend lectures, tutorials, practicals and seminars and must complete to the satisfaction of the institute.
- 3.** Although the duration of a full-time M.Phil. Course shall be for 1 yr., which can be maximally extended up to 2½ yrs from the date of admission to complete dissertation and after which the admission shall stand cancelled. In such a case, the student has to take fresh admission.

##### **(b) Vacational course :**

- i.** The vacational M.Phil. course shall extend over a period of 24 months (2 years). Such a Vacational M.Phil. student shall have to attend a minimum period of 4 months for his studies at the College / M.Phil. Centre. Like a regular student, a vacational student also may be permitted to complete his dissertation within the period of 2½ years from the date of admission. The facility of vacational M.Phil. course shall be restricted to teachers of any institutions.
- ii.** A student of vacational M.Phil. Course must attend lectures, tutorials, practicals and seminars for at least two months in a year to the satisfaction of the institution.
- iii.** The criteria for granting admission to the Vacational M.Phil. programme will be as follows :
  - a.** First preference will be given to the lecturers who are working in Universities and Colleges as per the merit of previous examination.
  - b.** Second preference will be lecturers of Junior College or School teachers.
- iv.** The duration of a vacational M.Phil. Course shall be for 2 yrs., However it can be extended up to 2½ yrs with the prior permission of the University authorities.

#### **4. Content:** - This course shall be divided into two parts-

**Part A** - Theory Paper (3 papers i.e., 2 compulsory & 1 optional).

**Part B** - Research Project (Dissertation, Seminar & Viva-Voce).

## 5. Evaluation :

- i. The evaluation of the performance of the student will be a continuous process and performance will be evaluated by the concern guide.
- ii. The dissertation will be evaluated by the guide of the candidate and an external referee appointed by the University authorities on recommendation of the principal.
- iii. Seminar and Viva-voce will be based on the dissertation. The evaluation of the final seminar and the viva-voce test will be done by a **committee** consisting of the following :
  - a. One expert (who is a senior research guide for Ph.D. of this or any other university) to be nominated by the Head/Professor-in-charge of the Institute;
  - b. The dissertation supervisor;
  - c. The Head of the Institute, who will act as Chairman of this Committee.
- iv. The following grade will be awarded to a student on the basis of marks obtain by him in the final exam as follows:

Percentage of Total Marks	Grade
50% & above but less than 55 %	“C” Grade
55% & above but less than 60 %	“B” Grade
60% & above but less than 65 %	“B”+ Grade
65% & above but less than 70 %	“A” Grade
Above 70%	“O” Grade / Outstanding

- v. In case a student fails in dissertation by not getting required marks for passing. The same dissertation may be sent to second examiner for evaluation. Even after second time evaluation, if the student fail he/she may be asked to resubmit the dissertation

with the suggestions and modification given by the examiners. He can resubmit and appear for final examination.

- vi.** All interested persons can attend the seminar and the viva-voce examination which will constitute the defense of the dissertation and they shall have the right to ask questions and participate in discussion on the dissertation. The chairman of M.Phil. Evaluation committee shall exercise his/ her discretion to allow or not to allow a question. However, the members of the audience at the defense shall have no right to express their opinion on the suitability or otherwise of the dissertation for the award of the M. Phil. Degree.

## **M. Phil. Structure**

**(Regular Course:- 1 yr. / Vacational Course:- 2 yrs.)**

**Intake: - 30 Students for each course**

**Structure of M. Phil.:-** This course shall be divided into two parts

Part A - Theory Paper

Part B - Research Project

### **Examination:**

#### **Part A:** Structure of Theory Paper

<b>Sr. No.</b>	<b>Paper Name</b>	<b>Optional / Compulsory</b>	<b>Theory / Practical</b>	<b>Marks</b>	<b>Min. Marks</b>	<b>Min.% of Passing</b>
01	Research Processes in Physical Education	Compulsory	Theory	100 Marks	40 Marks	50%
02	Advanced Statistics & Computer Application to Physical Education	Compulsory	Theory	100 Marks	40 Marks	
03	Yoga and Sports Achievement	Optional	Theory	100 Marks	40 Marks	
	Training method and applied Mechanics	Optional	Theory	100 Marks	40 Marks	
	Measurement & Evaluation in Physical Education	Optional	Theory	100 Marks	40 Marks	
	Sports Medicine	Optional	Theory	100 Marks	40 Marks	
	Exercise Physiology	Optional	Theory	100 Marks	40 Marks	
	Sports Psychology	Optional	Theory	100 Marks	40 Marks	
				<b>300 Marks</b>	<b>120 Marks</b>	

## Part B: Structure of Research Project

### 1. Dissertation / Thesis:-

Dissertation / Thesis shall be evaluated by both internal and external examiners for 100 Marks (i.e., Internal 50 Marks and External 50 Marks).

### 2. Seminar Presentation:-

Seminar Presentation shall be an open defense system, and will be evaluated by a three-member Committee which will consist of the Head of the Institute as Chairman of the committee, internal examiner and any one subject expert (Preferably a Ph.D. guide)

### 3. Viva Voce:-

Viva-voce shall be evaluated by a three-member Committee which will consist the Head of the Institute as Chairman of the committee, internal examiner and any one subject expert (Preferably a Ph.D. guide).

### Structure of Research Project:-

Sr. No	Research Project	Internal	External	Full Marks	Min. Marks of Passing	Minimum % of Passing
01	Dissertation/Thesis	50 Marks	50 Marks	100 Marks	40 Marks	50%
02	Seminar Presentation	50 Marks	50 Marks	100 Marks	40 Marks	
03	Viva - Voce	50 Marks	50 Marks	100 Marks	40 Marks	
		150 Marks	150 Marks			
	<b>Total</b>			<b>300 Marks</b>	<b>120 Marks</b>	<b>150 marks</b>

### STRUCTURE OF OVERALL MINIMUM PASSING MARKS:

Sr. No.	Name of Part	Total Marks	Minimum Passing Marks
01	Part "A"	300	150
02	Part "B"	300	150
Total		600	300

**STANDARD OF PASSING:**

- A student has to obtain minimum 40% Marks in each THEORY PAPER of Part-A and 50% marks in aggregate in Part-A total, also students has to obtain 40% marks in each a) Dissertation b) seminar & c) Viva-voce and 50% marks in aggregate in Part B
- If a student fails to get less than 50% marks in overall aggregate in theory, he / she may apply again in *one or more theory subject* to obtain 50% marks in Part-A.
- If any student fails to get 50% marks in Part-B (Dissertation / Seminar Presentation / Viva Voce), he / she has to reappear either in Seminar or Viva Voce or both to get 50% marks for passing in part-B.

**AWARDS OF GRADE:**

The following grade will be awarded to a student on the basis of marks obtain by him in the final exam as follows:

<b>Percentage of Total Marks</b>	<b>Grade</b>
50% & above but less than 55 %	“C” Grade
55% & above but less than 60 %	“B” Grade
60% & above but less than 65 %	“B”+ Grade
65% & above but less than 70 %	“A” Grade
Above 70%	“O” Grade / Outstanding

**System of Dissertation / Thesis Submission:**

The M. Phil. Course must be completed within 2½ years from the time of admission; otherwise the admission is treated as cancelled. In such a case, the student has to take fresh admission.

Students can submit their dissertation any time during the session. The dissertation will be sent to an expert for evaluation and Viva-voce will be conducted accordingly. After receiving the marks, the university will declare the final result.

**PATTERN OF QUESTION PAPER:  
M. Phil. Question Paper Structure**

Subject: - .....

Day: -

Time:-

Date: -

Marks:- 100

**N. B.** 1. Attempt any 04 questions from Q. No. 01 to 06

2. Q. No. 07 is **COMPULSARY**

01. ....(20)

02. ....(20)

03. ....(20)

04. ....(20)

05. ....(20)

06. ....(20)

07. Write to Short Note (Any Four) (20)

a) .....

b) .....

c) .....

d) .....

e) .....

f) .....

### Time Table of M. Phil. Examination

Paper No.	Subject	Full Marks	Day & Date	
			Regular Course	Vacational Course
Paper I (Compulsory)	Research Process in Physical Education	100	Monday 21 <sup>st</sup> June 2010	Monday 18 <sup>th</sup> June 2012
Paper II (Compulsory)	Advanced Statistics and Computer Application to Physical Education	100	Tuesday 22 <sup>nd</sup> June 2010	Tuesday 19 <sup>th</sup> June 2012
Paper III (Optional)	Yoga & Sports Achievement	100	Wednesday 23 <sup>rd</sup> June 2010	Wednesday 20 <sup>h</sup> June 2012
	Thesis/Dissertation (Submission)	100	Monday 03 <sup>rd</sup> May 2010	Monday 03 <sup>rd</sup> May 2012
	Final Seminar (Research Thesis)	100	7 <sup>th</sup> June 2010 To	4 <sup>th</sup> June 2012 To
	Viva-Voce (Research Thesis)	100	10 <sup>th</sup> June 2010	9 <sup>th</sup> June 2012
		600 Marks		



## **Syllabus For Master Of Philosophy (M. Phil.)**

### **Compulsory paper – I: - Research Processes in physical education**

Learning outcomes

1. Identify the research problem in the field of physical Education and sports
2. Know to Summarize the various research literature
3. Understand and apply the basics of statistics in research
4. Organize the samples and sampling techniques which is relevant to the study.
5. Apply the systematic methods in writing research thesis

#### **Unit I: - Introduction**

Meaning nature and scope of research importance of research in general and With special reference to physical education and sports Characteristics of research and research worker.

#### **Unit II:-**

Basic, Applied and action research-their relationship and difference.

Importance and methodology of research.

#### **Unit III:-**

Place of research in university, Historical perspective, relation to graduate study,

Organization & financing of research, problem of university sponsored research.

#### **Unit IV:- The Problem**

Located the problem – selection of problem

Developing problem statement

Meaning and significance of Hypothesis

Type of hypothesis

#### **Unit V:- Non-Laboratory Research Techniques**

Historical Research

Meaning and significance of Hypothesis

Examining validate of historical data

Principal of historical criticism

Pitfalls in historical Research

**Unit VI:- Philosophical studies.**

Meaning and significance.

Methodology of philosophical research.

Critical thinking continuum.

**Unit VII : - Descriptive studies – Board survey**

Questionnaire, Opinion ire and interview techniques.

Case studies and profiles.

**Unit VIII:- Laboratory Research**

Experimental designs.

**Unit XI:- Experimental Methods**

Control of Experiment Factors.

Principals of Experimental Enquiry (Mill's Canons)

Establishing a research Laboratory

**Unit X:- Research Report**

Deference between abstract, Research proposal & research reports.

Format of research reports

Table and Figures.

Footnote and Bibliography

**Reference Books:**

1. John w. Best Research Education (Fourth Ed.) New Delhi, prentice Hall of India.
2. M.L. Kamallesh- Methodology of research in physical education. New Delhi, 1994
3. R.H. Whitney, Techniques of research.
4. Good, Bar, Gatesw, Research in education.

5. Clark, David H. Clar. Harison H.: Research process in physical education.
6. Veit, Richard, Research – The students Guide. New York Macmillan publishing company, 1980.
7. Sadhu A.N., Sing Amarjit; Research Methodology In Social Sciences (Fourth Edition) Bombay Himalaya Publishing House-1998

## **Compulsory paper– II:- Advanced Statistics And Computer Application to physical Education**

### Learning Outcome

1. To equip the students to understand the basic of skills acquisitions of sports performance.
2. To make them understand the basic of skills and selected sports movement pattern
3. To enable them to understand the link between motor skills, ability, learning and performance
4. To familiarize the students with various theories improving and affecting the sports skills performance

### **Unit I :- Introduction to statistics**

Meaning – importance and need of statistics parametric and non parametric statistic.

**Unit II:-** Measure of central tendency – specific characteristics and use of central tendency

### **Unit III: Percentiles and quartiles –**

Meaning and importance – computation of percentiles and deciles.

### **Unit IV:- Measure of variability-**

Quartile deviation, mean deviation and standard deviation – Specific Characteristic and uses.

**Unit V:** Normal probability curve – principles and properties of normal curve

### **Unit VI: Analysis of variance :**

Need for analysis of variance – standard deviations of combined

Samples – one way analysis of variance – two way analysis of Variance post Hoc Tests of significance

### **Unit VII: Analysis of co-variance:-**

Need for co-variance. Application of analysis of co-variance, control of covariates.

**Unit VIII : Partial and multiple correlations :**

Meaning of partial correlation, First order part correlation – computation of partial standard deviation.

Meaning of multiple correlation computation of multiple correlation – Difference between multiple correlation.

**Unit IX : Prediction and Wherry – Doolittle method:**

Meaning of predication – Two Variables regression equations – Multiple regression equations.

**Unit X:- Wherry Doolittle method of multiple correlation.**

Unit XI Special Co relational and parametric methods:

Chi-Square

Rank – Difference method of correlation. Biserial Correlation

Phi-Coefficient, Contingency coefficient, Curvilinear, relationship

**Unit XII : Computer programmers with basic knowledge.****Reference Books:**

1. Ferguson, George A. Statistical Analysis in psychology and education (Fifth edi.) Singapore, Mc Graw-hill international Book Co.,1985.
2. Walpole Ronald E. Introduction to statistics (Third Edi) Macmillan publish co. Inc, New York 1982
3. Mendenhal, off Understanding statistics (Second Edi) Belmont california, Wadsworth publishing company Inc., 1976
4. Garrett, Henry E. Wood Worth R.S.; Statistic in psychology and education, Bombay, Vakil & sons Ltd. INDIA, 1981
5. Advance statistic by Clark & Clarke.
6. Steele Robert, and Torrid James A. Principles and procedure of statistics, New York, Mc Graw-hill Book CoM.,1960.
7. Garret, Harry E. and Wood worth R.S. statistic in psychology and education, Bombay, Allied Pacific Private Ltd. 1981

## **Optional Paper – Training Method and Applied Mechanics**

### **Part – ‘A’ Training Methods**

Learning outcome

1. Understand training as performance based science
2. Explain different means and methods of various training
3. Prepare training schedule for various sports and games
4. Appraise types of periodization for performance development
5. Create various training facilities and plans for novice to advance performers
6. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
7. Students will locate and select physical fitness and sports skill tests
8. Students will properly administer psychomotor tests

#### **Unit I :- Principals of training and Conditioning**

Type of training weight training, circuit training, interval, times

Running wind sprint, jogging miles, fartlek training.

Other factors: diet, sleep-rest musical ione and readiness

#### **Unit II :- Fitness**

Basic of physical fitness, basic physical characteristic fitness & training,

Emotional fitness and psychological training.

#### **Unit II :- Strength Development:**

Maximum strength, elastic strength, strength endurance, absolute and relative strength, external resistance and the athletes ability to express force, static muscular activity, dynamic muscular activity, strength development training

#### **Unit IV: Speed Development :**

Speed in Sports, Speed Development Training For Speed Development the Speed Barrier Endurance and Speed Training.

#### **Unit V : Endurance Development**

Training Method- Duratin-Repetirion Competition and Testing Endurance Sports.

**Unit VI: Mobility Development**

Mobility Classification Factors influencing Mobility Role of Mobility,  
Mobility Training: Mobility Unit Construction- Mobility Derivation.

**Unit VII:** Physiological Effort of Training:

**Unit VIII:** Training Schedules – Seasons and Levels-Concept of Trainer System  
Role of Trainer in Programmed Implementation.

**Unit XI:** Testing Processes & Tools Strength Speed- Endurance Vital Capacity  
Blood Pressure- Pulse rate. Apparatus Spire Meter Spignomono  
Meter-Lig Dynamo Meter-Intru Pulse Apparatus.

**Unit X:** The Erect or Drugs, Alcohol and Smoking on Performance.

**Unit XI:** Effect of climatic changes and High Altitude on Human Performance.

**Part-B Applied Mechanics**

**Unit I:** Nature and Scope of Applied Mechanics in Physical Education  
Movement Mechanics in the Body

**Unit II: a)** Concepts of Application of Mechanics in Sports Static and Dynamic  
Balance (Equilibrium).

Force-Movement of Force Centripetal and Centrifugal.

Force of Gravity, Spin and Friction, Impact -Leaves, Newton's

Laws of Motion Velocity and Action-Reaction types of Motion -Rotary  
and Linear Motion-Angular Kinetics, Linear Kinetics, Kinematics  
Linear, Kinematics Center of Gravity Falling Bodies. Path of  
Projection-Work Power and Energy.

**B)** Guiding Principles Derived From the Application of Above  
Mechanical Concepts.

**Unit III : Hydrodynamics constructions:**

Concepts & Application of Mechanics in Sports in the Aqua Media  
Flotation. Buoyant Force-Specific Gravity Center of Buoyancy-Rotative  
Motion Fluid Resistance-Gyro Scoping Action-Guiding Principles

Derived From the Application of the Above Mechanical Concepts in the Aqua Media.

**Unit IV: Aero Dynamic Constructs :**

Principal of Cinematographic Analysis-Application of Cinematographic & Video Analysis Motor Ideograms Avoidance of Errors of Measurements.

**Unit IV: Analysis dynamic constructions:**

Principal of cinematographic analysis – application of cinematographic & video analysis motor ideograms avoidance of errors of measurement

**Reference Books:**

1. Johnson C.R.Fisher, A.G.Scientific Basis of Athletic Conditioning. Philadelphia ,Lea Febiger1972.
2. Singh,H Sport Training General Theory and Method N.I.S., Patiala, 1984.
3. Singh, Hardayal,Science of Sports Trainig,New D.A.V Publications.
4. Fronce Wand Field,Dorothy Marking and John M.Cooper Track and Field fundamental for Girls & Women, London C.V.Mosby Company 70.
5. L. Matevan ,Sports Training U.S.S.R Publication, New Delhi.
6. Frank N. Dich. Sports Training Principles, London M Lepus Book Co.
7. Amol, Robert & Gaines, Charles Sport Talent New Zealand, Penguin Books.
8. Bunn, John W. Scientific Principal of Coaching Eagle wood Cliffs N.J. Prentice Hall.
9. Harre, Dierich Principles of Sports Training Berlin Sportverlag.



## **Optional Paper – Measurement And Evaluation In Physical Education**

### Learning outcome

1. Students will understand the concept of Test, Measurement, Evaluation and Assessment Procedure in Physical Education and give examples of each
2. Students will differentiate formative and summative evaluation, Process and Product evaluation
3. Students will identify the purposes of measurement and Evaluation
4. Students will describe the features of Technical and administrative feasibility that should be considered when selecting test
5. Students will locate and select physical fitness and sports skill tests
6. Students will properly administer psychomotor tests

**Unit I:** Meaning of the term Measurement and evaluation. Basic Principles & functions of measurements and evaluation – Brief history of Measurement in Physical Education –Place of measurement and evaluation in Phy.Edu.

**Unit II:** Critical of test selection – Scientific Authenticity, Reliability, Validity, Objectivity, Norms– Administrative feasibility & educational application

**Unit III:** Tests Classification – Standard test – Objective and Subjective tests. Construction of Tests: Knowledge tests (Written Tests) & Skill tests (Evaluation of knowledge test steps in constructions of knowledge & skill tests.)

**Unit IV:** Maturity, Nutrition Body Size and form \_ Nutrition – Evaluating Nutrition, Nutritional test evaluation body Dimensions – Somato types – Posture, Values Test of Antero Posterior Posture, Lateral Deviation and Spine foot measurement.

**Unit V:** Determination of Center of Gravity of the human body – Graphic method, and Analytical rate, Respiratory Volume, Tidal Volume – Vital Capacity Audition & visual Reaction time, body fat, Grip Strength. Leg Strength & Flexibility.

**Unit VI:** Strength test – Kraus Weber Muscular Tests – Rogers Physical Fitness, Index Suggested Changes in the PFI test. Physiological fitness – Mc curdy Larson test of Organic efficiency cremation blood – piosis tests, Harvard step test, Kuper's 12 minutes continuous Run / Walk test.

**Unit VII:** Testing instrument– Expire Graph, Peak Flow meter chromatograph, Duckle method and Analytical method.

**Unit VIII:** Motor fitness – Oregon motor fitness test, California physical performance tests, revised AAHPER Youth fitness tests, Motor fitness tests of the armed forces. The JCR test, New York State Physical Fitness test, Purdue University Motor fitness test, Shafer Girl’s motor fitness test, Evaluation of motor Fitness test, sit-ups and chins. Inter relationship and self-scoring.

**Unit IX:** General motor Abilities – the concept of general motor Ability equating by specific activities, equating by general abilities, strength index – strength abilities of girls. MC Cloy’s General motor ability & Capacity test, Motor educability – LOWA Brace test. Explosive muscular vertical jump & standing broad jump.

**Unit X:** Measurement of social efficiency – MC Dolly’s behavior rating scale, Blascrchand’s scale, Cowell Social behavior trend index, social Acceptance Evaluation Socio metric Questionnaire. Measurement of general social Efficiency – Bell Adjustment Inventory, the Bereuter Personality Inventory. Cattails Sixteen personality Factor questionnaire & California psychological Inventory.

**Unit XI:** Measurement Programmes – Suggestions for administering tests. Test Personnel, time for testing – Economy of tables, Graphics exhibits Preparation of reports – Co-Operative measurement projects central New York State Projects, Oregon Pilot Physical fitness project.

**Unit XII:** Use of test in meeting the individual needs:

- a) Presentation, interpretation and use of test results.
- b) The teacher
- c) The student
- d) The parent
- e) The Administrator

### **Reference Book:**

1. Clarke, Harrison, Application of measurement to physical Education, Englewood Cliffs, New Jersey: Prentice Hall’76

2. Mathews, Donald K. Measurement in physical Education Philadelphia, London W.B. Saunders co.'58.
3. Margaret H. Safrit, Evaluation in physical education Englewood cliffs, New Jersey: prentice Hall Inc. '81.
4. Barry L. Jonson and jack N. Nelson practical measurements for evaluation in physical education. Delhi: Surjeet Publication.

## **Optional Paper:- Sports Medicine**

### **Learning Outcome**

1. Perform and report on the exploratory analysis of data collected using sports technology
2. Analyze sporting data of various types via astute use of statistical packages.
3. Practice mathematics, statistics, information technology in sport technology related problems.
4. Support a conclusion based upon quantitative prediction, performance and analysis of a sporting team, code, or gaming environment

**Unit I:** - History of sports medicine – its definition aims and objective, nature and functional utility- preventive, curative and rehabilitative aspects.

**Unit II:-** Concept of physical fitness – specific fitness- definition and components of physical fitness.

**Unit III:-** Physiological, pathological and psychological problems of sportsmen before, during and after competition.

**Unit IV:-** Thermo-regulation and sports: Fluid balance, Climatic ant tomes and their possible effects on the physiological function – Heat Exhaustion, Heat camp, Heat stroke, Exposure, Mountain Sickness-High altitude & its effects on performance,

**Unit V:-** Nutrition and Hygiene : Athletic nutrition and malnutrition high calorie diets, Role of vitamins, Minerals, Salts Carballydrate protein, fat loading before tournament, Hygiene of sportsmen Athletes foot, ringworm etc. Importance and need of immunization

**Unit VI:-** Roll of Skills rule and regulation in the prevention of sports injuries and early rehabilitation.

**Unit VII:-** Regional and specific injuries in track and filels and ither major games and their management

**Unit VIII:-** Common injuries and their management

**Unit IX:-** Somato types, physique and performance.

**Unit X:-** Women in sorts: Special problem of female athlete.

**Unit XI:-** Aging and Sports

**Unit XII :-** Sports physiotherapy: History of massage, definition, Muscle relaxations an aid to massage factors to be considered in including relaxation – points to be considered in giving massage - classification, contra indication – effects & uses Hydrotherapy, sauna bath , Electrotherapy & exercise therapy – Sports therapy- Sports therapy.

**Unit XIII:** At tapping and supports – safety gadgets in sports and games.

**Unit XIV:** Drugs and doping: Ergogenic – Artificial aids, Anabolic substances its use and amuses in sports, its effects and dangers.

**Unit XV:** Evaluation in sports medicine – Biometrics – measurement analysis interpretation for evaluation & performance – selection – prediction.

**Reference Books:**

1. Peter G. Stroke A Guide to Sports Medicine Churchill Livingston. Edinburgh, London.79.
2. Armstrong and Trckter injuries and sports London stample press.
3. Dolon J.P. Treatment an prevention of Athletic injuries.
4. Johnson W.R. science and medicine of Exercise and sports, New York, Harper and Smither Publisher.
5. Encyclopedia of sports science and medicine London: Edward Arnold publish.

## **OPTIONAL PAPER – EXERCISE PHYSIOLOGY**

Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

### **Unit I: Introduction and function of muscles:**

Classification of muscles, structure of muscles tissues, various theories of Muscular contraction, Hypertrophy of muscles in relation to physical activity.

### **Unit II: Neuromuscular Physiology:**

Neuron, motor units neuron muscular junction, Bio-electric Potential, Kinesthesia tone moisture and equilibrium.

### **Unit III: Bio-Energies:**

Fule for muscular work, energy for muscular contraction, Aerobic & Anaerobic systems. Inter relationship of aerobic and Anaerobic system with special reference to different activities Anaerobic – Threshold training.

### **Unit IV: Operational Dynamic:**

Physiological changes due to Exercise and training: Effect of exercise on various systems, - oxygen debt, second wind, micro circulation. Effect of Exercise and training on carbohydrates, Fat and protein metabolism- control of variables in training.

### **Unit V: Sports Ergonomics:**

Works capacity under different environmental conditions such as hot, humid, cold and high altitude.

### **Unit VI: Sports Nutrition:**

Physiological consideration of diet in relation components, quantities and significance, sports and diet, diet before during and after competition Glycogen boosting – calorie calculator. Determination of energy cost of various sports activities.

**Unit VII:** Sex differences and sports.

**Unit VIII:** Effect of smoking, drinking, drugs and athletic performance, Dope Testing.

**Unit IX:** Aging and Exercise, Basic principles and guidelines for construction of cardio respiratory endurance exercise for the aged.

**Unit X: Physical conditioning:**

General principles of physical training, development of muscular strength and local endurance, development of Aerobic & Anaerobic endurance.

**Unit XI:** Functional tests E.M.G. Instrumentation.

**Unit XII: Physiology for the physically handicapped**

- a) Neuro Muscular condition
- b) Skelete – Muscular condition.
- c) Cardio – Muscular condition

**Reference Books:**

1. Astrance: P.P. and K.Rodhal Text Book of work physiology, New York, MCGraw book company.
2. Berger, A.R. applied Exercise physiology, Philadelphia lea and Febiger.
3. Clarke, David N. Exercise physiology, Eaglewood cliffs, New Jersey, Prentice
4. Curbain T.K. The physiological Effects of Exercise programmed on Adults, springfield: Charles C. Thomas Publisher.
5. Da Vriv H.A. Physiotoy of exercise far physical education and Athletic, Staples press, condon,1976.
6. Karpovioh, P.V. and Siuning W.R. Physiology, New Delhi: Surjeet Publications.
7. Shaver L.G. Essentials of exercise physiology of muscular Activity.
8. Noble Bruce J. Physiology of exercise and sports, saint Louis: Time / Mirror / Mosby college publishing.
9. Sundarajan G.S. Sports Medical Lecturers, Madars, Rasha Publications.
10. Welsh R. Peter and Roy J. shafer (Eds) Current Therpy in Sports Medicine, Toronto: B.C. Becker Inc.

## **Optional Paper :- SPORTS PSYCHOLOGY**

Learning outcomes

1. Understand the basic principles of physiology and Exercise Physiology
2. Apply the knowledge in the field of physical education and movement activity.
3. Analyze the practical knowledge during the practical situation.
4. Remember and recall the definition of physiology and co-relate the principles of physiology.
5. Appraise the effects during the training and practical sessions

**Unit I:** The History and Development of Sports Psychology.

**Unit II:** Psychology and play  
Traditional theories of play  
Twentieth Century theories of Play

**Unit III: Psychology of motor learning.**

Measuring of the term, perceptual motor learning the retention of motor skills transfer of skill, measurement of learning, and learning curve, Attention and its role in learning motor skills.

**Unit IV: Children in Sports:**

Early Psychological experience, motivation of children in sport emotions of Children in sport, child and coach, children and competitive sports.

**Unit V:** Women in sport – issues and controversies.

**Unit VI:** Physical activity and the psychological development of the handicapped.

**Unit VII: Personality of sportsmen and coach:**

Nature of personality, the issue of heredity in personality, personality traits of sportsmen, assessment of personality traits of the coach and his personality.

**Unit VIII: Motivation in Sport:**

Theories in/ or/ motivation, achievement motivation, level of aspiration and achievement, methods and assessing aspiration level, motivation and participation in physical activity dropouts in sports.



**Unit IX: Socio psychological dimension of sport:**

Sport performance in groups, team cohesion, socio metry in sport, leadership sport, sport audience and their effect on performance.

**Unit X: Psychology of competition:**

Psychological characteristics of pre-during and post competition (Anxiety, fear, frustration) Mental training, Psychological preparation for competition – Autogenic training.

**Unit XI: Psycho Dynamics in sports:****Unit XII:**The Evaluation of the superior Athlete:

- a) Typology of Athletics activities based upon their Psychological demands.
- b) Personality assessment.
- c) Assessing the Athlete through field tests.
- d) Motivate of superior athletes.
- e) Psychological preparation of the superior athlete.

**Unit XIII: Aggression and performance:**

- a) Theories of aggression
- b) Aggression in Athletic competition
- c) Sex difference in Aggression
- d) Instruction in Aggression

**Unit XIV: Activation:**

- a) Basic research findings
- b) Activation in sports, research findings
- c) Method of adjusting activation levels of Athletes.

**Reference Books:**

1. Vanke Miroave: Bryant Cratty J. 'Psychology and the Superior Athletic' The Mamillian Co. London.
2. Craty Bryant, 'Psychology in Contemporary Leadership' Englewood cliffs: prentice – Hall Inc. New Jersey.
3. Bruin Richard, 'Psychology in sports methods and application' Collarada state University, Fort Williams, Colorado, Surjeet Publications, Delhi.
4. Lee Wakyn Tackh, Judy Al Bliner, 'Psychology of coaching,Theory and application' Florida International University, Miami Florida Reprinted by Surjeet Publications, New Delhi.
5. Gratty Bryant, 'Movement Behavior and Motor Learning' Philadelphia: Lea and Febiger, 1989.
6. Gratly Bryant J. Career Potential in Physical Activity. Englewood Cliffs, New Jersey's Prentice Hall Inc.

7. Gratly Bryant **Psychology in contemporary sports**. Englewood Cliffs, New Jersey, Prentice Hall Inc.
8. Singer Robert N. **Motor Learning and human performance**. New York Mc Graw Hill Company, 1975.
9. J.N. Schultz and W. Luther '**Autogenic Therapy**' Grune and Stration New York.
10. Cox Richard H. 'Sport Psychology conepts and application' MC Graw Hill, New York.

**Optional Paper: Yoga and Sports Achievement:**

**Subject Outcome:-**

1. To understand the concept and nature of yoga along with its historical background.
2. To gain knowledge regarding the application of yoga to Physical Education and Sports.
3. To understand the anatomy and Physiology of Asanas and Pranayamas.
4. To acquire the skills needed to understand and to overcome environmental problems.
5. To gain knowledge regarding the effect of yogic practices on health aspects.

**Unit I: Understanding of Yoga:**

- Yoga – Definition of Yoga – steps, Asana: Definition of objectives, aims.
- Pranayama – Definition, Aims & Objectives, Mechanism of Pranayama.
- Kriyas, Bandhas, Mudras.
- Ardinal Principles of Yoga practives.

**Unit II: Philosophical Foundation of Yoga**

- Yogic Texts & Yoga Philosophy
- Patanjali Yoga.
- Yoga, Mysticism & Cultural Synthesis.

**Unit III: Scientific Foundation of Yoga**

- Various physiological systems in the body.
- Deep Breathing, Normal breathing – pranayama breathing
- Scientific explanation of Asana & Exercises.
- Physiological implications of different yogic practices.

**Unit IV: Yoga Psychology & Mental Health**

- Meaning & nature
- Characteristics of mental health in western Psychology and Yoga.
- Interpretation of Psychological disturbance in terms of Yoga.
- Mechanism of Patanjala Yoga in controlling psychosomatic disorders.

**Unit V: Yoga, Health & Fitness**

- Health related fitness
- Role of yoga in health & fitness
- Non-slip dominance in relation to health, fitness and performance
- Injuries in yoga & remedies

**Unit VI: Yoga Diet**

- Philosophy of Yoga diet.
- Process of Eating
- Balance diet & concept of Ahara (Svattik, Rajasik, Tamasik)
- Diet & Behavior

**Unit VII: Yoga Practical's (as suggested by Swami Kuvalayanada)**

- Short course of Yoga
- Easy course of Yoga
- Full course of yoga

**Unit VIII: Yoga Practicals**

- Methods of Teaching & Learning
- Yoga Lesson Planning
- Practice Teaching (One Lesson)

**Reference Book:**

1. Pal Satya, 'Yogasana and sadhana' Pustak Mandal, Delhi.
2. Nagendra H.R. 'Yoga and Cancer' Swami Vivekananda Yoga Prakashan, Bangalore.
3. Narendran Shamanthakamani. 'Yoga for Pregnancy' Swami Vivekananda Yoga Prakashan, Bangalore.
4. Nagarathana R. 'Yoga for Arthritis' Swami Vivekananda Yoga Prakashan, Bangalore.
5. Nagarathana R. 'Yoga for Anxiety and Depression' Swami Vivekananda Yoga Prakashan, Bangalore.
6. Srikanta S.S. 'Yoga for Diabetes' Swami Vivekananda Yoga Prakashana, Bangalore.
7. Nagarthana R. 'Yoga for Digestive Disorders' Swami Vivekananda Yoga Prakashan, Bangalore.
8. Nagarthana R. 'Yoga for Hypertension and heart diseases' Swami Vekananada Yoga Prakashan, Bangalore.
9. Nagrthana R. 'Yoga for Asthama' Swami Vivekananda Yoga Prakashan, Bangalore.

10. B.K.S. 'Light on Pranayama pranayama Dipika' Harper Collins, New Delhi.

**THE SEMESTER-WISE DETAILS OF COURSES/CREDITS ARE GIVEN BELOW:  
LL.B. (3 Year Degree Programme)**

<b>I</b>	<b>LL.B First Semester Examination</b>	<b>Credits</b>
1.	Constitutional Law – I	4
2.	Law of Contract	4
3.	Law of Crimes	4
4.	Legal Language	4
5.	Law of Torts Including Motor Vehicle Accident and Consumer Protection Act	4
6.	Optional – I	4
	<b>A. Business Law Group –</b> Banking Law including Negotiable Instrument Act	
	<b>B. Constitutional Law Group –</b> Media and Law	
		<b>Total = 24 Credits</b>
<b>II</b>	<b>LL.B Second Semester Examination</b>	<b>Credits</b>
1.	Constitutional Law – II	4
2.	Special Contract	4
3.	ICT and Legal Research (Soft Skills)	4
4.	Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5.	Jurisprudence	4
6.	Optional – II	4
	<b>A Business Law Group –</b> Insurance Law	
	<b>B. Constitutional Law Group –</b> Health Law	
		<b>Total =26 Credits</b>
<b>III</b>	<b>LL.B. Third Semester Examination</b>	<b>Credits</b>
1.	Family Law – I (Marriage,Divorce and Matrimonial Disputes)	4
2.	Civil Procedure Code	4
3.	Interpretation of Statute	4
4.	Practical Paper – II (Drafting Pleading & Conveyancing)	6
5.	Company Law	4
6.	Optional – III	4
	<b>A Business Law Group –</b> Merger and Acquisition	
	<b>B. Constitutional Law Group –</b> Right to Information	
		<b>Total =26 Credits</b>
<b>IV</b>	<b>LL.B. Fourth Semester Examination</b>	<b>Credits</b>
1.	Family Law – II (Matrimonial Property, Guardianship And Adoption)	4
2.	Public International Law	4
3.	Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	4
4.	Law of Evidence	4
5.	Cyber Law	4
6.	Optional -IV	4
	<b>A. Business Law Group –</b> Competition Law and practice	
	<b>B. Constitutional Law Group –</b> Gender Justice and Feminist Jurisprudence	
		<b>Total =24 Credits</b>

<b>V</b>	<b>LL.B. Fifth Semester Examination</b>	<b>Credits</b>
1.	Intellectual Property Law	4
2.	Property Law Including Transfer of Property Act and Easement Act	4
3.	Administrative Law	4
4.	Practical Paper – III (Moot Court Pre-trial Preparations and Participation in Trial Proceedings)	6
5.	Court Management	4
6.	Optional – V	4
	<b>A. Business Law Group –</b> Direct Tax	
	<b>B. Constitutional Law Group –</b> Law on Education	

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**Total =26 Credits**

<b>VI</b>	<b>LL.B. Sixth Semester Examination</b>	<b>Credits</b>
1.	Labour Law	4
2.	Environmental Law	4
3.	Law of Trusts, Equity and Fiduciary Relationship	4
4.	Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	6
5.	Law on Infrastructure Development	4
6.	Optional – VI	4
	<b>A Business Law Group –</b> Indirect Tax	
	<b>B. Constitutional Law Group –</b> Human Rights Law & Practice	

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**Total =26 Credits**

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**Total Credit requirement for LL.B 3 Years Programme = 152 Credits**

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## COURSE DESIGN OF LL.B 3 YEARS PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical papers	Electives/ Optional	Total number of Papers	Total Marks Allotted	Total Credits
I	5	-	1	6	600	24
II	4	1	1	6	600	26
III	4	1	1	6	600	26
IV	5	-	1	6	600	24
V	4	1	1	6	600	26
VI	4	1	1	6	600	26
Total Number of Compulsory / Foundational Courses = <b>26</b>		Total Number of Practical Papers = <b>04</b>	Total Number of Electives = <b>06</b>	Total Number of papers = <b>36</b>	Total Marks = <b>3600</b>	Total number of Credits for LL.B 3 Years Programme = <b>152</b>



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**GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM  
(Rules & Regulations)**

1	Class/ Home Assignments & Research Paper	- 10 Marks
2	Unit Tests / Moot Courts/ Legal Aid	- 20 Marks
3	Tutorials Based On Case Studies & Legislative Analysis	- 05 Marks
4	Attendance	- 05 Marks

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**Total = 40 Marks**

**GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM  
(Rules & Regulations)**

**1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-**

Long Term Paper	- 05 Marks
2 research papers	- 05 Marks (2.5 Marks Each)

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**Total = 10 Marks**

**EXPLANATION:-**

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

**2. UNIT TESTS:-**

Unit test I	- 10 Marks
Unit test II	- 10 Marks

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**Total = 20 Marks**

**EXPLANATION:-**

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The Topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

### 3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

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**Total = 05 Marks**

#### EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

### 4. ATTENDANCE:-

**Attendance = 05 Marks**

#### EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

#### SPECIAL CLAUSE:-

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

## SYSTEM OF EXAMINATION:

Each paper shall be of out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each Paper.

## THE CREDIT SYSTEM:

The credits specified for LL.B. 3 year programme describe the weightages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown. There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10. The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

## THE GRADING SYSTEM UNDER CBCS

### Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

## **EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:**

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

## **STANDARDS OF PASSING:**

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

## **RULES OF PROMOTION FOR LL.B 3 YEARS PROGRAMME:**

The candidate, who has taken admission in LL.B 3 years Course, subject to the clearance of eligibility and after securing required credits as prescribed by the university, shall be automatically promoted to next year. However, a Student who has not put up sufficient credits shall not be promoted to next year. In order to take admission in the final year, the Candidate has to pass in all the papers of 1<sup>st</sup> year with minimum 6.00 Grade points at both University Examination and Internal Examination.

## AWARD OF HONOURS:

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

*The Criteria for the award of Degree are given as follows:*

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 < CGPA < 10.00	O	Outstanding	80 < Marks < 100
9.00 < CGPA < 9.49	A+	Excellent	70 < Marks < 80
8.00 < CGPA < 8.99	A	Very Good	60 < Marks < 70
7.00 < CGPA < 7.99	B+	Good	55 < Marks < 60
6.00 < CGPA < 6.99	B	Satisfactory	50 < Marks < 55
CGPA Below 6.00	F	Fail	Marks below 50



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## **B.A. LL.B. (5 Year Degree Programme-10 Semester Programme)**

<b>I. B.A LL.B First Semester</b>	<b>Credits</b>
1. General English – I	5
2. Political Science – I	5
3. Sociology – I (General Principles)	5
4. Economics – I (General Principles)	5
5. Law of Torts including Motor Vehicle Accident and Consumer Protection Act	5
<b>Total Credits= 25</b>	
<b>II. B.A LL.B Second Semester</b>	<b>Credits</b>
1. General English – II	5
2. Political Science – II	5
3. Sociology – II (Sociology of India)	5
4. Economics – II (Indian Economics)	5
5. Law of Contract	5
6. International Human Rights	5
<b>Total Credits= 30</b>	
<b>III. B.A Law Third Semester</b>	<b>Credits</b>
1. General English – III (Including Legal Writing)	5
2. Political Science – III (Concepts & Ideology)	5
3. Sociology & Law – III	5
4. ICT & Legal Research (Soft Skills)	5
5. Constitutional Law – I	5
<b>Total Credits= 25</b>	
<b>IV. B.A LL.B Fourth Semester</b>	<b>Credits</b>
1. English – IV (Legal Language)	5
2. Political Science – IV (International Relations)	5
3. Economics and Law III	5
4. Family Law – I (Marriage, Divorce and Matrimonial Disputes)	5
5. Constitutional Law – II	5
6. Private International Law	5
<b>Total Credits= 30</b>	
<b>V. B.A LL.B Fifth Semester</b>	<b>Credits</b>
1. Political Science – V (Politics & Foreign Policy in India)	5
2. Law of Crimes	5
3. Jurisprudence	5
4. Family Law – II (Matrimonial Property, Guardianship & Adoption)	5
5. Optional – I	5
<b>A. Business Law Group –</b> Banking law including Negotiable Instrument Act	
<b>B. Constitutional Law Group –</b> Media and Law	
<b>Total Credits= 25</b>	

<b>VI. B.A LL.B Sixth Semester</b>	<b>Credits</b>
1. Political Science – VI (Public Administration)	5
2. Cyber Law	5
3. Special Contract	5
4. Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5. International Dispute Resolution Bodies	5
6. Optional – II	5
<b>A Business Law Group –</b> Insurance Law	
<b>B. Constitutional Law Group –</b> Health Law	
<b>Total Credits=</b>	<b>31</b>

<b>VII. B.A LL.B Seventh Semester</b>	<b>Credits</b>
1. Civil Procedure Code & Limitation Act	5
2. Interpretation of Statutes	5
3. Company Law	5
4. Property Law Including Transfer of Property Act and Easement Act	5
5. Optional – III	5
<b>A Business Law Group –</b> Merger and Acquisition	
<b>B. Constitutional Law Group –</b> Right to Information	
<b>Total Credits=</b>	<b>25</b>

<b>VIII. B.A LL.B Eighth Semester</b>	<b>Credits</b>
1. Labour Laws	5
2. Law of Evidence	5
3. Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	5
4. Practical Paper-II (Drafting, Pleading & Conveyancing)	6
5. Maritime Law	5
6. Optional –IV	5
<b>A. Business Law Group –</b> Competition Law & Practice	
<b>B. Constitutional Law Group –</b> Gender Justice and Feminist Jurisprudence	
<b>Total Credits=</b>	<b>31</b>

<b>IX. B.A LL.B Ninth Semester</b>	<b>Credits</b>
1. Administrative Law	5
2. Environmental Law	5
3. Law on Infrastructure Development	5
4. Practical Paper-III (Moot Court, Pre-trial Preparations and Participation in trial proceedings)	6
5. Optional – V	5
<b>A. Business Law Group –</b> Direct Tax	
<b>B. Constitutional Law Group –</b> Law on Education	
<hr/> <b>Total Credits = 26</b>	

<b>X. B.A LL.B Tenth Semester</b>	<b>Credits</b>
1. Public International Law	5
2. Intellectual Property Laws	5
3. Court Management	5
4. Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	7
5. International Environmental Law	5
6. Optional – VI	5
<b>A Business Law Group –</b> Indirect Tax	
<b>B. Constitutional Law Group –</b> Human Rights Law & Practice	
<hr/> <b>Total Credits=32</b>	

**Total Requirement of Credits for B.A. LL.B 5 years Programme= 280 Credits**

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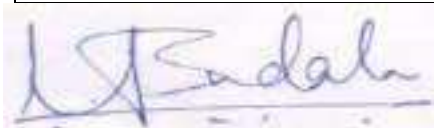




## COURSE DESIGN OF B.A. LL.B 5 YEAR PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical Papers	Electives/ Optionals	Total number of Papers	Total Marks Allotted	Total Credits
I	5	-	-	5	500	25
II	6	-	-	6	600	30
III	5	-	-	5	500	25
IV	6	-	-	6	600	30
V	4	-	1	5	500	25
VI	4	1	1	6	600	31
VII	4	-	1	5	500	25
VIII	4	1	1	6	600	31
IX	3	1	1	5	500	26
X	4	1	1	6	600	32
Total Number of Compulsory / Foundational Courses <b>=45</b>		Total Practical papers <b>= 04</b>	Total Number of Electives <b>= 06</b>	Total Number of papers <b>= 55</b>	Total Marks <b>= 5500</b>	Total number of Credits for BA. LL.B 5 Years Programme <b>= 280</b>



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## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

- **Class/ Home Assignments & Research Paper** - 10 Marks
- **Unit Tests / Moot Courts/ Legal Aid** - 20 Marks
- **Tutorials Based On Case Studies & Legislative Analysis** - 05 Marks
- **Attendance** - 05 Marks

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**Total = 40 Marks**

## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

#### 1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

- Long Term Paper - 05 Marks
- 2 research papers - 05 Marks (2.5 Marks Each)

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**Total = 10 Marks**

#### EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

#### 2. UNIT TESTS:-

- Unit test I - 10 Marks
- Unit test II - 10 Marks

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**Total = 20 Marks**

#### EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The Topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

### 3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

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**Total = 05 Marks**

#### EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

### 4. ATTENDANCE:-

**Attendance = 05 Marks**

#### EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

#### SPECIAL CLAUSE

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

## SYSTEM OF EXAMINATION

Each paper shall be of 100 Marks out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each paper.

### THE CREDIT SYSTEM:

The credits specified for B.A. LL.B. 5 years programme describe the weight ages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown.

There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10.

The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

### THE GRADING SYSTEM UNDER CBCS

#### Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

## **EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:**

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

## **STANDARDS OF PASSING**

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

## **RULES OF PROMOTION FOR B.A LL.B 5 YEARS PROGRAMME**

In a 5 year LL.B programme, a Student who is admitted in 1st year, subject to the clearance of eligibility and after securing required credits for that year, shall automatically be promoted to next year. However, a Candidate who has not put minimum credits shall not be promoted to next year of the programme. In order to get promotion in 3rd year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 grade points in each paper at both University Examination and Internal Examination. Similarly, in order to get promotion to 4th Year, a Candidate has to pass in all the papers of 1st year and 2nd year. In order to get promotion in last year, a Candidate has to pass in all the papers of 1st year, 2nd year and 3rd year of the programme.

## **SINGLE DEGREE:**

As per the UGC rules, a Candidate admitted in **B.A. LL.B 5 Years Programme** is entitled for Single Degree only (**B.A. LL.B**) that too after the successful completion of 5 years programme. They shall not be entitled for Dual Degree as the duration of the Programme is only five years.

## **AWARD OF HONOURS:**

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

*The Criteria for the award of Degree are given as follows:*

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
9.50 < CGPA < 10.00	O	Outstanding	80 <Marks <100
9.00 < CGPA < 9.49	A+	Excellent	70 <Marks <80
8.00 < CGPA < 8.99	A	Very Good	60 <Marks <70
7.00 < CGPA < 7.99	B+	Good	55 <Marks <60
6.00 < CGPA < 6.99	B	Satisfactory	50 <Marks <55
CGPA Below 6.00	F	Fail	Marks below 50



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**BB.A. LL.B (5 Year Degree Programme-10 Semester Programme)**

<b>I. BB.A LL.B First Semester</b>	<b>Credits</b>
1. General English – I	5
2. Fundamentals of Management	5
3. Sociology – I (General Principles)	5
4. Economics – I (General Principles)	5
5. Law of Torts including Motor Vehicle Accident and Consumer Protection Act	5
<b>Total Credits = 25</b>	
<b>II. BB.A LL.B Second Semester</b>	<b>Credits</b>
1. General English – II	5
2. Human Resource Management	5
3. Sociology – II (Sociology of India)	5
4. Economics – II (Indian Economics)	5
5. Law of Contract	5
6. Business Organization	5
<b>Total Credits =30</b>	
<b>III. BB.A LL.B Third Semester</b>	<b>Credits</b>
1. General English – III (Including Legal Writing)	5
2. Business Ethics	5
3. Sociology & Law – III	5
4. ICT & Legal Research (Soft Skills)	5
5. Constitutional Law – I	5
<b>Total Credits = 25</b>	
<b>IV. BB.A LL.B Fourth Semester</b>	<b>Credits</b>
1. General English – IV (Legal Language)	5
2. Business Communication	5
3. Economics and Law III	5
4. Family Law – I (Marriage, Divorce And Matrimonial Disputes)	5
5. Constitutional Law – II	5
6. Financial & Management Accounting	5
<b>Total Credits =30</b>	
<b>V. BB.A LL.B Fifth Semester</b>	<b>Credits</b>
1. Business Environment	5
2. Law of Crimes	5
3. Jurisprudence	5
4. Family Law – II (Matrimonial Property, Guardianship & Adoption)	5
5. Optional – I	5
<b>A. Business Law Group –</b> Banking law including Negotiable Instrument Act	
<b>B. Constitutional Law Group –</b> Media and Law	

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**Total Credits = 25**

<b>VI. BB.A LL.B Sixth Semester</b>	<b>Credits</b>
1. Marketing Management	5
2. Cyber Law	5
3. Special Contract	5
4. Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5. Financial Management	5
6. Optional – II	5
<b>A Business Law Group –</b> Insurance Law	
<b>B. Constitutional Law Group –</b> Health Law	

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**Total Credits =31**

<b>VII. BB.A LL.B Seventh Semester</b>	<b>Credits</b>
1. Civil Procedure Code & Limitation Act	5
2. Interpretation of Statutes	5
3. Company Law	5
4. Property Law Including Transfer of Property Act and Easement Act	5
5. Optional – III	5
<b>A Business Law Group –</b> Merger and Acquisition	
<b>B. Constitutional Law Group –</b> Right to Information	

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**Total Credits =25**

<b>VIII. BB.A LL.B Eighth Semester</b>	<b>Credits</b>
1. Labour Laws	5
2. Law of Evidence	5
3. Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	5
4. Practical Paper-II (Drafting, Pleading & Conveyancing)	6
5. International Business	5
6. Optional –IV	5
<b>A. Business Law Group –</b> Competition Law & Practice	
<b>B. Constitutional Law Group –</b> Gender Justice and Feminist Jurisprudence	

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**Total Credits =31**



<b>IX. BB.A LL.B Ninth Semester</b>	<b>Credits</b>
1. Administrative Law	5
2. Environmental Law	5
3. Law on Infrastructure Development	5
4. Practical Paper-III (Moot Court. Pre-trial Preparations and Participation in trial proceedings)	6
5. Optional – V	5
<b>A. Business Law Group –</b> Direct Tax	
<b>B. Constitutional Law Group –</b> Law on Education	
<hr/> <b>Total Credits =26</b>	

<b>X. BB.A LL.B Tenth Semester</b>	<b>Credits</b>
1. Public International Law	5
2. Intellectual Property Laws	5
3. Court Management	5
4. Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	7
5. Important Documentation in Business	5
6. Optional – VI	5
<b>A Business Law Group –</b> Indirect Tax	
<b>B. Constitutional Law Group –</b> Human Rights Law & Practice	
<hr/> <b>Total Credits =32</b>	

**Total Credits for BB.A LL.B 5 Years Programme = 280**

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## COURSE DESIGN OF BB.A. LL.B 5 YEAR PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical Papers	Electives/ Optional	total number of Papers	total Marks Allotted	total Credits
I	5	-	-	5	500	25
II	6	-	-	6	600	30
III	5	-	-	5	500	25
IV	6	-	-	6	600	30
V	4	-	1	5	500	25
VI	4	1	1	6	600	31
VII	4	-	1	5	500	25
VIII	4	1	1	6	600	31
IX	3	1	1	5	500	26
X	4	1	1	6	600	32
Total Number of Compulsory /Foundational Courses  <b>=45</b>		Total Practical papers  <b>= 04</b>	Total Number of Electives  <b>= 06</b>	Total Number of papers  <b>= 55</b>	Total Marks  <b>= 5500</b>	Total number of Credits for BBA. LL.B 5 Years Programme  <b>= 280</b>



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## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

- **Class/ Home Assignments & Research Paper** - 10 Marks
- **Unit Tests / Moot Courts/ Legal Aid** - 20 Marks
- **Tutorials Based On Case Studies & Legislative Analysis** - 05 Marks
- **Attendance** - 05 Marks

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**Total = 40 Marks**

## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

#### 1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

- Long Term Paper - 05 Marks
- 2 research papers - 05 Marks (2.5 Marks Each)

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**Total = 10 Marks**

#### EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

#### 2. UNIT TESTS:-

- Unit test I - 10 Marks
- Unit test II - 10 Marks

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**Total = 20 Marks**

#### EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

### 3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

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**Total = 05 Marks**

#### EXPLANATION:-

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

### 4. ATTENDANCE:-

**Attendance = 05 Marks**

#### EXPLANATION:-

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

### SPECIAL CLAUSE

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a matter of his/her right.

## SYSTEM OF EXAMINATION

Each paper shall be of out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each paper.

### THE CREDIT SYSTEM:

The credits specified for BB.A. LL.B. 5 years programme describe the weightages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown.

There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10.

The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

## THE GRADING SYSTEM UNDER CBCS

### Point Scale for Grading

Marks Range of marks (Out of 100)	Grade Point	Grade
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

## **EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:**

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

## **STANDARDS OF PASSING**

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

## **RULES OF PROMOTION FOR BB.A LL.B 5 YEARS PROGRAMME**

In a 5 year LL.B programme, a Student who is admitted in 1st year, subject to the clearance of eligibility and after securing required credits for that year, shall automatically be promoted to next year. However, a Candidate who has not put minimum credits shall not be promoted to next year of the programme. In order to get promotion in 3rd year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 grade points in each paper at both University Examination and Internal Examination. Similarly, in order to get promotion to 4th Year, a Candidate has to pass in all the papers of 1st year and 2nd year. In order to get promotion in last year, a Candidate has to pass in all the papers of 1st year, 2nd year and 3rd year of the programme.

## SINGLE DEGREE:

As per the UGC rules, a Candidate admitted in **BB.A. LL.B 5 Years Programme** is entitled for Single Degree only (**BB.A. LL.B**) that too after the successful completion of 5 years programme. They shall not be entitled for Dual Degree as the duration of the Programme is only five years.

## AWARD OF HONOURS:

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

*The Criteria for the award of Degree are given as follows:*

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 < CGPA < 10.00	O	Outstanding	80 < Marks < 100
9.00 < CGPA < 9.49	A+	Excellent	70 < Marks < 80
8.00 < CGPA < 8.99	A	Very Good	60 < Marks < 70
7.00 < CGPA < 7.99	B+	Good	55 < Marks < 60
6.00 < CGPA < 6.99	B	Satisfactory	50 < Marks < 55
CGPA Below 6.00	F	Fail	Marks below 50



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**COURSE DESIGN OF LL.M (TWO YEAR PROGRAM)  
(SEMESTER PATTERN)**

Semester	Core Course	Elective Course	Practical Paper	Open Course	General Course	Total No. of Papers	Total Marks	Total Credits
First Semester	02	02	01	NIL	NIL	05	500	30
Second Semester	02	02	01	NIL	NIL	05	500	30
Third Semester	NIL	02	01	02	01	06	600	30
Fourth Semester	Dissertation	NIL	NIL	NIL	NIL	01	200	30
<b>Total</b>						17	1800	120

**1. Scheme of Examination:** The examinations for two year LL.M. Program will be held in each Semester. The medium of instruction and the examination shall be in English. Every paper shall carry 100 marks out of which 60 marks are for written examination i.e. University Examination (UE) & 40 marks for Internal Assessment (IA). There shall be no written examination (i.e UE) for Practical Paper and Dissertation.

▪ **Internal Assessment (IA) will be as follows:**

- Unit Tests - 15 marks
- Home assignment - 10 marks
- Tutorial/Class Presentation - 10 marks
- Attendance - 5 marks

▪ **Practical Paper**

- The student has to appear for a Practical Paper in First, Second and Third Semester each respectively.
- The practical paper shall carry 100 marks each which shall be evaluated on the basis of the performance of the students under following headings:
  - Research Project (Doctrinal/Non-doctrinal)
  - Research publication
  - Clinical work
  - Law teaching

▪ **Dissertation**

- Dissertation shall carry 200 marks which shall be evaluated as follows:
  - Written work submission – 100 Marks
  - Research Publication – 50 Marks  
(in Peer reviewed journal having ISSN No.)
  - Presentation and Viva voce – 50 marks

The student shall also have to submit two progress reports signed by their research guide highlighting the work carried out by the student during his research.



2. **Credit System:** Choice based credit system designed as per the University rules has been implemented for this program. The two year LL.M. program will have **120 credits**. Each credit is of 15 hours.
3. **Grading System:** The University has adopted a **10-point absolute grading system** for grading in each head of passing. The grading system shall be as shown in Table-1 below.

The Grading System under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
Marks < 50	0	D

The performance indicators O, A+, A, B+, B, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, and Poor. It may be noted that entries in Table are meant for converting marks in individual courses to grade points. The respective grade points can also be computed from the following formulas given in Table-2.

**The Formula to calculate the Grade Points (GP):**

Suppose that '**Max**' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, set  $x = \text{Max}/10$  (since we have adapted 10-point system). Then GP is calculated by the formulas shown in Table-2. After computing the grade point the grade can be found from Table-1.

Table-2: Formula to Calculate Grade Point in Individual Evaluations

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq M \leq 10x$	10
$5.5x \leq M \leq 8x$	$\text{Truncate}(M / x) + 2$
$4x \leq M \leq 5.5x$	$\text{Truncate}(M/x) + 1$

**4. Computation of Grade Point Averages: Cumulative performance indicators such as GPA, SGPA, or CGPA shall be calculated as described and illustrated below.**

- I. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. **The weights for performance at UE and IA shall respectively be 60% and 40%.**
- II. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table in (2) above) shall be the GPA for the course.**
- III. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of a learner when he/she completes the programme is the final result of the learner.

- IV. The SGPA is calculated by the formula 
$$SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

- V. The CGPA is calculated by the formula 
$$CGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

- VI. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result.

**5. Standards of Passing**

- For all courses, both UE and IE constitute separate heads-of-passing (HoP).
- In order to pass in such courses and to 'earn' the assigned credits the learner must obtain a minimum grade point of **6.0 (50% marks) at UE** and also a minimum grade point of **6.0 (50% marks) at IA**;
- The GPA for a course will be calculated only if the learner passes at the UE.
- A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP.

- Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP.

**6. Rules of Promotion:** - The admission of students to the Two Year LL.M Program shall be on the yearly basis. A student admitted to the First Year of the course who complies with norms of the credit system and internal assessment with minimum 75% of attendance in the first year shall be automatically promoted to the Second year.

**7. Award of Honours:**

1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 4.

Table 4: Criteria for the Award of Honours at the End of the Programme

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 < CGPA < 10.00$	O	Outstanding	$80 < Marks \leq 100$
$9.00 < CGPA < 9.49$	A+	Excellent	$70 < Marks \leq 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks < 70$
$7.00 < CGPA < 7.99$	B+	Good	$55 < Marks \leq 60$
$6.00 < CGPA < 6.99$	B	Satisfactory	$50 < Marks \leq 55$
CGPA below 6.00	F	Fail	Marks Below 50

2. Formula to compute equivalent percentage marks for specified CGPA:

$$\%Marks(CGPA) = \begin{cases} 10 \times CGPA - 10, & \text{if } 5.00 \leq CGPA \leq 6.00 \\ 5 \times CGPA + 20, & \text{if } 6.00 \leq CGPA \leq 8.00 \\ 10 \times CGPA - 20, & \text{if } 8.00 \leq CGPA \leq 9.00 \\ 20 \times CGPA - 110, & \text{if } 9.00 \leq CGPA \leq 9.50 \\ 40 \times CGPA - 300, & \text{if } 9.50 \leq CGPA \leq 10.00 \end{cases}$$



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# COURSE STRUCTURE FOR LL.M (TWO YEAR PROGRAM) (SEMESTER PATTERN)

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## ➤ Core courses

- Law and social transformation in India (5 credits)
- Indian constitutional law: The new challenges (5 credits)
- Judicial process (5 credits)
- Legal education and research methodology (5 credits)

## ➤ Elective Courses

### ▪ Business law

- Law of industrial and Intellectual property (5 credits)
- Legal regulation of economic enterprises (5 credits)
- Law of export import regulation (5 credits)
- Banking laws (5 credits)
- Insurance laws (5 credits)
- Corporate finance (5 credits)

### ▪ Human rights law

- Concept and development of human rights (5 credits)
- Human rights and international order (5 credits)
- Protection and enforcement of human rights in India (5 credits)
- Human rights of disadvantaged groups (5 credits)
- International humanitarian law and refugee law (5 credits)
- Science technology and human rights (5 credits)
- Dissertation (30 credits)

### ▪ Intellectual Property Law

- General Regime of Intellectual Property Rights (5 credits)
- Law Relating to Patents (5 credits)
- Law Relating to Trademarks (5 credits)
- Law Relating to Copyright (5 credits)
- Biotechnology and IPR (5 credits)
- Law of geographical indication and traditional knowledge (5 credits)

### ▪ Environment Law

- Environment and Development: Law and Policy (5 credits)
- Environment and international legal order (5 credits)
- Environment protection in India (5 credits)
- Environment protection and disaster management (5 credits)
- Climate change and legal order (5 credits)
- Biological diversity and legal order (5 credits)

➤ **Practical Paper**


- Practical Paper I (10 Credits)
- Practical Paper II (10 Credits)
- Practical Paper III (10 Credits)

➤ **Interdisciplinary Courses**

- Educational Technology and E-learning (3 credits)
- Computer Application and Legal research (3 credits)

➤ **Value Added Course**

- Soft skills and Personality Development (4 credits)



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**BHARATI VIDYAPEETH  
(DEEMED TO BE) UNIVERSITY, PUNE  
ABHIJIT KADAM INSTITUTE OF MANAGEMENT AND  
SOCIAL SCIENCES, SOLAPUR**

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**Criteria I**

**1.1.3**

*Total number of courses having focus on  
employability/ entrepreneurship/ skill  
development offered*



Director

Bharati Vidyapeeth Deemed University, Pune  
Abhijit Kadam Institute of Management  
and Social Sciences, Solapur

Sr.	Name of the Course	Employability Skill	Entrepreneurship Development	Skill Development
1	Management Concepts & Applications			Y
2	Managerial Economics			Y
3	Financial & Management Accounting	Y		
4	Organization Behaviour		Y	Y
5	Statistical Techniques			Y
6	Legal Aspects of Business			Y
7	Business Communication			Y
8	Data Analysis Using Advance Excel			Y
9	Marketing Management	Y		Y
10	Financial Management	Y		
11	Human Resource Management	Y		
12	International Business	Y		
13	Production & Operations Management	Y		
14	Research Methodology	Y		
15	Business Environment			Y
16	Business Ethics and Corporate Governance			Y
17	Strategic Management			Y
18	Operations Research			Y
19	Entrepreneurship Development		Y	Y
20	Summer Internship	Y		
21	Innovation, Technology and Change Management	Y		
22	CONSUMER BEHAVIOUR	Y		
23	Services Marketing	Y		
24	Investment Analysis and Portfolio Management	Y		
25	Management of Financial Services	Y	Y	
26	Training and Development	Y	Y	
27	Labor Laws	Y	Y	
28	Regulatory Aspects of International Business	Y	Y	
29	Export Import Policies, Procedures and Documentation	Y	Y	
30	Quality Management	Y	Y	
31	Production Planning and Control	Y	Y	
32	System Analysis and Design	Y	Y	
33	Information Systems Security and Audit	Y	Y	
34	RURAL MARKETING	Y	Y	
35	SUPPLY CHAIN MANAGEMENT IN AGRIBUSINESS	Y	Y	
36	Introduction to Retailing	Y	Y	
37	Retail Management and Franchising	Y	Y	
38	PROJECT MANAGEMENT	Y	Y	
39	Environment and Disaster Management			Y
40	Sales & Distribution Management			Y
41	Integrated Marketing Communications	Y	Y	
42	Corporate Finance	Y	Y	

  
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43	International Financial Management	Y	Y	
44	Personnel Cost and Compensation Management	Y	Y	
45	Performance Management System	Y	Y	
46	International Marketing	Y	Y	
47	Global Business Strategies	Y	Y	
48	Logistics & Supply Chain Management	Y	Y	
49	Industrial Management	Y	Y	
50	RDBMS with ORACLE	Y	Y	
51	Enterprise Business Applications	Y	Y	
52	Use of Information Technology in Agribusiness Management	Y	Y	
53	Cooperatives Management	Y	Y	
54	Merchandising, Display and Advertising	Y	Y	
55	Supply Chain Management in Retailing	Y	Y	
56	Micro-Finance	Y	Y	
57	RURAL ENTREPRENEURSHIP	Y	Y	
58	Agriculture and Indian Economy	Y	Y	
59	Marketing of Agro Products	Y	Y	
60	CONTEMPORARY RETAIL MANAGEMENT	Y	Y	
61	RETAIL PLANNING	Y	Y	
62	RETAIL AND DISTRIBUTION MANAGEMENT	Y	Y	
63	RURAL RETAILING	Y	Y	
64	Data Science	Y		
65	Optimization Techniques			
66	Software Project Management			Y
67	Lab on Current Trends			
68	Dot Net Technologies	Y		
69	Internship Project	Y		
70	Applied Database Management Systems			Y
71	Computer Networks			Y
72	Java Programming	Y		
73	Computational Statistics			Y
74	Lab on Applied Database Management Systems	Y		
75	Lab on Java Programming	Y		
76	Object Oriented Software Engineering			Y
77	Cloud Computing Concepts			Y
78	Data structures using Python	Y		
79	Data Warehousing and Data Mining			Y
80	Web Supporting Technologies	Y		
81	Lab on Data Structures using Python	Y		
82	Business English - Communication			
83	Business Organization & Systems			
84	Micro Economics			
85	Business Accounting			
86	Foundations of Mathematics and Statistics			
87	Environmental Science			

  
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88	Principles of Management			Y
89	Macro Economics			Y
90	Management Accounting			Y
91	Business Statistics			Y
92	Computer Applications for Business (Theory - 3 & Lab -2)			
93	Organizational Behavior			
94	Principles of Marketing			Y
95	Introduction to Financial Management	Y		
96	Entrepreneurship Development		Y	
97	Enhancing Personal & Professional Skills (Theory - 3 & Lab -2)			Y
98	Human Resource Management	Y	Y	
99	International Business	Y	Y	
100	Business Research	Y		Y
101	Business Laws			Y
102	Summer Internship Report & Viva	Y		Y
103	MANAGEMENT OF SERVICES	Y		
104	Introduction to Operations Research	Y		Y
105	Industrial Exposure, (Mini Project)	Y	Y	
106	Introduction to Strategic Management			Y
107	Disaster Management			Y
108	Consumer Behavior	Y	Y	
109	Sales and Distribution Management	Y	Y	
110	Integrated Marketing communication	Y	Y	
111	Digital Marketing	Y	Y	
112	Elements of Financial Services	Y	Y	
113	Introduction to Management Control Systems	Y	Y	
114	Elements of Corporate Finance	Y	Y	
115	International Finance and Financial Risk Management	Y	Y	
116	Performance & Compensation Management	Y	Y	
117	Training & Development	Y	Y	
118	Management of Industrial Relations	Y	Y	
119	Cross Cultural HRM	Y	Y	
120	International Marketing	Y	Y	
121	Export Import Procedures and Documentation	Y	Y	
122	Basics of International Finance	Y	Y	
123	Fundamentals of International Economics	Y	Y	
124	Entrepreneurship & New Ventures Creation	Y	Y	
125	Corporate Entrepreneurship	Y	Y	
126	E - Commerce			Y
127	Managing Family Business		Y	Y
128	Introduction to Financial Markets and Financial Institutions		Y	Y
129	Capital Market Operations	Y	Y	
130	Commodity Markets	Y	Y	
131	Introduction to Derivatives : Equity and Currency	Y	Y	
132	Fundamentals of Information Technology			
133	Algorithm and program Design			Y
134	C Programming -1	Y		

  
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135	Business organization system			
136	Business Mathematics			
137	Lab on MS-Office Suite			Y
138	Lab on C Programming - I	Y		
		Y		
139	Computer Organization and Architecture			
140	DBMS I			
141	C Programming - II			
142	Financial Accounting			Y
143	Principles of Management			Y
144	Lab on C Programming - II			
145	Operating Systems			
146	Software Engineering			
147	DBMS II			Y
148	Statistics			Y
149	Multimedia Technology			Y
150	Lab on Oracle and Multimedia	Y		
151	Lab on Linux Operating System	Y		
152	Computer Networks			Y
153	Software Testing			Y
154	Java Programming	Y		
155	Operations Research			Y
156	Entrepreneurship Development		Y	
157	Lab on Java	Y		
158	Introduction to the Internet Technologies			Y
159	Object Oriented Analysis and Design			Y
160	C# Programming	Y		
161	Lab on Internet Technology and C# Programming	Y		Y
162	Project	Y		
163	Data Warehousing and Data Mining			Y
164	Web Programming	Y		
165	Software project Management			Y
166	Business Analytics			Y
167	Lab on Web programming	Y		
168	Project	Y		Y



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## **BHARATI VIDYAPEETH**

**(Deemed to be University), Pune**

**'A+' Accreditation (Third Cycle) by 'NAAC' in 2017**

**Category - I - Deemed to be University Grade by UGC**

**'A' Grade University Status by MHRD Govt. of India  
Ranked 63<sup>rd</sup> By NIRF – 2020 Category.**

**FACULTY OF MANAGEMENT STUDIES**

**MASTER OF BUSINESS ADMINISTRATION**

**MBA (General)**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**SYLLABUS**

**Applicable with effect from 2020-21**

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**BHARATI VIDYAPEETH (DEEMED to be UNIVERSITY), PUNE**  
**Faculty of Management Studies**  
**Master of Business Administration– (MBA-General)**  
**Revised Course Structure (To be effective from 2020-2021)**

**I. Title:**

- a) **Name of the Programme: Master of Business Administration (General)**
- b) **Nature & duration of the Programme: *FULL TIME* Post-Graduate Degree Programme of TWO YEARS (approved by AICTE).**

**II. Introduction :**

The Master of Business Administration (General) is a full time two-year program offered by Bharati Vidyapeeth (Deemed to be University), Pune and conducted at its Management Institutes in Pune, New Delhi, Karad, Kolhapur, Sangli, and Solapur. All the institutes have experienced faculty members, excellent Laboratories, Library, and other modern facilities to provide proper learning environment to the students. This programme is very well received by the industry.

**III. Rationale for Syllabus revision:**

The Vision and Mission statements of the MBA (General) program embodies the spirit of the mission of the University and vision of Hon'ble Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth (Deemed to be University), Pune, which is to usher in "Social Transformation through Dynamic Education

In view of the dynamic nature of the market, economy and evolving expectations of the stakeholders such as students, faculty members and industry in particular, the syllabus is revised periodically. Last revision was in the year 2016-17.

Over the past four years, feedback was received from various stakeholders and considering the changes that in the macro environment, a need was felt to revise the syllabus so as to suffice the requirements of the industry and society. This revised draft is the result of inputs received from the industry, academia, alumni and all stakeholders. This revised draft is the result of inputs received time to time from the industry, academia, alumni and all stakeholders

**IV. Vision Statement of MBA (General) Program :**

To facilitate creation of Dynamic and Effective Business Professionals, Managers and Entrepreneurs who can transform the corporate sector, cater to the needs of the society and contribute towards Nation building.

**V. Objectives of the MBA (General) Program :**

At Bharati Vidyapeeth (Deemed to be University), Pune the objective of MBA (General) Program is to provide world class Business Education and develop dynamic managers, entrepreneurs and business leaders. The Program aims to enhance decision

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making capabilities of upcoming managers by imparting critical thinking and analytical abilities.

## **VI. MBA Program: Program Outcomes**

On the successful completion of this Program a student shall be able to:

1. Apply the knowledge of management theories and practices to solve business problems.
2. Foster analytical and critical thinking abilities for data-based decision making.
3. Learn new technologies with ease and be productive at all times
4. Ability to understand, analyze and communicate global, economic, legal and ethical aspects of business.
5. Read, write, and contribute to Business literature
6. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

## **VII. Eligibility for Admission:**

Admission to the programme is open to any graduate (10+2+3) of any recognized university satisfying the following conditions:

1. The candidate should have secured at least 50% (45% for SC/ST) in aggregate at graduate level university examination.
2. The Candidate studying in final year of Bachelor's degree may also apply. Admission of such candidates will remain provisional until submission of final result certificates in original.
3. Subject to the above conditions, the final admission is based solely on
  - a) The merit at the All India entrance test (B-MAT) followed by Group Discussion & Personal Interview conducted by Bharati Vidyapeeth (Deemed to be University), Pune
  - b) Submission of Migration Certificate, Transference Certificate, anti-ragging affidavit etc.

## **VIII. Structure of the Program:**

The MBA-General program is of **102** credits which need minimum two years divided into four semesters to complete. During third semester students have to opt for

specialization(s) and study the specialization courses in depth. The programme also includes Summer Internship / Summer Training of 50 days. The medium of instruction and examination will be only English.

A student would be required to complete the course within FOUR academic years from the date of admission.

## **IX. Credits – 102**

The definition of credits is based on the following parameters;

- i) Learning hours put in by the learner
- ii) Learning outcomes
- iii) Contents of the syllabus prescribed for the course etc.

In this system each credit can be described as a combination of 03 (**THREE**) components such as Lectures (L) + Tutorials (T) + Practice (P).

These components are further elaborated for an effective teaching learning process;

- Lectures (L): Classroom lectures delivered by Faculty member in an interactive mode.
- Tutorials (T): Sessions that includes participatory discussions, presentations by the students, case study discussions etc.
- Practice (P): It includes LAB sessions for IT related courses & Business Communication and practice sessions for courses like Accounts, Mathematics, Statistics and field assignments etc.
  
- ONE Credit = 12 Hours ; In terms of a Semester of 15 (FIFTEEN) weeks,
  
- Every ONE hour session per week of Lecture (L) = 01 (one) credit per Semester
  
- TWO hour sessions per week of Tutorial (T) = 01(one) credit per Semester
  
- TWO hour sessions per week of Practice (P) = 01(one) credit per Semester
- a) Every **ONE** hour session per week of Lecture (L) = 01 (one) credit per Semester
  
- b) **TWO** hour sessions per week of Tutorial (T) = 01(one) credit per Semester
  
- c) **TWO** hour sessions per week of Practice (P) = 01(one) credit per Semester

## **X: Examination :**

### **1. A) Scheme of Examination:**

Courses having Internal Assessment (IA) / *Internal Examination(IE)* and University Examinations (UE) shall be evaluated by the respective institutes and the University at the term end for 50(fifty) and 50(fifty) Marks respectively. The total marks of IA and UE shall be 100 Marks and it will be converted to grade points and grades.

For courses having *only Internal Assessment (IA) / Internal Examination(IE)* the respective institutes will evaluate the students in various ways through *Class Test, Presentations, Field Assignments and Mini Projects* for a total of 100 marks during the term. Then the marks will be converted to grade points and grades.

*Open Courses shall be evaluated for 100 marks only (hundred marks only).*

**B) Components of continuous evaluation system (CES) :**

Following are the suggested components of CES,

- a) Case Study/ Caselet /Situation Analysis- (Group Activity or Individual Activity)
- b) Class Test
- c) Field Assignment
- d) Role play
- e) Industry Analysis (Group Activity or Individual Activity)
- f) Business plan
- g) Quiz
- h) Workbook / scrapbook
- i) Presentations
- j) Mini Research Projects

**Breakup of CES marks (50)**

Class Participation / Attendance	10
Mid-term	15
End-term	15
Class Tests, Assignments, MOOCs, Presentation / Mini-Project, Case Study/Lab work etc.	10

**2. Grading System for Programmes under Faculty of Management Studies:**

The Faculty of Management Studies, Bharati Vidyapeeth (Deemed to be University), Pune has suggested the use of a 10-point grading system for all programmes designed by its different Board of Studies.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks≤80	A+	9
60≤Marks≤70	A	8
55≤Marks≤60	B+	7
50≤Marks≤55	B	6
40≤Marks≤50	C	5
Marks < 40	D	0



### Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

- If learner fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.
- A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he/she has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.
- The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 50% and 50% respectively.
- GPA is calculated by adding the UE marks out of 50 and IA marks out of 50. The total marks out of 100 are converted to grade point, which will be the GPA.

### Formula to calculate Grade Points (GP)

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max}/10$  (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the program is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C<sub>k</sub> is the Credit value assigned to a course and GP<sub>k</sub> is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$CGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

where, C<sub>k</sub> is the Credit value assigned to a course and GP<sub>k</sub> is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrollment and also during the semester for which CGPA is calculated. **The CGPA shall be calculated up to two decimal place accuracy.**

**The formula to compute equivalent percentage marks for specified CGPA:**

% marks (CGPA)	10 * CGPA-10	If 5.00 ≤ CGPA ≤ 6.00
	5 * CGPA+20	If 6.00 ≤ CGPA ≤ 8.00
	10 * CGPA-20	If 8.00 ≤ CGPA ≤ 9.00
	20 * CGPA-110	If 9.00 ≤ CGPA ≤ 9.50
	40 * CGPA-300	If 9.50 ≤ CGPA ≤ 10.00

### **Award of Honours:**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed.

The criteria for the award of honors are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

### **3. ATKT Rules:**

A student is allowed to carry any number of backlog papers of Semester I and Semester II while going into Semester III. However, a student must clear all papers of Semester I and Semester II so as to become eligible for appearing in Examinations at Semester IV.

### **XI: A. Dual Specialization:**

M.B.A (General) Programme 2020-21 offers Dual Specialization to the students in second year of MBA Programme. Under dual specialization students are required to select any **Two Specialization Groups** from the list given below :

#### **i) Prerequisite for offering a combination of Specialization Groups**

The Institute will offer the Specializations proposed only if minimum **Ten** students opt for the same.

#### **ii) Specialization Combinations:**

Two Specializations may be chosen from the following choices :

<b>Specialization Choices</b>
Marketing Management
Financial Management
Human Resource Management
Information Technology Management
International Business Management
Production & Operations Management
Agribusiness Management
Retail Management
Project Management

## **B. Summer Internship:**

At the end of Semester II, each student shall undertake Summer Internship in an Industry for 50 (**Fifty Days**). It is mandatory for the students to seek written approval from the Faculty Guide about the Topic and the Organization before commencing the Summer Internship.

During Summer Internship students are expected to take necessary guidance from the faculty guide allotted by the Institute. To do it effectively they should be in touch with their guide through e-mail or phone.

Summer Internship Project should be a research project or it may be an operational assignment that involves working by the students in an organization.

### ***In case of an operational assignment***

- 1) Students are expected to do a project work in an organization wherein they are doing Summer Internship.
- 2) The students should identify specific problems faced by the organization in a functional area in which the assignment is given.  
e.g.
  - a) Sales - sales targets are not achieved for a particular product or service in a given period of time.
  - b) Finance – mobilization & allocation of financial resources.
  - c) HR – Increase in employee turnover ratio.
- 3) In this study students should focus on
  - Identifying the reasons / factors responsible for the problems faced by the organization
  - Collection of data(Primary & Secondary) related to reasons /factors responsible for these problems
  - Data Analysis tools & interpretation
  - Findings & observations.
  - Suggestions (based on findings & observations) for improving the functioning of the organization.

The ***learning outcomes and the utility to the organization*** must be highlighted in Summer Internship Project Report.

- 4) General chapterization of the report shall be as under;
- 1) Introduction and Literature Review: - This chapter will give a reader the background of problem area, specific problem & how you come across it?
  - 2) Company profile: -
  - 3) Objectives of the study:-
  - 4) Data collection: -
  - 5) Data analysis & interpretation: -
  - 6) Findings & observations: -
  - 7) Suggestions:-

Annexure: -

- Questionnaire
- References.

5. Technical details:

1. The report shall be printed on A-4 size white bond paper.
2. 12 pt. Times New Roman font shall be used with 1.5 line spacing for typing the report.
3. 1” margin shall be left from all the sides.
4. Considering the environmental issues, students are encouraged to print on both sides of the paper.
5. The report shall be hard bound as per the standard format of the cover page given by the Institute and shall be golden embossed.
6. The report should include a Certificate (on company’s letter head) from the company duly signed by the competent authority with the stamp.
7. The report shall be signed by the respective guide(s) & the Director of the Institute 10 (Ten) days before the viva-voce examinations.
8. Student should prepare two hard bound copies of the Summer Internship Project Report and submit one copy in the institute. The other copy of the report is to be kept by the student for their record and future references.
9. In addition to this, students should prepare two soft copies of their SIP reports & submit one each in Training & Placement Department of the Institute & Library

The Summer Internship shall be assessed out 100 Marks. The break-up of these marks is as under;

Sr. No.	Assessment Criteria	Marks
1	Summer Internship Report	50 (Fifty only)
2	Viva- voce examination	50 (Fifty only)

<b>TOTAL MARKS</b>	<b>100</b>
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The examiners' panel shall be approved as per the University Guidelines.

The viva –voce shall evaluate the project based on

- i. Actual work done by the student in the organization
- ii. Student's knowledge about the company & Business Environment
- iii. Learning outcomes for the student
- iv. Utility of the study to the organization

## Question Paper Pattern for University Examinations

The pattern of question paper for the courses having University Examinations will be as follows:

**Title of the Course**

**Day:** **Total Marks: 50**

**Date:** **Time: 02 Hours**

**Instructions:**

- a. Attempt any **THREE** questions from Section I and any **TWO** questions from **SECTION II**.
- b. All questions carry **EQUAL** marks.
- c. Answers to both the Sections should be written in the **SAME** answer book.

<b>SECTION – I</b>		<b>30 Marks</b>
<i>It should contain 05 questions covering the syllabus &amp; should test the conceptual knowledge of the students.</i>		
Question		Marks
Q.1	.....	(10 marks)
Q.2		(10 marks)
Q.3		(10 marks)
Q.4		(10 marks)
Q.5.	Write <b>Short Notes</b> on ANY TWO	(10 marks)
<b>SECTION – II</b>		<b>20 Marks</b>
<i>It should contain 03 questions covering the entire syllabus &amp; should be based on application of the Concepts</i>		
Q.6.		(10 marks)
Q.7.		(10 marks)
Q.8		(10 marks)

### **XII. Structure of the Syllabus**

The MBA Programme as per Semesters, Credits and Marks is as follows:

Semester	Credits	Marks Distribution
I	25	900
II	25	900
III	31	1000
IV	21	800
<b>Total</b>	<b>102</b>	<b>3600</b>

The detailed structure is as follows

### MBA – (General)- Semester I

Course Code	Semester – I	Credits	IE	UE	Total Marks
101	Management Concepts & Applications	3	50	50	100
102	Managerial Economics	3	50	50	100
103	Financial & Management Accounting	3	50	50	100
104	Organizational Behaviour	3	50	50	100
105	Statistical Techniques	3	50	50	100
106	Legal Aspects of Business	3	50	50	100
107	Business Communication	3	50	50	100
108	Data Analysis Using Advance - Excel	2	100	-	100
See below	Open 1	2	100	-	100
	<b>Total No. of Credits</b>	25	550	350	900

*Open Courses: Students can opt any one course from the following*

Course Code	Open Course
109	Computers Application for Business
110	Social Media Management
111	Current Affairs

**\*\* In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

### MBA - (General)- Semester II

Course Code	Semester II	Credits	IE	UE	Total Marks
201	Marketing Management	3	50	50	100
202	Financial Management	3	50	50	100
203	Human Resource Management	3	50	50	100
204	International Business	3	50	50	100
205	Production & Operations Management	3	50	50	100
206	Research Methodology	3	50	50	100
207	Business Environment	3	50	50	100
208	Business Ethics and Corporate Governance	2	100	-	100
See below	Open	2	100	-	100
	<b>Total No. Credits</b>	25	550	350	900



*Open Courses: Any one course from the following*

Course Code	Open course
209	Introduction to Business Analytics
210	E-commerce Applications
211	Managerial Skills for Effectiveness

**\*\* In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

### MBA -(General)- Semester III

Course Code	Semester – III	Credits	IE	UE	Total Marks
301	Strategic Management	3	50	50	100
302	Operations Research for Managers	3	50	50	100
303	Entrepreneurship Development and Innovation Management	3	50	50	100
See groups	Specialization I - E-(i)	3	50	50	100
	Specialization I - E-(ii)	3	50	50	100
See groups	Specialization II - E-(i)	3	50	50	100
	Specialization II - E-(ii)	3	50	50	100
304	**Summer Internship	6	50	50	100
305	Change Management	2	100	-	100
See below	Open	2	100	-	100
	<b>Total No. of Credits</b>	<b>31</b>	<b>600</b>	<b>400</b>	<b>1000</b>

*Open Courses: Students can opt any one course from the following*

Course Code	Open Course
306	Digital Marketing
307	Corporate Taxation
308	Negotiation Management

**\*\* In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

**MBA - (General) -Semester IV**

<b>Course Code</b>	<b>Semester IV</b>	<b>Credits</b>	<b>IE</b>	<b>UE</b>	<b>Total Marks</b>
401	Project Management	3	50	50	100
See groups	Specialization I - E-(iii)	3	50	50	100
	Specialization I - E-(iv)	3	50	50	100
See groups	Specialization II - E-(iii)	3	50	50	100
	Specialization II - E-(iv)	3	50	50	100
402	Environment & Disaster Management	2	100	-	100
403	E-Business Management	2	100	-	100
See below	Open	2	100	-	100
	<b>Total No. Credits</b>	21	550	250	800

*Open Courses: Any one course from the following*

<b>Course Code</b>	<b>Open course</b>
404	Introduction to Data Science
405	Artificial Intelligence for Managers
406	Rural Entrepreneurship

**\*\* In addition to the above ;Add on Course having 02 (TWO) credits may be offered by the Institute on Extra fees for the course from the student.**

## LIST OF SPECIALIZATION - ELECTIVES

### Elective: Marketing Management :

Sem III	
Code.	Name of the Course
MK01	Consumer Behaviour
MK02	Services Marketing
Sem IV	
MK03	Sales & Distribution Management & B2B
MK04	Integrated Marketing Communication

### Elective: Financial Management

Sem III	
Code.	Name of the Course
FM01	Investment Analysis & Portfolio Management
FM02	Management of Financial Services
Sem IV	
FM03	Corporate Finance
FM04	International Financial Management

### Elective: Human Resource Management

Sem III	
Code.	Name of the Course
HR01	Human Resource Planning and Development
HR02	Labour Laws - I
Sem IV	
HR03	Compensation and Benefits Management
HR04	Competency Mapping and Performance Management

### Elective: International Business Management

Sem III	
Code.	Name of the Course
IB01	Regulatory Aspects of International Business
IB02	Export Import Policies, Procedures and Documentation
Sem IV	
IB03	International Marketing
IB04	Global Business Strategies

**Elective: Production & Operations Management**

<b>Sem III</b>	
<b>Code.</b>	<b>Name of the Course</b>
PM01	Quality Management
PM02	Business Process reengineering
<b>Sem IV</b>	
PM03	Logistics & Supply Chain Management
PM04	World Class Manufacturing Practices

**Elective: Information Technology Management**

<b>Sem III</b>	
<b>Code.</b>	<b>Name of the Course</b>
IT01	System Analysis & Design
IT02	Information System Security & Audit
<b>Sem IV</b>	
IT03	RDBMS with Oracle
IT04	Enterprise Business Applications

**Elective: Agribusiness Management**

<b>Sem III</b>	
<b>Code.</b>	<b>Name of the Course</b>
AM01	Rural Marketing
AM02	Supply Chain Management in Agribusiness
<b>Sem IV</b>	
AM03	Use of Information Technology in Agribusiness Management
AM04	Cooperatives Management

**Elective: Retail Management**

<b>Sem III</b>	
<b>Code.</b>	<b>Name of the Course</b>
R01	Introduction to Retailing
R02	Retail Management & Franchising
<b>Sem IV</b>	
R03	Merchandising, Display & Advertising
R04	Supply Chain Management in Retailing

**Elective: Project Management**

<b>Sem III</b>	
<b>Code.</b>	<b>Name of the Course</b>
PR01	Project Risk Management
PR 02	Microsoft Project 2010
<b>Sem IV</b>	
PR 03	Advance Project Management
PR 04	Scanning Business Environment for Project

**SYLLABUS**  
(w.e.f. 2020\_21)

**MBA - (GENERAL)**

**SEMESTER – I**

Programme: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	101	Management Concepts and Applications	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :
<ol style="list-style-type: none"> <li>1) To understand the basic Management Concepts and Skills.</li> <li>2) To study the Principles and Functions of Management.</li> <li>3) To learn the Applications of Principles of Management.</li> <li>4) To familiar with the Functional areas of management.</li> <li>5) To study the Leadership styles in the organization.</li> <li>6) To expose to the Recent trends in management.</li> </ol>
Learning Outcomes:
<p>On completion of this course, the students will be able to</p> <ol style="list-style-type: none"> <li>1) Understand the Management Concepts and Managerial Skills.</li> <li>2) Focus on the Principles and Functions of Management.</li> <li>3) Learn to apply the Principles of Management in practice.</li> <li>4) Familiarize with the Functional areas of management.</li> <li>5) Use the effective Leadership styles in the organization.</li> <li>6) Recognize the Recent trends in management.</li> </ol>

Unit	Contents	Sessions
1	<b>Introduction to Management:</b> Definition and meaning of Management, Characteristics of Management, Scope of Management, Scientific Management Approach by F.W. Taylor, Principles of Management by Henry Fayol, Levels of management, Managerial Skills, Functions of Management - Planning, Organizing, Staffing, Directing and Controlling. concept of "POSDCORB".	06
2	<b>Planning:</b> Meaning of Planning, Nature and importance of Planning, Process of Planning, Principles of Planning, Types of Plans - Single Use Plans - Repeated Use Plans, Types of Objectives, Setting Objectives, Management by Objectives (MBO), Decision making- Process of Decision making, Decision making models: classical, Administrative, Political and Vroom-Jago Model.	06
3	<b>Organizing:</b> Meaning of Organizing, Process of Organizing and Creation of Organization structure, Types of organizational structures - Formal and Informal, <b>Staffing:</b> Meaning of Staffing, Human Resource Planning - Job Analysis, Recruitment - Sources of Recruitment, Selection - Process of Selection, Placement of employees, Departmentalization - Bases of Departmentalization, Line and Staff Relationship.	07
4	<b>Directing:</b> Meaning of Directing, Principles of Directing, Leadership Styles, Span of	08

	Management - Determinants of Span of Management, Centralization and Decentralization, Authority, Responsibility and Accountability, Delegation of Authority - Advantages of Effective Delegation. Barriers to effective delegation-Guidelines for effective delegation-Distinctions between Delegation & Decentralization.	
5	<b>Controlling:</b> Importance of coordination, Meaning of Controlling, Need for effective controlling, Process of Controlling, Techniques of Controlling, Relationship between Planning and Controlling, Use of IT for Controlling, Control techniques, Zero Base Budgeting and Management audit.	08
6	<b>Functional Departments And Sections</b> - HR, Marketing, Production & Operations, Finance, etc. <b>Introduction To Business Sectors:</b> Manufacturing (Automobile, Pharmaceutical, etc ), Service ( IT, Telecom, Banking, Insurance, etc), Management of SMEs.	10

### Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	S.A. Sherlekar and V.S. Sherlekar	Principles of Business Management		Himalaya Publishing House.
2 – National	Dr. T. Ramasamy	Principles and Practice of Management		Himalaya Publishing House.
3 – National	L.M. Prasad	Principles and Practice of Management,		Sultan Chand & Sons
4 – International	Koontz, Weihrich and A. RamchandraAryasri	Principles of Management		Tata McGraw-Hill.
5 – International	Peter F. Drucker	Practice of Management		Harper Business.
6 – International	Richard L. Daft	Principles of Management		Cengage Learning.
7-Lead Textbook	Pravin Durai	Principles of Management – Text	2019	Pearson

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.ft.com/business-education">http://www.ft.com/business-education</a> .
2	<a href="http://www.makeinindia.com/policy/new-initiatives">http://www.makeinindia.com/policy/new-initiatives</a> . <a href="https://india.gov.in/">https://india.gov.in/</a> <a href="http://www.makeinindia.com/policy/new-initiatives">http://www.makeinindia.com/policy/new-initiatives</a> <a href="https://mygov.in/group/digital-india">https://mygov.in/group/digital-india</a> <a href="http://www.skilldevelopment.gov.in/World%20Youth%20Skills%20Day.html">www.skilldevelopment.gov.in/World%20Youth%20Skills%20Day.html</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/learn/management-fundamentals-healthcare-administrators">https://www.coursera.org/learn/management-fundamentals-healthcare-administrators</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	102	Managerial Economics	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :		
Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To acquaint learners with basic concepts and techniques of economic analysis and their application to managerial decision making.</li> <li>ii) To prepare the students for the use of managerial economics tools and techniques in specific business settings.</li> <li>iii) Comprehend how changes in the environment in which firms operate influence their decision-making.</li> <li>iv) To develop managerial skills for developing business strategy at the firm level.</li> <li>v) To understand recent developments in strategic thinking and how it is applied to economic decision making.</li> <li>vi) Identify possible external and internal economic risks and vulnerabilities to economic growth and identify policies to address them.</li> </ul>		
Learning Outcomes:		
<ul style="list-style-type: none"> <li>i) Understand the role of managers in firms.</li> <li>ii) Analyze the demand and supply conditions and assess the position of a company.</li> <li>iii) Estimation of production function and finding out optimal combination of input using Isoquant and Isocost.</li> <li>iv) Design competition strategies including costing, pricing and market environment according to the nature of the product and structure of market.</li> <li>v) Enable to know the importance of various sectors of the economy and their contribution towards national income.</li> <li>vi) Investigate potential output and compute output gaps and diagnose the outlook for the economy.</li> </ul>		
Unit No.	Contents	Hrs.
1	Introduction to Economics For Business -Nature and Scope of Managerial Economics, Firm and its Objectives, Theories of Firm, Role of Managerial Economics in Decision Making.	5
2	Demand Theory and supply- Demand and its Determination - Law of Demand, Types of Demand, Demand Function, Economic Concept of Elasticity (Price, Cross and Income Elasticity). Concept of Supply, Demand and Supply Equilibrium, Shift in Demand and Supply.	9
3	Theory of Production -Production function, Law of Diminishing Marginal Returns, Three stages of Production, The Long run Production function, Isoquant and Isocost curve, Importance of Production function in managerial decision making.	8
4	Theory of Cost - Classification of Costs - Short Run and Long Run Cost, Cost Function, Scale Economies, Scope Economies, Dual Relationship Between Cost and Production Function, Least cost combination of input (Producer Equilibrium).	7



5	Market Structure - Introduction to different types of Market- <i>Price Determination under Perfect Competition</i> - Introduction, Market and Market Structure, Perfect Competition, Price-Output Determination under Perfect Competition, Short-run Industry Equilibrium, Short-run Firm Equilibrium, Long-run Industry Equilibrium, Long-run Firm Equilibrium under Perfect Competition. <i>Pricing Under Imperfect Competition</i> - Introduction, Monopoly, Price Discrimination under Monopoly, Monopolistic Competition, Oligopoly (Kinked Curve), Game theory.	9
6	Macroeconomic markets and Integration -Product Market: Saving and Investment Function, consumption function. Aggregate demand and Aggregate supply. Fiscal Policy and Monetary Policy for uplifting the economy. Types of Business Cycle.	7
Activity	Students are required to prepare workbook (practical file) -Hands on practice towards diagrams of Demand, Supply, Markets and price determination. News from economic times –For Policy Making, Industry related and country specific. Applications of managerial economics in different firms. Comparing the GDP and other key indicators across the countries. Macroeconomic indicators and the role of fiscal policy in uplifting economy.	

### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	DN Dwivedi	Managerial Economics	2015	Vikas Publishing
2 National	G.S Gupta	Managerial Economics: Micro Economic	2004	McGraw Hill
3 National	H.L.Ahuja	Managerial Economics	2017	S. Chand
4 International	D. Salvatore	Managerial Economics	2015	Oxford
5 International	R.Dornbusch, S.Fischer	Macro Economics	2018	McGraw Hill
6 International	A.Koutsoyiannis	Micro Economics	1979	Mac Millan

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.rbi.org.in">www.rbi.org.in</a>
2	<a href="http://www.economicshelp.org">www.economicshelp.org</a>
3	<a href="http://www.federalreserve.gov">www.federalreserve.gov</a>
4	<a href="http://www.economist.com">www.economist.com</a>
5	<a href="http://www.bbc.com">www.bbc.com</a>
6	International Journal of Economic policy in Emerging Economies <a href="https://www.inderscience.com/jhome.php?jcode=ijepee">https://www.inderscience.com/jhome.php?jcode=ijepee</a>
7	Journal of International Economics <a href="https://www.journals.elsevier.com/journal-of-international-economics/">https://www.journals.elsevier.com/journal-of-international-economics/</a>

## MOOCs:

Resources No	Web site address
1	Swayam –IIT <a href="https://swayam.gov.in/nd1_noc20_mg20/preview">https://swayam.gov.in/nd1_noc20_mg20/preview</a>
2	Swayam –IIM <a href="https://swayam.gov.in/nd2_imb19_mg16/preview">https://swayam.gov.in/nd2_imb19_mg16/preview</a>
3	EDX –IIM <a href="https://www.edx.org/course/introduction-to-managerial-economics-2">https://www.edx.org/course/introduction-to-managerial-economics-2</a>
4	Coursera <a href="https://www.coursera.org/specializations/managerial-economics-business-analysis">https://www.coursera.org/specializations/managerial-economics-business-analysis</a>

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Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	103	<i>Financial and Management Accounting</i>	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

#### Course Objectives :

- i) To acquaint the learners with the fundamentals of Financial Accounting.
- ii) To orient to the Accounting mechanics involved in preparation of Books of Accounts and Financial Statements of a sole proprietor
- iii) To make the students familiar with International Accounting Standards and International Financial Reporting Standards (IFRS)
- iv) To introduce the concepts of Cost and Management Accounting
- v) To orient the students about application of budgetary control as a technique of Management Accounting
- vi) To acquaint the students with application of Standard Costing and Marginal Costing as techniques of Management Accounting.

#### Learning Outcomes :

- I. Learners will able to know the fundamentals of Financial Accounting and Accounting Principles
- II. Learners will demonstrate the ability to prepare Financial Statements of a sole proprietor
- III. Learners will understand the utility and importance of International Accounting Standards and International Financial Reporting Standards (IFRS)
- IV. Learners will be familiar with concepts of Cost and management Accounting
- V. Learners will be able to apply the technique of Budgetary Control
- VI. Learners will be able to apply the technique of Standard Costing and Marginal Costing.

Name : -	Syllabus – Financial and Management Accounting	Hrs.
Unit No : 1	<b>Introduction to Financial Accounting</b> Financial Accounting: Definition, Objectives and Scope Accounting Concepts and Conventions, GAAP, Branches of Accounting Accounting Cycle, End Users of Financial Statements	7
Unit No : 2	<b>Accounting Mechanics</b> Principles of Double Entry Book-Keeping, Journal Ledger and Preparation of Trial Balance Preparation of Trading, Profit & Loss Account and Balance Sheet of a Sole Proprietor	11
Unit No : 3	<b>Introduction to International Accounting Standards</b> Development of international accounting Standards and financial reporting rules. Role of ICAI and Ministry of Corporate affairs in setting up Accounting Standards. Need and Advantages of International Financial Reporting Standards (IFRS) IFRS for Small and Medium Enterprises(SMEs).	5
Unit No : 4	<b>Introduction to Cost and Management Accounting</b> Cost Accounting: Meaning and Importance Classification of Costs, Preparation of Cost Sheet Management Accounting: Definition, Nature and Scope Distinction between Financial Accounting and Management Accounting	6
Unit No : 5	<b>Techniques of Management Accounting (Budgetary Control)</b>	8

	Meaning, Objectives, Advantages and Limitations of Budgetary Control Types of Budgets Preparation of Flexible Budget and Cash Budget	
Unit No : 6	<b>Techniques of Management Accounting (Standard Costing and Marginal Costing)</b> Meaning of Standard Costing, Steps to implement Standard Costing Variance Analysis of Material and Labour Costs Marginal Costing – Meaning of Marginal Cost, Characteristics and Advantages of Marginal Costing, Cost-Volume-Profit Analysis – Profit/Volume ratio, Break-Even Analysis and Margin of Safety	11

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	S.N. Maheswari	An Introduction to Accounting	11 <sup>th</sup> edition	Vikas
2 – National	Ambarish Gupta	Financial Accounting for Management	5 <sup>th</sup> edition	Pearson
3 – National	Ashok Seghal, Deepak Seghal	Taxman's Financial Accounting	2015 edition	Taxman
4 – International	Colin Drury, Huddersfield	Cost and Management Accounting	7 <sup>th</sup> 2011	Cengage Learners
5 – International	Pauline Weetman Fin	Financial and Management Accounting – An introduction,	7 <sup>th</sup> 2015	Pearson
6 – International	Jan Williams , Sue Haka , Mark Bettner , Joseph Carcell	Financial & Managerial Accounting,	18 <sup>th</sup> edition	McGraw hill

### Online Resources:

Online Resources No	Web site address
1	<a href="https://www.moneycontrol.com/">https://www.moneycontrol.com/</a>
2	<a href="http://www.icai.org">www.icai.org</a>
3	<a href="https://www.ifrs.org/">https://www.ifrs.org/</a>
4	<a href="https://icmai.in/icmai">https://icmai.in/icmai</a>
5	<a href="https://www.rbi.org.in/">https://www.rbi.org.in/</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/learn/wharton-accounting">https://www.coursera.org/learn/wharton-accounting</a>
2	<a href="https://www.classcentral.com/course/whartonaccounting-769">https://www.classcentral.com/course/whartonaccounting-769</a>
3	<a href="https://swayam.gov.in/nd2_cec19_cm04/preview">https://swayam.gov.in/nd2_cec19_cm04/preview</a>
4	<a href="https://swayam.gov.in/nd1_noc19_mg36/preview">https://swayam.gov.in/nd1_noc19_mg36/preview</a>
5	<a href="https://www.coursera.org/learn/accounting-for-managers">https://www.coursera.org/learn/accounting-for-managers</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	104	Organizational Behavior	
Type	Credits	Evaluation	Marks
Full Credit	3	CES	UE:IE = 50:50=100

#### Course Objectives:

- i) To create Dynamic and Effective Business Professionals and Leaders.
- ii) To transform the individuals to cater to the needs of the society and contribute to Nation building
- iii) To develop entrepreneurs to register different aspects of their business under remedial individual and team behavior.
- iv) To improve Organizational Behavior by having a sound knowledge of cultural differences.

#### Learning Outcomes :

- i) Understand the expected individual and team behavior in business world.
- ii) The awareness of applicable leadership qualities for entrepreneurs / corporate / managers.
- iii) To develop skills and inculcate motivational concepts.
- iv) To be aware of individual, cultural difficulties of organizations and to be able to master over them.

Unit No.	Contents	Hrs.
1	Introduction to Organizational Behaviour – Definition - Evolution of the Concept of OB- Contributions to OB by major behavioural science disciplines - Challenges and Opportunities for OB managers - Models of OB study	8
2	Individual Behavior : Perception – Factors influencing perception, Process, Perception distortion- halo effect, stereotyping, projection, Attitudes and Job Satisfaction - Components of Attitude - Major Job Attitudes - Job Satisfaction, Job involvement, Organizational Commitment. Personality and Values - Personality Determinants - MBTI, Big - Five Model, Values - Formation - Types of Values, Learning- Theories of Learning – reinforcement	8
3	Motivation Concepts to applications: Concept of motivation - Definition - Theories of Motivation - Maslow's' need Theory, Herzberg's Two factor theory, McClelland, Porter and Lawler Model, ERG Theory - Theory X and Theory Y Equity Theory - Vroom's Expectancy Theory – Application of Motivation concept, Individual motivation and motivation in the organization, Cultural Differences in Motivation, Intrinsic and Extrinsic Motivation, The Job Characteristics model – Work Redesign	8
4	Group Behavior: Group - Formation of Group - Classification - informal and formal groups, Group Properties - Roles, norms, status, size and	8

	cohesiveness - Group decision making – Group Shift, Group Think, <b>Teams:</b> team building: selecting team members, team roles, stages in team development, team building, team identity, team loyalty, commitment to shared beliefs, multi-disciplinary teams, Team Dynamics: decision-making behaviour, dysfunctional teams, Understanding teams - creating effective teams. Conflict - Process - Conflict management	
5	Leadership: Concept of Leadership - Traits of good Leader - Difference between Leader and Manager - Theories of Leadership – Trait theory, Behavioral theory and Contingency theory, Ohio State and Michigan Studies - Blake and Mouton theory - Fielders model - Likert's model. Managers as leaders. 3D leadership model. Leadership Styles. The management Grid, Future perspectives of Leadership	8
6	The Organization System : Stress: meaning and types, burnout, causes and consequences of stress, strategies to manage stress, Workforce diversity- Diversity management strategies. Culture - Definition, Culture's function, need and importance of Cross Cultural training – Organizational Change – Forces for change, resistance to change, Managing organizational change.	8

#### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	Kavita Singh	Organizational Behaviour	2015, 3 <sup>rd</sup> edition	Pearson Publication
2 International	Robbins, Timothy Judge, SeemaSanghi	Organizational Behaviour	12 <sup>th</sup> edition	Stephen Pearson Prentice Hall
3 National	M N Mishra	Organizational Behaviour	2010	Vikas Publishing House Pvt. Limited
4 International	Fred Luthans	Organizational Behaviour	13th edition	Mc Grow Hill Inc
5 International	John Newstrom and Keith Davis	Organizational Behaviour	11 <sup>th</sup> edition	Tata McGraw Hill

Online Resources No	Web site address
1	<a href="http://www.bretsimmons.com">www.bretsimmons.com</a> ...
2	<a href="https://www.youtube.com/watch?v=Jla7vP3gyL4">https://www.youtube.com/watch?v=Jla7vP3gyL4</a>
3	<a href="http://www.positivesharing.com">www.positivesharing.com</a>
4	<a href="https://www.youtube.com/watch?v=r2Xv9Am7PWQ">https://www.youtube.com/watch?v=r2Xv9Am7PWQ</a>

#### MOOCs:

Resources No	Web site address
1	Alisons
2	Swayam

Course : MBA CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	105	Statistical Techniques	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

### Course Objectives:

- I. To introduce to the learner the importance of statistical techniques in business applications
- II. To familiarize with the basic concepts of statistical techniques.
- III. To expose to the Graphical representation of data.
- IV. To impart skills in computation and application of correlation and regression.
- V. To understand the basics of probability and testing of hypotheses

### Learning Outcomes:

After learning the concepts of Statistical Techniques, students will be able to have a

- I) Develop numerical ability to solve examples on various topics and specifically formation and Testing of Hypothesis
- II) Have clear understanding of various statistical tools and their applications in Business.
- III) Analyze the importance of Statistical Techniques in different functional areas of Management.
- IV) Apply Correlation and Regression Techniques in Business applications.
- V) To apply the statistical techniques to small data sets for analysis and interpretation

Name : -	Contents	Hrs.
Unit No : 1	<b>Introduction to Statistics:</b> Introduction to Statistics, Importance of Statistics in modern business environment. Scope and Applications of Statistics. Advantages and limitations of Statistics. Sources of data – Primary and secondary, Universe or Population, Sample, Concept of Sampling, Advantages of Sampling, Types of Sampling. Classification, Tabulation and Presentation of Data, Requisites of a good classification, Types of classification, Methods of classification, Tabulation - Frequency and Frequency Distribution, Diagrammatic and graphic representation of Data – Bar diagrams, Pie chart, Histogram, Frequency polygon, Frequency curve, Ogive curves	08
Unit No :2	<b>Measures of Central Tendency and Dispersion:</b> Statistical Averages - Arithmetic mean, Median and Mode, Positional averages - Quartiles, deciles and percentiles. Dispersion – Range - Quartile deviations, Mean deviation, Standard Deviation - Properties of standard deviation, Variance, Coefficient of Variation. Applications in business and management.	10
Unit No :3	<b>Correlation:</b> Correlation, Types of Correlation, Scatter diagram, Karl Pearson's correlation coefficient, Properties of Karl Pearson's correlation	08

	coefficient, Spearman's Rank Correlation Coefficient. Association of attributes.	
Unit No : 4	Regression - Regression analysis, Regression lines, Regression coefficients. Business application.	06
Unit No : 5	Elementary probability concepts, Probability Distributions- Binomial, Poisson and Normal Distribution	06
Unit no 6	Introduction to Testing of Hypothesis: Null and alternate hypothesis, Significance Level, type I and Type II error, Chi – Square Test.	08

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	S.C.Gupta & Indira Gupta	Business Statistics	2016	Himalaya Publishing House
2 – National	Bhardwaj R. S.	Business Statistics	2009	Excel Books India
3 – National	R.P. Hooda	Statistics for Business and Economics	2013	Vikas Publishing House
4 – International	Richard I. Levin & David	Statistics for Management	1994	Prentice Hall
5 – International	Robert S. Witte, John S. Witte	Statistics	2014	John Wiley & Sons
6 – International	Dr. Jim McClave, Dr. Terry Sincich	Statistics for Business and Economics	2011	Pearson

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.yourarticlelibrary.com">http://www.yourarticlelibrary.com</a>
2	<a href="https://en.wikipedia.org">https://en.wikipedia.org</a>
3	<a href="https://managementhelp.org">https://managementhelp.org</a>
4	<a href="https://www.cleverism.com">https://www.cleverism.com</a>
5	<a href="https://commercemates.com">https://commercemates.com</a>

### MOOCs:

Resources No	Web site address
1	<a href="http://www.swayam.gov.in">www.swayam.gov.in</a>
2	<a href="http://www.udemy.com">www.udemy.com</a>
3	<a href="http://www.coursera.org">www.coursera.org</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	106	Legal Aspects of Business	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:
<p>Subject / Course Objectives :</p> <ul style="list-style-type: none"> <li>i) To create Dynamic and Effective Business Professionals</li> <li>ii) To transform the stake holders to cater to the needs of the society and contribute to Nation building</li> <li>iii) To improve decision making by having a sound knowledge of law.</li> <li>iv) To develop entrepreneurs to register different aspects of their business under the law.</li> </ul>
Learning Outcomes :
<ul style="list-style-type: none"> <li>I) extrapolate the legal knowledge to business.</li> <li>II) The graduates' attributes reflect legal knowledge and understanding global Competencies.</li> <li>III) To demonstrate domain comprehensive knowledge.</li> <li>IV) To articulate with business skills.</li> <li>V) To inculcate the culture of abiding law.</li> <li>VI) To Develop a coherent approach.</li> </ul>

Units	Contents	Hours
Unit 1	- Introduction to Business laws, structure and sources of law, <b>Law of contract- The Indian Contract Act,1872</b> –Introduction, Objectives, Definition of a Valid Contract, Offer and Acceptance, Capacity to Contract, Consent ,Consideration, Performance of Contracts, Discharge of Contracts, Breach of Contract and Void Agreements, Quasi Contracts <b>Contracts of Guarantee and indemnity, Bailment, Pledge</b>	05
Unit 2	<b>Contract of Agency</b> – Introduction, Agent and Agency, general rules, Modes of creation of Agency, Classification of Agents, Duties and Rights of Agents, Principal's Duties to the Agent and his Liability to Third Parties	10
Unit 3	<b>Law of sales of Goods</b> – Essentials of contract of sale, Goods and their classification, Sale, Agreement to Sell and Hire Purchase, Conditions and Warranties (Implied and Expressed), Unpaid seller and his rights, rights of buyer.	10

	Law of Negotiable Instruments – Characteristics of Negotiable Instruments, Types of Negotiable Instruments, Classification of	
Unit 4	<b>Consumer Protection Act</b> -Introduction, Definitions – consumer, complaint, complainant, Rights of Consumers, Nature and Scope of Complaints, Remedies Available to Consumers <b>The Partnership Act, 1932</b> - types of partners, formation of partnership, rights and liabilities of partners.	10
Unit 5	<b>The Company’s Act, 2013 (Amended)</b> : Introduction and types of companies, Formation of a Company, Memorandum of Association, Articles of Association, Winding up. Arbitration and Conciliation Act, 1996 – Types of Arbitration, Alternative Dispute Resolution, Arbitration agreement, Arbitral Tribunal, Arbitral proceedings.	05
Unit 6	<b>Information Technology Act, 2000 Amended 2018</b> , Definition - —Certifying Authority, Controller, Digital Signature and electronic governance, Role of certifying authorities, Functions of controller, Offences  Intellectual Property Laws- Introduction and types of IPR, Whistleblower Protection Act 2014. Introduction, Definitions, Salient Features, importance of the act	05

*Land mark case laws to be cited and discussed.*

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	N.D. Kapoor	Mercantile Law	2019	Eastern Book Company
2 – National	Narayan	Intellectual Property Laws	2019	
3 – National	Bare Act	The Patent Act	2019	
4 – National	Bare Act	The Trademark Act	2019	
5 – International	Bare	The Negotiable Act	2019	

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf">https://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf</a>
2	<a href="http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_43_1_trade-marks-act.pdf">http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_43_1_trade-marks-act.pdf</a>
3	<a href="http://legislative.gov.in/sites/default/files/A1996-26.pdf">http://legislative.gov.in/sites/default/files/A1996-26.pdf</a>
4	<a href="http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015.pdf">http://www.ipindia.nic.in/writereaddata/Portal/IPOAct/1_31_1_patent-act-1970-11march2015.pdf</a>
5	<a href="https://www.youtube.com/watch?v=vlk40C91HqQ">https://www.youtube.com/watch?v=vlk40C91HqQ</a>

**MOOCs:**

Resources No	Web site address
1	Alisons

Course : MBA (General) CBCS 2020 - w.e.f. - Year 2020 - 2021			
Semester	Course Code	Course Title	
	107	Business Communication	
Type	Credits	Evaluation	Marks
Core	03	CES	UE:IE =50:50

Course Objectives:
i) To familiarize the students with the process of communication, make them understand the principles and techniques of Business Communication. ii) To enable students to comprehend the different dimensions of Business Communication. iii) To enlighten about the communications strategy for managers.
Learning Outcomes:
i) The Students should be able to communicate effectively in professional circles. ii) There should be a positive change in the oral and written communication skills of the students after studying the subject. iii) The students should be able to draft business letters, give effective presentations write formal reports and deliver speeches independently.

Unit No.	Contents	Hours
01	<u>Basic Principles of Communication:</u> Introduction, Understanding Communication, the Communication Process, Barriers to Communication, the Importance of Communication in the Workplace, Types of Communication channels, their effectiveness and limitations, Importance of Non-Verbal Communication	06
02	<u>Communication in Organizations</u> Communication needs of business organization, Strategies for improving Organizational communication, direction of flow of communication in organization, networks of flow of communication– wheel network, chain network, Y network, circle network. Feedback, types of feedback, importance of feedback Intra-organizational communication, inter-organizational communication. Inter-cultural communication – guidelines for effective communication across cultures	06
03	<u>Developing Oral Business Communication Skills:</u> Introduction, Advantages of Oral Communication, Speech Writing, Creative Writing, Public Speaking, Presentation Skills –Techniques for effective Presentations, Qualities of a skillful Presenter. Exercises for Oral Communications – Individual and Group Presentations, Extempore, Role Playing, Debates and Quiz	06
04	<u>The Importance of Listening and Reading Skills:</u> Introduction, what is listening? Barriers to Listening, Strategies for Effective Listening, Listening in a Business Context <u>Reading Skills for Effective Business Communication:</u> Introduction,	06

	what is reading? Types of reading, SQ3R Technique of Reading.	
05	<p><u>Guidelines for Written Business Communication:</u> Introduction, General Principles of Writing, Principles of Business Writing</p> <p><u>Internal Business Communication:</u> Writing Memos, Circulars and Notices: Introduction, What is a Memo? Circulars and Notices, Meetings, Notices, agenda, minutes of the meeting Communicating through Email, Communication with Shareholders</p> <p><u>External Business Communication– Writing Business Letters:</u> Introduction, Principles of Business Letter Writing, Types of Business Letters, Format for Business Letters (Types of business letters: office order, office circular, invitation letters, enquiry letters, trade reference letters, etc Letters from Purchase department, Letters from the Sales/Marketing Department, Accounts department, Personnel department, Letters of social significance, Tenders, Quotations and Orders, Banking Correspondence, Letters of enquiry, dealing with complaints) Exercises for Written Communications: Essay writing, Poster Making, Writing, an Advertisement Copy, Slogans, Captions, &amp; preparing Press notes, Letter Of Acceptance, Letter Of Resignation</p> <p><u>Writing Business Reports:</u> Introduction, What is a Report? Types of Business Reports, Format for Business Reports, Steps in Report Preparation</p> <p><u>Employment Communication – Resumes and Cover Letters:</u> Introduction, Writing a Resume, Writing Job Application Letters, Other Letters about Employment</p> <p>Group Discussions and Interviews: Introduction, What is a Group Discussion? Attending Job Interviews, Preparation for GD and Interviews.</p>	15
06	<p><u>Technology enabled communication</u>–role of technology, different forms of technology for communication, Telephone Etiquette, Netiquette</p> <p><u>Communication Strategy for Managers:</u> Communicating different types of messages – positive or neutral messages, negative messages, persuasive messages, effective team communication, motivational communication</p>	06

### Reference Books:

Sr. No.	Name of Author	Title of the Book	Publisher
1 National	MeenakshiRaman,Prakash Singh	Business Communication	Oxford Higher Education
2 National	R.K.Madhukar	Business Communication	Vikas Publications
3 National	UrmilaRai, S M Rai	Business Communication	Himalaya Publications
4 International	Shirley Taylor	Communication for Business	Pearson Longman Publications

5 International	<u>Kerry Patterson, Joseph Grenny</u>	Crucial Conversations: Tools for Talking When Stakes Are High	McGraw-Hill
6 International	John V. Thill, Courtland L. Bovee	Excellence in Business Communication	Pearson Publications

Online Resources:

Resource No.	Website Address
01	<a href="https://www.freebookcentre.net/business-books-download/Business-Communication.html">https://www.freebookcentre.net/business-books-download/Business-Communication.html</a>
02	<a href="https://open.umn.edu/opentextbooks/textbooks/business-communication-for-success">https://open.umn.edu/opentextbooks/textbooks/business-communication-for-success</a>
03	<a href="https://courses.lumenlearning.com/wm-businesscommunicationmgrs/">https://courses.lumenlearning.com/wm-businesscommunicationmgrs/</a>

MOOCs:

Sr. No.	Details
01	<a href="http://www.coursera.org">www.coursera.org</a>
02	<a href="http://www.udemy.com">www.udemy.com</a>
03	<a href="http://my-mooc.com">my-mooc.com</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	108	Data Analysis Using advance -Excel	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

**Course Objectives:**

- i) To train the student for using the spreadsheet package MS-Excel for business applications.
- To impart skills of analyzing data and presenting it using MS-Excel.

**Learning Outcomes :**

Understand the different functions of MS Excel  
Use MS Excel for analysis of Data

Unit No.	Contents	Hrs.
1	<b>Introduction to Excel</b> MS excel screen elements – Tool bar, title bar, ribbon, formula bar, status bar. Moving around a Worksheet, entering and formatting (e.g. Number, Text, Date and Currency) data. Cell referencing (relative, absolute, mixed), using formulae, Use of Find, Replace, Goto.	5
2	<b>Working with Excel</b> Insert, delete - cells, rows, columns. Sorting (basic, custom), filtering, grouping, ungrouping data, dealing with subtotals and grand totals. Validating data, protecting cells. Create, manage, and format pivot tables and pivot charts.	5
3	<b>Conditional Formatting</b> Once defined, it will automatically change the formats as per conditions user inputs. Work with functions to manipulate strings of text and data	5
4	<b>Commonly used functions</b> Sum, Max, Min, Average, Count, Today, Now, Datedif, Countif, CountA, CountBlank, Round, Roundup, Round Down, ABS, Sign, Ceiling, Floor, Trim, Value, Clean, sqrt, if, sumif	5
5	<b>Data Viewing and Reviewing</b> Inserting comments, spell checks and changes to the worksheet data etc, Viewing data in different ways eg. Page break, normal etc	5
6	<b>Creating and managing charts</b> Create and modify graphs / charts like Column, Line, Pie, Bar, Area, Scatter, 3D etc. Working with multiple sheets, hyper linking Work with spark lines. Perform Look UP tables. Analysis Tool pack: Correlation, Regression	5

**Reference Books:**

1. Albright : Data Analysis and Decision Making Using MS Excel
2. StwphenNelson : Data Analysis ForDuMmIES
3. Narayan Ash Sah: Data Analysis Using Microsoft Excel 1/e, Excel Bools



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	109	Computers Application for Business	
Type	Credits	Evaluation	Marks
Core Elective	2	CES	IE = 100

Course Objectives
<ul style="list-style-type: none"> <li>i) To impart the IT skills and Knowledge required for managers.</li> <li>ii) To help the students understand the basics of computer technology and Networking</li> <li>iii) To help the students develop the use of Tools like Microsoft Word, Microsoft Excel and Power point</li> <li>iv) To orient the students about the E-Commerce technology and its applications in Business world.</li> <li>v) To help the students understand various Information Systems implemented in organizations</li> <li>vi) To acquaint the students with various current trends and concepts of computer Technology.</li> </ul>
Learning Outcomes:
<ul style="list-style-type: none"> <li>i) Students will be able to gain the basic knowledge of Computer Technology</li> <li>ii) Students will be able to know the basics of computer technology and Networking</li> <li>iii) Students will be able to practically use the tools like Microsoft Word, Microsoft Excel and Power point</li> <li>iv) Students will understand the E-commerce technology and its applications</li> <li>v) Students will have a greater understanding of with Information Systems implemented in organizations</li> <li>vi) Students will be familiar with new terms and trends of computer technology</li> </ul>

Unit No.	Contents	Hrs.
1	<b>Introduction to Computer Technology</b> , Basic operations and connecting Devices and External Operating devices, Types of Software: (system, Utility, Applications) types of application software (content access, end user, enterprise, simulation, application suite), examples, selecting and acquiring software options for procuring the software (licensed, sold, public domain, open source, freeware, shareware), software trends and issues (mobile applications, integration of in-house and outsourced services strategy, cloud based enterprise solutions), Data Base, Data Base Management Systems	05
2	<b>Networking:</b> Definition of Network, Types of Networks, Advantages of Networks, <b>Internet:</b> Definition , concept, advantages, threats, applications	02

3	<p><b>Microsoft Word, Microsoft Excel, Microsoft PowerPoint :</b>  <b>IT Skills: Lab sessions necessary</b>  Microsoft Office- Introduction and working with MS Word, Features - insert headers and footers, insert table and table options, Mail Merge.etc  <b>MS Power point-</b> Basic introduction, features, Creating &amp; Formatting Content Collaborating – Track, Edit, Add, Delete Comments, Merge Managing &amp; Delivering Presentations, design a template, entering data to graph, organization chart, slide transitions, creating slide shows.</p>	05
4	<p><b>E-COMMERCE :</b> E-commerce : Definition, evolution, advantages. Types of E-commerce: B2B, B2C, C2C, E-governance,. Impact of E-commerce on Banking Industry. How Banking Industry has evolved post E-commerce applications.</p>	05
5	<p><b>Introduction to MIS:</b> Principles of MIS, Characteristics, functions, structure &amp; Classification of MIS, information for decisions; MIS in Manufacturing, Marketing, Finance Human Resource Management, Materials &amp; Project Management; Types of information systems(TPS, MIS, DSS, ESS, ES, KWS), GIS Information systems and functional areas- Transaction processing system, Human Resource systems</p>	05
6	<p>Current trends- Integrated enterprise system (ERP, CRM, and SCM), COBIT- IT governance tool, ITIL, changing role of CIO. Concept of SMAC (Social, Mobile, Analytics and Communication), use of Social media face book, tweeter, LinkedIn etc. for general communication and business communication, social media for marketing, email and video conferencing tools for business communication, Analytical tools of data interpretation.</p> <p>Latest terms in computer technology: Definition and concept of Agile Development, Big Data, Business Intelligence, Cloud Computing, Content Management, Disruptive Technology, Green Technology, Artificial Intelligence, Wearable devices, Machine Learning, GUI (Graphical user Interface), XaaS (Technology as a Service such as SaaS, Analytics as a Service) ., Audio-visual communication/ meeting platforms such as Microsoft Teams, Zoom, Google Meet, social media communications for business</p>	08

### Reference Books

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Ramesh Bahl	Information Technology for Managers		Tata Macgraw Hill
2 – National	Pradeep K. Sinha	Computer Fundamentals		BPB Publications
3 – National	A. K. Saini, Pradeep Kumar	Computer Application in Management		Anmol Publications
4 – International	Geoff Walsham	“Interpreting Information Systems in Organizations”		The Global Text Project , 2011, <a href="http://www.saylor.org/site/extbooks/Information%20Systems%20for%20Business%20and%20Beyond.pdf">http://www.saylor.org/site/extbooks/Information%20Systems%20for%20Business%20and%20Beyond.pdf</a>
5 – International	Henry C. Lucas	“Information Technology for Management”		McGraw-Hill/Irwin , 2009

6 – International	David T. Bourgeois	“Information Systems for Business and Beyond”	Saylor Foundation , 2014
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**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.webopedia.com/">https://www.webopedia.com/</a>
2	<a href="http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf">http://intronetworks.cs.luc.edu/current/ComputerNetworks.pdf</a>
3	<a href="https://www.managementstudyguide.com/understanding-e-commerce.htm">https://www.managementstudyguide.com/understanding-e-commerce.htm</a>
4	<a href="https://www.sigc.edu/department/mba/studymet/ManagmentInformationSystem.pdf">https://www.sigc.edu/department/mba/studymet/ManagmentInformationSystem.pdf</a>
5	<a href="https://www.tutorialspoint.com/management_information_system/basic_information_concepts.htm">https://www.tutorialspoint.com/management information system/basic information concepts.htm</a>

**MOOCs:**

Resources No	Web site address
1	<a href="https://www.coursera.org/browse/information-technology">https://www.coursera.org/browse/information-technology</a>
2	<a href="https://www.udemy.com">https://www.udemy.com</a>
3	<a href="https://alison.com">https://alison.com</a>

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	110	Social Media Management	
Type	Credits	Evaluation	Marks
Core	2	CES	100

#### Course Objectives:

- i) To understand the concept of Social Media and its utility in marketing efforts.
- ii) To study the implementation of social media campaign.
- iii) To study the importance of social media in the promotion of a product or service.

#### Learning Outcomes:

- i) Effective utilization of Social Media in connecting with the target market.
- ii) Using the social media for the implementation of marketing strategies

Unit No.	Contents	Hrs.
1	Defining your target customer based on the usual demographics, age, gender, identifying your target customer's marital status, where they live, or what their hobbies are, understanding their basic needs, identifying the topics of interests by studying the customer's feedback research analysis,	2
2	Customer acquisition elements with human approach, why you'll use social media for business, and identify KPIs, Building a Community, designing a media planning strategy, use of social media for marketing strategies, four critical steps you'll need to take to stand out and learn the processes behind taking each step	4
3	Designing the metrics with which you can measure the growth based on: <ul style="list-style-type: none"> <li>• Number of group members</li> <li>• Engagement on your live videos</li> <li>• Engagement on your daily posts</li> <li>• Questions your group is asking</li> </ul>	8
4	Increase brand awareness, use of metrics to assess brand awareness, boost engagement, customer engagement strategies based on their basic needs, targeting the customers and target strategy	4
5	Criteria of choosing the right social network to engage audience, monthly active users, utility and usage study of Twitter, facebook, Instagram, Pinterest, youtube and other social media sites, asses their pros and cons before launching your website or social media channel	2
6	Characteristics of creating content that will engage target audience, planning content calendar, designing keywords: transactional, informational, and navigational, create a content plan, building trust through consistent engagement, measure progress Concept of Influencer Marketing and Importance.  Project/blog or website in development of content and hosting utube channel to be designed by the students in the area of their interest	10

## Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
4 – International	Jeff Abston	<b>Youtube Growth Hacking</b>	2018	CreateSpace Independent Publishing Platform
5 – International	Gary Vaynerchuk	<b>Crushing It</b>	2018	Harper Business
6 – International	Donald Miller	<b>Building a StoryBrand: Clarify Your Message So Customers Will Listen</b>	2017	HarperCollins Leadership

## Online Resources:

Online Resources No	Web site address
1	<a href="https://www.socialmediaexaminer.com/how-to-create-social-media-marketing-content-plan-in-7-steps/">https://www.socialmediaexaminer.com/how-to-create-social-media-marketing-content-plan-in-7-steps/</a>
2	<a href="https://sproutsocial.com/insights/social-media-content-strategy/">https://sproutsocial.com/insights/social-media-content-strategy/</a>
3	<a href="https://www.smartinsights.com/social-media-marketing/social-media-strategy/creating-social-media-content-strategy-plan/">https://www.smartinsights.com/social-media-marketing/social-media-strategy/creating-social-media-content-strategy-plan/</a>
4	<a href="https://blog.hootsuite.com/books-social-media-manager-read/">https://blog.hootsuite.com/books-social-media-manager-read/</a>
5	<a href="https://business.linkedin.com/marketing-solutions/success/marketing-case-studies?src=go-pa&amp;trk=sem_lms_gaw&amp;veh=Google Search APAC IN NB-Social Beta DR English 249875649279 %2Bsocial%20%2Bmedia%20%2Bcontent_c_aud-790231220534:kwd-">https://business.linkedin.com/marketing-solutions/success/marketing-case-studies?src=go-pa&amp;trk=sem_lms_gaw&amp;veh=Google Search APAC IN NB-Social Beta DR English 249875649279 %2Bsocial%20%2Bmedia%20%2Bcontent_c_aud-790231220534:kwd-</a>

## MOOCs:

Resources No	Web site address
1	<a href="https://www.udemy.com/course/social-media-content-creation-101/?utm_source=adwords&amp;utm_medium=udemyads&amp;utm_campaign=DSA_Catchall_1_a.EN_cc.INDIA&amp;utm_content=deal4584&amp;utm_term=.ag_82569850245.ad_398023114490.kw.de.c.dm.pl.ti_dsa-302692350888.li_9061696.pd.&amp;matchtype=b&amp;gclid=CjwKCAjwguzzBRBiEiwAgU0FT4Nw0wI0EFDvWkNXjH5HJAVwbz0wGrBf-w1sPG825KK75SXokKSHWRoCmwwQAvD_BwE">https://www.udemy.com/course/social-media-content-creation-101/?utm_source=adwords&amp;utm_medium=udemyads&amp;utm_campaign=DSA_Catchall_1_a.EN_cc.INDIA&amp;utm_content=deal4584&amp;utm_term=.ag_82569850245.ad_398023114490.kw.de.c.dm.pl.ti_dsa-302692350888.li_9061696.pd.&amp;matchtype=b&amp;gclid=CjwKCAjwguzzBRBiEiwAgU0FT4Nw0wI0EFDvWkNXjH5HJAVwbz0wGrBf-w1sPG825KK75SXokKSHWRoCmwwQAvD_BwE</a>
2	<a href="https://www.upgrad.com/digital-marketing-and-communication-pgc-mica/?utm_source=Google&amp;utm_medium=Search&amp;utm_campaign=mv_dm_pgc_google_search_highintent-25-64_t1_all&amp;utm_content=social_media_course&amp;utm_term=%2Bsocial%20%2Bmedia%20%2Bcourse&amp;gclid=CjwKCAjwguzzBRBiEiwAgU0FTwsPEZYDW61_qg_cc4F6ZtE9L3B15Z_Ldr343-RNgNUa-r-a7LdQNhoCTUgQAvD_BwE">https://www.upgrad.com/digital-marketing-and-communication-pgc-mica/?utm_source=Google&amp;utm_medium=Search&amp;utm_campaign=mv_dm_pgc_google_search_highintent-25-64_t1_all&amp;utm_content=social_media_course&amp;utm_term=%2Bsocial%20%2Bmedia%20%2Bcourse&amp;gclid=CjwKCAjwguzzBRBiEiwAgU0FTwsPEZYDW61_qg_cc4F6ZtE9L3B15Z_Ldr343-RNgNUa-r-a7LdQNhoCTUgQAvD_BwE</a>

3	<a href="https://www.coursera.org/specializations/social-media-marketing">https://www.coursera.org/specializations/social-media-marketing</a>
4	<a href="https://iversity.org/en/courses/digital-and-social-media-marketing">https://iversity.org/en/courses/digital-and-social-media-marketing</a>

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	111	Current Affairs	
Type	Credits	Evaluation	Marks
Core	2	CES	100

Course Objectives :	
i)	Apply the knowledge of management theories and practices in resolving the business problems.
ii)	Foster analytical and critical thinking abilities for data-based decision making.
iii)	Learn new technologies with ease and be productive at all times
iv)	Read, write, and contribute to Business literature
v)	Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.
Learning Outcomes:	
I)	To enable the students to take decisions related to critical current business issues.
II)	To be able to Interpret and understand the current business issues.
III)	To analyze business current affairs.
IV)	To acquaint with the current happenings in the business.
vi)	To comprehend the current affairs and its implications on businesses at national and international level.

Unit	Contents	Sessions
1	Economy: Monetary and Fiscal Policy, Budget Analysis, Digital Economy, Insolvency and Bankruptcy Code, UBI (Universal Basic Income), Banking Sector - Bank Mergers, Private Bank Licensing, Payment Banks etc.	6
2	Financial, Judicial and Political Reforms - National Issues, Indian Economy, Ease of doing Business, Labor Laws, Enforcing of Contracts, Recent Employee Unrest in Industry	6
3	Corporate Social Responsibility, Social Schemes, Reports, Committee and Commission Sustainability – Paris Climate Agreement and Protocol, Global Calamities, Science and Technology, Green Energy etc.	6
4	Global Business Environment: Globalization and Protectionism, Trade Wars, Tariffs, Subsidies and Trade Barriers. Global Trade Treaties, RCEP, NAFTA, G20, Brexit	6
5	Article Reading and Discussion on Current Affairs: <ul style="list-style-type: none"> <li>• Economics Times</li> <li>• Mint</li> <li>• Business Line (by Hindu)</li> </ul> Book Reading: <ul style="list-style-type: none"> <li>• Imagining India – Nandan Nilekani</li> <li>• Breakout Nations – Ruchir Sharma</li> <li>• Wings of fire- An autobiography of APJ Abdul Kalam</li> </ul>	6



6	Students are required to prepare workbook (practical file) for assimilating data of different events. Make presentations, Study the related topic independently and analyse and relate the current decision with the issue.	
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**Reference Books:**

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Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1..National	Dr. Abdul Kalam&ArunTiwari	Wings of fire- An autobiography of APJ Abdul Kalam	1999	University Press
2. National	Mahatma Gandhi	Mahatma Gandhi Autobiography : The story of my experiments with truth.	1948	Dover Publication
3 – National	Jawaharlal Nehru	The Discovery of India by Jawaharlal Nehru	2008	Penguin
4 – International	Loren B. Belker, Gary S. Topchick	The First- Time Manager	2005	Amacom
5 – International	Bear Grylls	A Survival Guide for life – How to achieve your goals, thrive in adversity, and grow in character.	2013	July
6 – International	FransJohanson	The Medici Effect- What Elephants & Epidemics can teach us about Innovation.	2004	HBS Press
7 – International	Charles Futrell	ABC's of Selling	1989	Irwin

#### Online Resources:

Online Resources No	Web site address
1	<a href="https://dea.gov.in">https://dea.gov.in</a>
2	<a href="https://finmin.nic.in">https://finmin.nic.in</a>
3	<a href="http://www.wto.org">www.wto.org</a>
4	<a href="http://www.commerce.nic.in">www.commerce.nic.in</a>
5	<a href="http://www.weforum.com">www.weforum.com</a>
6	<a href="https://www.journals.elsevier.com/">https://www.journals.elsevier.com/</a>
7	<a href="http://www.iibs.net/">http://www.iibs.net/</a>
8	<b>Open Textbook Library</b> <a href="https://open.umn.edu/opentextbooks/textbooks/international-business">https://open.umn.edu/opentextbooks/textbooks/international-business</a>

#### MOOCs:

Resources No	Web site address
1. Economics	<a href="https://www.es.corporatefinanceinstitute.com">https://www.es.corporatefinanceinstitute.com</a>
2. Politics	<a href="https://www.classcentral.com/course/edx-contemporary-issues-in-world-politics-11431?utm_source=mooc_report&amp;utm_medium=web&amp;utm_campaign=new_courses_october_2018">https://www.classcentral.com/course/edx-contemporary-issues-in-world-politics-11431?utm_source=mooc_report&amp;utm_medium=web&amp;utm_campaign=new_courses_october_2018</a>
3. Business	EDX <a href="https://www.edx.org/learn/international-business">https://www.edx.org/learn/international-business</a>
4. Leadership	<a href="https://www.classcentral.com/course/edx-agile-leadership-principles-and-practices-11920?utm_source=mooc_report&amp;utm_medium=web&amp;utm_campaign=new_courses_october_2018">https://www.classcentral.com/course/edx-agile-leadership-principles-and-practices-11920?utm_source=mooc_report&amp;utm_medium=web&amp;utm_campaign=new_courses_october_2018</a>
5. International Financial Environment	<a href="https://nptel.ac.in/courses/110105031/">https://nptel.ac.in/courses/110105031/</a>

**SYLLABUS**  
(w.e.f. 2020\_21)

**MBA - (GENERAL)**

**SEMESTER – II**

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	201	Marketing Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

**Course Objectives:**

**Course Objectives :**

- i) To understand the core concepts of Marketing and approaches to Marketing.
- ii) To differentiate the Marketing and Selling processes.
- iii) To study the Marketing Environment and understand its influence on Marketing Decisions.
- iv) To study the concept of Segmentation, Targeting and Positioning.
- v) To understand the Marketing Mix Elements and their utility in Marketing.
- vi) To Study the concept of Marketing Research and Marketing Information Systems.

**Course Outcomes:**

- i) Gain a solid understanding of key marketing concepts and skills.
- ii) Identify and demonstrate the dynamic nature of the environment in which marketing decisions are taken and appreciate the implications for marketing strategy determination and implementation.
- iii) Develop the students' skills in applying the analytical perspectives on the concepts of marketing and the decisions related to segmentation, targeting and positioning, determining marketing mix etc.
- iv) Develop an understanding of the underlying concepts, strategies and the issues involved in the exchange of products and services and control the marketing mix variables in order to achieve organizational goals.
- v) Develop strong marketing research plans and persuasively communicate your recommendations and rationale.
- vi) Discuss the scope and managerial importance of marketing research and its role in the development of marketing strategy

Unit No.	Contents	Hrs.
1	Basics of Marketing: Definition and meaning of Marketing, Core concepts of Marketing - Need, Want, Demand, Value, Exchange, Customer satisfaction & Customer delight, Differentiation between Sales and Marketing, Approaches to Marketing - Product, Production, Sales, Marketing, Societal and Relational. Marketing environment - Micro and Macro marketing environment	06
2	Definition and meaning of consumer behaviour, importance of consumer behaviour, different buying roles, buying motives and its types, buying decision making process.	5
3	Segmentation, Targeting and Positioning: Meaning, need and importance, bases for consumer market segmentation and industrial market segmentation, evaluation of identified segments and selection and evaluation of target market.  Targeting strategies: Levels of market segmentation: segment marketing, niche marketing, local marketing, individual marketing.  Positioning and Differentiation: meaning, concept, product, service, people and image differentiation, ways to position the product.	10
4	Marketing Mix: Concept, Seven P's of marketing mix:  Product – meaning, levels of product, product mix- product line – decisions : line stretching, filling, pruning , width, length, depth. Product life cycle (PLC) – Concept, stages in PLC, characteristics and strategies for each stage of PLC. New product development process, Brand – Concept, Brand Creation  Price – meaning, objectives of pricing, pricing approaches- cost based, competition based, and market based, pricing strategies- skimming pricing, penetrative pricing, psychological or odd pricing, perceived value pricing, loss leader pricing etc.  Place- Importance of distribution in marketing of products or services, Types of intermediaries, levels of channels, Channel Management Decisions- factors considered for selection and motivation of dealers and retailers, channel conflict- concept, types of channel conflict, ways to resolve channel conflicts  Promotion- Elements of promotion mix: meaning of advertising- 5 Ms. of Advertising, sales promotion, personal selling, public relations, publicity, direct marketing and event marketing and sponsorship.	14
5	Marketing Research: Need and Importance of Marketing Research, Marketing Research Process, Types of Marketing Research. Marketing Information System- overview.	4
6	Marketing Planning and Control: Marketing Planning Process, nature and contents of a	6

	marketing plan. Need of marketing control, Annual plan control, productivity control, efficiency control and strategic control- marketing audit.	
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### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year and edition	Publisher Company
1 – National	Dr. Rajan Saxena	Marketing Management	2016, Fifth edition	Tata McGraw Hill Publications
2 – National	V.S. Ramaswami and S. Namakumari	Marketing Management- Indian Context *Global Perspective	2013, fifth edition	Tata McGraw Hill Publications
3 – National	Dr. Tapan Panda	Marketing Management	2009, second edition	Excel Books India
4 – International	Philip Kotler, Garry Armstrong, Prafulla Agnihotri	Principles of Marketing	2018, seventeenth edition	Pearson Education
5 – International	Philip Kotler, Kavin Lane Keller	Marketing Management	2015, fifteenth edition	Pearson Education India
6 – International	Michael J. Etzel, Bruce J. Walker, William J. Stanton	Marketing	2005, fourteenth edition-revised	McGraw Hill Higher Education

### Online Resources:

Online Resources No	Web site address
1	<a href="https://managementhelp.org">https://managementhelp.org</a>
2	<a href="https://bookboon.com/en/marketing-and-law-ebooks">https://bookboon.com/en/marketing-and-law-ebooks</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://alison.com/course/introduction-to-marketing-management-revised">https://alison.com/course/introduction-to-marketing-management-revised</a>
2	<a href="https://alison.com/course/understanding-your-audience-market-segmentation">https://alison.com/course/understanding-your-audience-market-segmentation</a>
3	<a href="https://alison.com/course/marketing-management-analysing-competitors-and-customers-revised">https://alison.com/course/marketing-management-analysing-competitors-and-customers-revised</a>
4	<a href="https://swayam.gov.in/nd1_noc19_mg48/preview">https://swayam.gov.in/nd1_noc19_mg48/preview</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	202	Financial Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:	
i)	To introduce the fundamentals of Financial Management
ii)	To orient on the skills set required for Financial Decision Making Techniques
iii)	To orient on Financial Statement Analysis and Interpretation
iv)	To develop analytical skills which would help decision making in Business.
v)	To develop the entrepreneurial mind set
Learning Outcomes :	
i)	Development of basic skill sets required for Financial Decision Making
ii)	Development of analytical skill set to understand and interpret Financial Statements
iii)	Graduates are able to improve their knowledge about functioning business, identifying potential business opportunities, evolution of business enterprises and exploring entrepreneurial opportunities (BEDK)
iv)	Graduates are expected to develop skills on analyzing the business data, application of relevant analysis, problem solving in the functional areas, i.e. Critical thinking- Business Analysis-Problem Solving and Innovative Solutions (CBPI)
v)	Developing Social Responsiveness to contextual social issues/ problems and exploring solutions. Graduates are expected to identify problems, explore the opportunities, design the business solutions and demonstrate ethical standards in organizational decision making.(SRE)

Unit No 1	Contents	Hrs.
1	<b>Introduction</b> Meaning of Financial Management, Scope and Functions of Financial Management, Objectives of Financial Management Profit Vs Wealth Maximization, Finance Functions: Investment Decision, Liquidity Decision, Financing Decision and Dividend Decision, concept of Social Responsibility	7
2	<b>Investment Decision: Capital Budgeting Decision</b> Meaning, Importance and process of Capital Budgeting, Concept of Time Value of Money, Capital Budgeting Techniques - Problems & case studies- Accounting Rate of Return, Payback Period, Net Present Value, Profitability Index, Discounted Payback Period, Internal Rate of Return Capital Budgeting under Risk and Uncertainty Concept and Techniques	10
3	<b>Liquidity Decision: Working Capital Management:</b> Meaning, Need and Types of Working Capital, Components of Working Capital, Factors determining Working capital, Estimation of Working Capital, Problems and Case Studies on Estimation of Working Capital, Sources of Working Capital Financing	6
4	<b>Financing Decision: Sources of Long Term Domestic Finance:</b> Shares, Debentures, Retained Earnings, <b>Capital Structure:</b> Meaning and Principles of Capital Structure Management, Factors affecting Capital Structure, <b>Cost of Capital:</b> Meaning, Components, Cost of Debt, Cost of Preference Share, Cost of Equity Share, Cost of Retained Earnings, and Weighted Average Cost of Capital.	8

	, <b>Leverage:</b> Concept and Types of Leverage,	
5	<b>Dividend Decision:</b> Factors determining Dividend policy, Theories of Dividend-Gordon Model, Walter Model, MM Hypothesis, and Forms of Dividend Payment: Cash Dividend, Bonus Share and Stock Split, Stock Repurchase, Dividend Policies in Practice.	4
6	<b>Financial Statement Analysis:</b> Meaning and Types, Techniques of Financial Statement Analysis: Common Size Statement, Comparative Statement, Trend Analysis and Ratio Analysis. (Orientation level Problems on Ratio analysis) Funds Flow Statement and Cash Flow Statement.	10

### Reference Books:

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	SheebaKapil	Fundamentals of Financial Management		Pearson Publications
2 – National	I.M. Pandey	Financial Management		Vikas Publication
3 – National	Khan and Jain	Financial Management		TATA McGraw Hill
4- National	R.P. Rustogi	Financial Management		
4 – International	Eugene F. Brigham, Michael C. Ehrhardt	Financial Management – Theory and Practice	11th edition.	
5 – International	Jonathan Berk, Peter DeMarzo and Ashok Thampy	Financial Management		Pearson Publication
6 – International	Journal of International Financial Management And Accounting By Wiley Publication			
7– International	Journal of Business Finance And Accounting By Wiley Publication			

### Online Resources:

Online Resources No	Resources Name	Web site address
1	Google Scholar	<a href="https://scholar.google.com/">https://scholar.google.com/</a>
2	Gutenberg	<a href="https://www.gutenberg.org/">https://www.gutenberg.org/</a>
3	Open Culture	<a href="http://www.openculture.com/free_ebooks">http://www.openculture.com/free_ebooks</a>
4	Open Library	<a href="https://openlibrary.org/">https://openlibrary.org/</a>

### MOOCs:

Resources No	Resources Name	Web site address
1	Alison - free technology, language, science, health, humanities, business, math, marketing and lifestyle courses.	<a href="https://alison.com/">https://alison.com/</a>
2	Khan Academy - free online courses and lessons	<a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a>
3	Futurelearn	<a href="http://www.openculture.com/free_eboo">http://www.openculture.com/free_eboo</a>



		ks
4	SWAYAM which is a India MOOCs platform for which University Grants Commission has allowed upto 20% credit transfer facility.	<a href="https://swayam.gov.in/">https://swayam.gov.in/</a>
5	University of Florida	<a href="http://www.coursera.org">www.coursera.org</a>
6	University of London	<a href="http://www.cefims.as.uk">www.cefims.as.uk</a>
7	IIM ,Bangalore	<a href="http://www.edx.org">www.edx.org</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	203	Human Resource Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:	
i.	To explain the significance of HRM and changing role of HRM
ii.	To explain the process of HRP, Recruitment and Selection.
iii.	To discuss the concept of training and development
iv.	To illustrate the job evaluation and wage determination concepts.
v.	To bring out the role of HR in organization's effectiveness and employee performance
Learning Outcomes :	
i.	Understand and apply Human resource Management functions for effective management of organization.
ii.	Ability of designing job analysis and ability to understand various manpower forecasting techniques
iii.	Understand the techniques of recruitment, selection and interview and ability to conduct the recruitment process
iv.	Understand the training needs in the organization and ability to design suitable training plan
v.	Understand the components of wages and salary and factors affecting it.
vi.	Ability to analyze issues related to performance appraisal, career planning and rewards management.

Unit No.	Contents	Hrs.
1	<b>Introduction to HRM :</b> Definition, Nature and Scope of HRM, Evolution of HRM, Challenges of HRM, HR Profession and HR Department, Functions of HRM, Global perspective of HRM	06
2	<b>Human Resource Planning:</b> HRP, Demand and Supply forecasting, factors Affecting HRP, Job analysis and Job Design, Recruitment and Selection – Recruitment Process, Sources and Methods of Recruitment, Steps in selection.	08
3	<b>Training and Development:</b> Need and Importance of Training and Development, Training Need Analysis and techniques, Design Training Programme, Methods of training, Training evaluation, Executive Development, Concept of Career Development	09
4	<b>Wages and salary Management</b> Job Evaluation-Process and methods. Wage Determination, Types of Wages, Salary Structure, Fringe benefits, Executive Compensation, Understanding Stock Options and designing incentive plans	10
5	<b>Performance Appraisal:</b> Need and Importance of Performance Appraisal ,Performance Appraisal Process, Methods of Performance Appraisal	07

<b>6</b>	<b>Overview of Employee Relations Management-</b> Meaning and importance of Employee Relations Management, Employee Relation Management Tools, Issues in Employee Relation Management, People Analytics	05
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### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	. SeemaSanghi	Human Resource Management	2011	Macmilan Publication,
2 – National	V.S.P. Rao	Human Resource Management	2006	Excel Books
3 – National	. K. Ashwathappa	Human Resource Management	2007	Tata McGraw--Hill
4 – International	Gary Dessler, BijuVarkey	Human Resource Management	2016	Pearson Publication, 12 <sup>th</sup> Edition
5 – International	Ronald J. Burke Cary L Cooper	Reinventing Human resources Management: Challenges and new Directions	2005	Routledge Place of Publishing London

### Online Resources:

Online Resources No	Web site address
1	<a href="https://hbsp.harvard.edu/cases/">https://hbsp.harvard.edu/cases/</a>
2	<a href="https://open.umn.edu/opentextbooks/textbooks/human-resource-management">https://open.umn.edu/opentextbooks/textbooks/human-resource-management</a>
3	<a href="https://www.icmrindia.org/case%20volumes/Case%20Studies%20in%20Human%20Resource%20Management%20Vol%20I.htm">https://www.icmrindia.org/case%20volumes/Case%20Studies%20in%20Human%20Resource%20Management%20Vol%20I.htm</a>
4	<a href="https://www.citehr.com/">https://www.citehr.com/</a>
5	<a href="https://www.hr-guide.com/">https://www.hr-guide.com/</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/specializations/human-resource-management">https://www.coursera.org/specializations/human-resource-management</a>
2	<a href="https://swayam.gov.in/nd1_noc20_mg15/preview">https://swayam.gov.in/nd1_noc20_mg15/preview</a>
3	<a href="https://alison.com/course/introduction-to-modern-human-resource-management">https://alison.com/course/introduction-to-modern-human-resource-management</a>
4	<a href="https://www.classcentral.com/course/managing-human-resources-5462">https://www.classcentral.com/course/managing-human-resources-5462</a>
5	<a href="https://swayam.gov.in/nd1_noc20_mg15/preview">https://swayam.gov.in/nd1_noc20_mg15/preview</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	204	International Business	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

#### Course Objectives:

- vii) To prepare the students thoroughly with the domain knowledge and global issues of International business.
- viii) To discuss the reason of entering into International business through various trade theories propounded by economist and practical aspects.
- ix) To demonstrate through trade data analytics as to what to export and where to export from India.
- x) To discuss the role and functions of International organizations and trade organisation that is IMF, World Bank and WTO.
- xi) To familiarize the students with the key trade blocks such as NAFTA, EU etc.
- xii) To demonstrate the role of exchange rates in global markets.

#### Learning Outcomes :

- V) To enable the students to take decisions related to global issues and policies.
- VI) To be able to Interpret Foreign trade policy and avail incentives offered under various schemes.
- VII) To analyze the trade data for decision making as to what to export and where to export.
- VIII) To recall the role and functions of Global Institutions IMF, WTO and World Bank.
- IX) To acquaint with the trade blocks SAARC, NAFTA, EU etc.
- X) To comprehend the exchange rates practically and its implications on trade.

Unit No.	Contents	Hrs.
1	Introduction of International Business and Entry Strategies- Definition of International Business, Nature and Scope of International Business, Domestic Trade versus International Trade, Forms of Countertrade. Market Entry Strategies – Exporting, Importing, Joint venture, Franchising, Merger and acquisition.	06
2	Globalization and Cultural Issues - Definition of Globalization, Globalization of Markets, Pros and cons of Globalisation, Drivers of Globalization , Cultural environment in International Business (Hofstede Theory – Application in trade). Ease of Doing Business (Parameters given by world bank) in India and across BRICS.	06
3	Trade Theories, Trade Policy, Trade Analytics - Trade theories – Mercantilism, Absolute Advantage, Revealed Comparative Advantage, H.O Theory and Porters Diamond Model. International Trade Classification and Harmonized System (HS), Current Foreign Trade Policy in force (General Provisions), Incentives offered under FTP (Ch-3 and Ch-4 of Foreign Trade Policy). Trade Map Analytics and calculation of RCA, TII for various products, Ease of Doing Business.	10
4	Balance of Payment and FEMA Act - Components of BOP (Current and Capital Account) , Credit and Debit Entries in BOP, Differentiate between	08

	BOT and BOP , Key Provisions of FEMA Act 1999 and difference between FERA and FEMA. Country Risk Analysis and Lessons from ASIAN financial Crisis in 1997.	
5	International Financial and Trade Organizations - Role of GATT, WTO, IMF and World Bank group. Dispute settlement mechanism through WTO. Levels of trade integration. Basic conceptual note of NAFTA, SAARC and European Union. Role of BRICS.	09
6	Foreign Exchange Market and Types of exchange rates - Direct and indirect Quotes, Concept of Nostro and Vostro Account, Types of Exchange -Fixed vs. Flexible Exchange Rate (Independent and Managed Float) , Factors affecting Foreign Exchange Rate , Role, Functions and Participants of Foreign Exchange Market	06
<b>Activity</b>	<p>Students are required to prepare workbook (practical file) -Hands on experience on trade data analytics to find out the trade related ratios such as RCA (Revealed Comparative Analysis) and TII (Trade Intensity index). Students are advised to prepare assignment/file using HS codes given and find out the competitiveness to decide which market to enter and what products should be exported from India.</p> <p>Compare BRICS on EODB Ratings using data from world bank reports.</p> <p>Cultural differences of at least five countries by a group of students to be done. Globalisation Index to be understood in order to find out the reasons for those who are highly globalized versus those who are less globalized. Cultural differences across the countries to be explained using Hofstede theory. Key Exports from India and major markets to be studied through data analytics.</p>	

**Reference Books:**

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Rakesh Mohan Joshi (IIFT)	International Business	2009	OXFORD
2 – National	V.K Bhalla	International Business	(1 December 2013)	S. Chand
3 – National	K. Aswathappa	International Business	6 <sup>th</sup> Edition 2017	McGraw Hill Education
4 – International	Donald Ball and MichealGeringer	International Business: The Challenge of Global Competition	9 <sup>th</sup> Edition	McGraw-Hill Education
5 – International	Charles W. L. Hill	International Business: Competing in the Global Market Place	10 edition (1 July 2017)	McGraw Hill Education
6 – International	PrashantSalwan John D. Daniels, Lee H. Radebaugh, Daniel P. Sullivan (Author)	International Business, 15/e Fifteenth	Fifteenth edition (28 July 2016)	Pearson

		Edition, Kindle Edition		
7 – International	Ricky W. Griffin (Author), Michael Pustay (Author)	International Business, Global Edition	8th Edition on (May 15, 2014)	Pearson

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.imf.org">www.imf.org</a>
2	<a href="http://www.wto.org">www.wto.org</a>
3	<a href="http://www.trademap.org">www.trademap.org</a>
4	<a href="http://www.commerce.nic.in">www.commerce.nic.in</a>
5	<a href="http://www.dgft.gov.in">www.dgft.gov.in</a>
6	International Business Review <a href="https://www.journals.elsevier.com/international-business-review">https://www.journals.elsevier.com/international-business-review</a>
7	Journal of International Business Studies <a href="http://www.jibs.net/">http://www.jibs.net/</a>
8	Open Textbook Library <a href="https://open.umn.edu/opentextbooks/textbooks/international-business">https://open.umn.edu/opentextbooks/textbooks/international-business</a>

### MOOCs:

Resources No	Subject	Web site address
1	International Business	<a href="https://www.openlearning.com/courses/GFMA2023/">https://www.openlearning.com/courses/GFMA2023/</a>
2	International Business Environment and Global Startegy –IIMB (SushilVachani)	EDX <a href="https://www.edx.org/course/international-business-environment-and-global-stra">https://www.edx.org/course/international-business-environment-and-global-stra</a>
3	International Business	EDX <a href="https://www.edx.org/learn/international-business">https://www.edx.org/learn/international-business</a>
4	International Business I (Coursera) Taught by <b>-Doug E Thomas</b> (university of New Mexico)	COURSERA <a href="https://www.coursera.org/learn/international-business">https://www.coursera.org/learn/international-business</a>
5	International Financial Environment	<a href="https://nptel.ac.in/courses/110105031/">https://nptel.ac.in/courses/110105031/</a>

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Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	205	Production and Operations Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :	
i)	To understand fundamentalsofProduction and Operations Management.
ii)	To develop an understanding of the strategic importance of Production and Operations Management.
iii)	To understand Production System.
iv)	To learn EOQ concept.
v)	ToacquaintthestudentswithconceptsofallthefunctionsundertheManufacturingactivitiesby introducingtheUnits Maintenance Management,SCM,JIT,QAand ISOCertificationetc.
Learning Outcomes :	
After learning the concepts of Production and Operations Management, students will-	
I) Understand various concepts of Production and Operations Management.	
II) Analyze the importance of Production and Operations Management and compare various issues particular to manufacturing industry.	
III) Classify various Production Systems.	
IV)Develop numerical ability to solve examples on EOQ.	
V) Describe the advantages of Maintenance Management, SCM, JIT, QA and ISO Certification.	

Unit No.	Conents	Hrs.
1	<b>Introduction to POM</b> Nature, Scope, Importance and Functions of POM, Production Process, Difference between Production and Service operations, Responsibilities of Production Manager, Production process selection decisions, Production System, Classification of Production System.	7
2	<b>Production Planning Control</b> Objectives of PPC & it's various functions of common and optional nature, Co-ordination of PPC with other departments. Job sequencing, Assembly Line Balancing.	6
3	<b>Plant Location and Layout</b> Plant Location: Meaning, Need for selecting a suitable Location, Factors affecting Plant Location Decision, Plant Layout: objectives, types of Plant Layout.	8
4	<b>Maintenance Management</b> Concepts, Need of maintenance, Objectives & types of maintenance.	6
5	<b>Inventory management</b> Concept, Importance, Classification of Inventory System, EOQ Model with numerical, Basic concept of Material Requirement Planning(MRP).	8
6	<b>Emerging Trends in POM</b> Supply Chain Management(SCM),Just in Time (JIT),QualityControl,QualityAssurance(QA),ISOCertification,Enterprise Resource Planning(ERP), Total Quality Management(TQM),TPM, Quality Circles, Services Operations	10

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### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	L.C.Jhamb	Production Operations Management	2009	Everest Publishing House
2 – National	Chunawala & Patel	Production and Operations Management	2009	Himalaya Publishing House
3 – National	S.N.Chary	Production and Operations Management	2004	Tata McGraw Hill Ltd.
4 – International	Everett Adams & Ronald Ebert.	Production and Operations Management	1992	Prentice Hall
5 – International	Martin Kenneth Starr	Production and Operations Management	2008	Cengage Learning
6 – International	James B. Dilworth, White	Production and Operations Management: An Overview	1993	Thomson Learning

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.yourarticlelibrary.com">http://www.yourarticlelibrary.com</a>
2	<a href="https://en.wikipedia.org">https://en.wikipedia.org</a>
3	<a href="https://managementhelp.org">https://managementhelp.org</a>
4	<a href="https://www.cleverism.com">https://www.cleverism.com</a>
5	<a href="https://commercemates.com">https://commercemates.com</a>

### MOOCs:

Resources No	Web site address
1	<a href="http://www.swayam.gov.in">www.swayam.gov.in</a>
2	<a href="http://www.udemy.com">www.udemy.com</a>
3	<a href="http://www.coursera.org">www.coursera.org</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	206	Research Methodology	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:	
i)	To introduce the role of research in business and management
ii)	To introduce the concepts of scientific research and methods of conducting scientific enquiry
iii)	To identify various sources of information for literature review and data collection.
iv)	To familiarize the learners with the key concepts in sampling techniques and instruments for data collection
v)	To develop basic understanding of conducting surveys and reporting the research
vi)	To educate on the ethical issues in conducting applied research.
Learning Outcomes :	
At the end of the course the learner will	
I)	Develop understanding on different applications of research for managerial decision making
II)	Explain key research and summarize the research articles and research reports
III)	Have basic awareness of data analysis-and hypothesis testing procedures
IV)	Design questionnaires and administer simple survey based projects.
V)	Describe sampling methods, measurement scales and instruments, and appropriate uses of each
VI)	Explain the rationale for research ethics

Unit No.	Contents	Hrs.
1	<b>Introduction to Research Methodology</b> Meaning, definition and objectives of research, motivations for research, type of research, Importance of research in managerial decision making , research in Research in functional / business areas. Qualities of a good researcher.	06
2	<b>Research process:</b> Steps in research process, Defining the research problem, Problem formulation and statement, Framing of hypothesis Research design: Meaning, characteristics, advantages and importance of research design. Measurement – types and errors in measurement. Development and designing of tools of data collection – Attitude measurement scales, Levels of measurement and questions of validity and reliability Designing of research projects – research proposal, Pilot surveys	08

3	<p><b>Sampling and Data Collection:</b>  Census and sample survey. Need and importance of sampling, probability and non-probability sampling technique.  Data collection – Primary and secondary sources of data, methods of collecting primary data - interview, observation, questionnaires, schedules through enumerators, surveys. Advantages and Limitations of different methods of data collection. Use of secondary data, precautions while using secondary data.</p>	08
4	<p><b>Processing and Analysis of Data</b>  Meaning, importance and steps involved in processing of data. Use of statistical tools and techniques for analysis of data.  Testing of Hypotheses, Basic concepts, importance of hypothesis. Procedure of testing of hypothesis. Chi-square test – Problems on Basic application of chi square test.  Analysis and Interpretation of data – Interpretations of results, Concept of Univariate, Bi-variate and multivariate analysis of data</p>	10
5	<p><b>Reporting of research :</b>  Importance of research reports, types of reports, Format of a research report, Precautions in writing a research report.. Plagiarism and its types.  References and Bibliography. Dissemination of research results. Ethical issues in conducting research.</p>	08
6	<p><b>Role of ICT in research</b>  Information and Computer Technology(ICT), Important characteristics, Computer Applications for research, Use of Statistical Software Packages for research</p>	06

Pedagogy- Teaching methods include readings, lectures, group discussions, exercises, and assignments and Mini Projects..

Evaluation: Assignments Presentation , Mini-project/End-Term Paper

### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Kothari C R	Research Methodology – Methods & Techniques	2014	PHI Pvt Ltd New Delhi
2 – National	Uma Sekharan	Research Methods for business	2016	Oxford
3 – National	Ranjit Kumar	Research Methodology	2009	Pearson Education
4 – International	Donald Cooper and PS Schindler	Business Research Methods	2015	Tata McGraw Hill
5 – International	Neuman, W.L.	Social Researhc Methods – Qualitative and Quantitative	2008	Pearson
6 – International	Saunders, M., Lewis, P., &Thornhill, A.	Research Methods for Business Students	2011	Pearson

### Online Resources:

Sr	Web site address
1	<a href="https://www.manaraa.com/upload/43ef7b58-5c8a-4371-8aea-699609cd2aaf.pdf">https://www.manaraa.com/upload/43ef7b58-5c8a-4371-8aea-699609cd2aaf.pdf</a>
2	<a href="http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf">http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf</a>
3	<a href="https://www.methodspace.com/open-access-sage-journals-with-a-research-methods-focus/">https://www.methodspace.com/open-access-sage-journals-with-a-research-methods-focus/</a>
4	<a href="https://www.researchgate.net/deref/https%3A%2F%2Fwww.amazon.com%2Fhow-research-todays-tips-tools-ebook%2Fdp%2Fb01i5jjdxc">https://www.researchgate.net/deref/https%3A%2F%2Fwww.amazon.com%2Fhow-research-todays-tips-tools-ebook%2Fdp%2Fb01i5jjdxc</a> <a href="http://www.ala.org/tools/research/larks/researchmethods">http://www.ala.org/tools/research/larks/researchmethods</a>
5	<a href="https://www.intechopen.com/online-first/research-design-and-methodology">https://www.intechopen.com/online-first/research-design-and-methodology</a>
6	<a href="https://lecturenotes.in/m/21513-research-methodology-">https://lecturenotes.in/m/21513-research-methodology-</a>
7	<a href="http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf">http://ebooks.lpude.in/commerce/mcom/term_2/DCOM408_DMGT404_RESEARCH_METHODOLOGY.pdf</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://swayam.gov.in/nd2_cec20_hs17/preview">https://swayam.gov.in/nd2_cec20_hs17/preview</a>
2	<a href="https://www.classcentral.com/course/researchmethods-1767">https://www.classcentral.com/course/researchmethods-1767</a>
3	<a href="https://www.coursera.org/learn/research-methods">https://www.coursera.org/learn/research-methods</a>
4	<a href="https://www.classcentral.com/course/swayam-introduction-to-research-5221">https://www.classcentral.com/course/swayam-introduction-to-research-5221</a>
5	<a href="https://www.edx.org/course/introduction-to-social-research-methods">https://www.edx.org/course/introduction-to-social-research-methods</a>
6	<a href="https://www.coursera.org/learn/qualitative-methods">https://www.coursera.org/learn/qualitative-methods</a>

Continuous Assessment in percentage = total for 50 marks)

Class participation	Quizzes/class test	Mini Project	MOOCs /assignment	MID SEM
10%	20%	40%	10	20%

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	207	Business Environment	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives :
i) To enable the students to understand the overall business environment within which an organization has to function. ii) To enable students to understand its implication for decision making in business organizations.
Learning Outcomes :
On the successful completion of this course the learner will be able to; i) Understand the role of managers in firms. ii) Design and develop strategic plans for the organization iii) Understand the importance of various sectors of the economy and their contribution towards national income.

Unit	Contents	Sessions
1	<b>Introduction to Business Environment:</b> - Nature and scope of business, goals meaning of environment of business, objectives, environmental analysis, significance/benefits of environmental analysis, environmental factors/types, techniques of environmental forecasting, limitations of environmental forecasting.	7
2	<b>Economic Environment:</b> - Nature of economy, structure of economy, understanding economic system, economic policies- Industrial Policy and Trade Policy, Fiscal Policy, Monetary Policy, National Income and GDP, composition and growth trends.	10
3	<b>Regulatory Environment:</b> - Functions of state, Economic role of Government, Government and Legal System, the constitutional environment, forms of Government regulations, state intervention and control, business- Government interference.	6
4	<b>Socio-Cultural Environment:</b> - Business and Society- social responsibility of business social orientation of business, the Indian scenario, social audit, impact of culture on business, other socio-cultural factors and business, Consumer Protection Act, Consumer rights, Right to information Act, business ethics and corporate governance.	10
5	<b>Natural and Technological Environment:</b> - Natural Environment, technological environment and their impact on business, innovation and business technology and competitive advantage, economic effects of technology, technology policy and government promotional facilities.	4
6	<b>Global Environment and Institutions:</b> - Globalisation- meaning, features, benefits, challenges, globalization of Indian businesses GATT and WTO – understanding WTO, functions, structure, implications for India, regulation of foreign trade- Foreign Trade Act, EXIM policy, FEMA., Market Reforms in Asian Countries.	8

**Reference Books :-**

Sr. No.	Name of the Author	Title of the Book
1 National	Raj Agarwal	Business Environment
2 National	Francis Cherunilam	Business Environment
3 National	K. Aswathappa	Essentials of Business Environment

**Online Resources:**

Online Resources No	Web site address
1	<a href="http://www.rbi.org.in">www.rbi.org.in</a>
4	<a href="http://www.economist.com">www.economist.com</a>
5	<a href="http://www.bbc.com">www.bbc.com</a>

**MOOCs:**

Resources No	Web site address
1	Swayam
2	Coursera

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	208	Business Ethics and Corporate Governance	
Type	Credits	Evaluation	Marks
Core Elective	02	CES	IE = 100

Course Objectives:
i) To help the students understand the importance of ethical values and principles in life. ii) To enable students to comprehend the different dimensions of Business Ethics. iii) To enlighten about the corporate social responsibility in the corporate business.
Learning Outcomes :
i) The Students should be able to understand the importance of ethics and values in personal and professional life. ii) There should be a positive change in the attitude of the students towards morals, values and ethics after studying the subject. iii) The students understand their responsibility towards the society while running any business or as an employee.

Unit No.	Contents	Hours
01	Overview of Business Ethics: Importance and need for Business Ethics, Theories of Ethics, Ethical Issues in Business, Ethics and Management. Ethics and values,, Norms, Beliefs, Morality	05
02	<b>Spirituality and Ethics:</b> What is Spirituality? Importance, relationship between spirituality and ethics. Influence of Major religions on ethics: Hinduism, Islam, Christianity, Buddhism, Sikhism, and Zoroastrianism. Indian culture, Ethos and Values- Role of Indian ethos in managerial practices, management lessons from Vedas, Mahabharat, Bible, Quran, Kautilya's Arthshastra.	06
03	<b>Ethical Decision Making :</b> Ethical Decision Making process. Framework for ethical decision making. Ethical Dilemma, resolving ethical dilemmas, Ethical dilemmas in different business areas, finance, Marketing, HRM, IB, and technology etc. Ethical culture in organizations, Developing code of ethics and conduct, professional ethics.	05
04	<b>Corporate Governance:</b> Meaning and importance of corporate governance, Difference between governance and management, purpose of good governance, key pillars of corporate governance. Stakeholders: Rights and privileges; problems and protection, Board Of Directors – Role in Governance; Role and responsibilities of auditors Whistle blowing – concept of whistle blowing, whistle blowers, policy for whistle blowing . Corporate Social Responsibility (CSR)– concept and models of CSR, CSR initiatives in India.	06

05	<b>Social, Environmental and Ethical Issues in Business:</b> Business action that affects society (Ethical issues), Social responsibility of Business, Ethics and the Environment (pollution control and conserving depletable resources), Legal and Regulatory Issues, Sexual Harassment and Discrimination	<b>04</b>
06	<b>Implementation of Business Ethics</b> Need for organizational ethics program, Codes of Conduct, Ethics Audit and its 4 process, Corruption and Scams, Impact of Corruption on Society and Economy, Anti-Corruption Laws, Agencies such as Central Vigilance Commission(CVC) and Central Bureau of Investigation(CBI) for anti-corruption cases, Professional values for business and managerial values <b>Case studies:</b> Major Corporate Governance Failures : Enron (USA); World.com (USA); Vivendi (France); Satyam computer (India); Sahara (India); Kingfisher Ltd (India); etc.	<b>04</b>

Reference Books:

Sr. No.	Name of Author	Title of the Book	Publisher
1 National	Murthy CSV	Business Ethics	Himalaya Publishing House
2 National	Hartman L, Chatterjee A	Perspectives in Business Ethics	McGraw Hill Publishing Co. Ltd
3 National	Ananda Das Gupta	Business Ethics –An Indian Perspective	Springer Publications
4 International	Velasquez Manuel G	Business Ethics	Eastern Economy Edition
5 International	Ferrell O C, Fraedrich John Paul, Ferrell Linda	Business Ethics, Ethical Decision Making and Cases	Biztantra
6 International	Boatright John	Ethics and the conduct of Business	Pearson Education

Online Resources:

Resource No.	Website Address
01	<a href="https://www.ethicssage.com/ethics-resources.html">https://www.ethicssage.com/ethics-resources.html</a>
02	<a href="https://maag.guides.yosu.edu/businessethics/web">https://maag.guides.yosu.edu/businessethics/web</a>
03	<a href="https://www.researchgate.net/publication/226607374_Business_Ethics_Resources_on_the_Internet">https://www.researchgate.net/publication/226607374_Business_Ethics_Resources_on_the_Internet</a>

MOOCs:

Sr. No.	Details
01	<a href="http://www.coursera.org">www.coursera.org</a>
02	<a href="http://www.udemy.com">www.udemy.com</a>
03	<a href="http://my-mooc.com">my-mooc.com</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	209	Introduction to Business Analytics	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

**Subject / Course Objectives :**

- i) To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
- ii) To become familiar with the processes needed to develop, report, and analyze business data

**Learning Outcomes :**

After successful completion of this course the learner will be able to :

- i) Make sound managerial decisions aimed at furthering the business interests of the company.
- ii) Identify, analyze and understand the problems faced by the company.
- iii) Provide concrete solution to the identified business problems.

Unit No.	Contents	Hrs.
1	Introduction, What is Business Analytics, Overview of Areas where Business Analytics is applied	02
2	Visualization and Data Issues, organization of Source of Data, Importance of Data Quality, Dealing with Missing or incomplete data, data classification,	04
3	Data Mining: Introduction to Data Mining- classification, basic concepts, Data mining process, data mining tools XL MINER.	06
4	Applications of Business Analytics - Risk - Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing, Market share estimation and Sensitivity Analysis	06
5	Tableau: Extracting data into Tableau, data preparations, dimensions, transformation of variables, creating views , working with charts, exporting visualizations	07
6	CAPSTONE: A multifaceted assignment on any one of the following: Recruitment Analytics, Compensation Analytics, Talent Analytics, Training Analytics, Human Resource Retention Analytics, Workforce Analytics	05



Reference Books :-

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 National	PurbaHalady Rao	Business Analytics – an application focus	2013	PHI Learning
2 National	Tanushree Banerjee Arindam Bannerjea	Business Analytics – Text and Cases	2019	SAGE Publications
3 International	Essentials of Business Analytics	BhimasankaramPochiraju, Sridhar Seshadri	2018	Springer
4 International	Gert H.N. Laursen, JesperThorland	Business Analytics for Managers	2010	Wiley and SAS Business Series
5 International	Mark J. Schniederjans, Dara G. Schniederjans and Christopher M Starkey	Business Analytics- Principles, Concepts and Applications	2014	Pearson
6 International	Jay Liebowitz	Business Analytics: An Introduction	2013	CRC Press, Taylor and Francis

**Online Resources:**

No	Web site address
1	<a href="https://www.managementstudyguide.com/business-analytics.htm">https://www.managementstudyguide.com/business-analytics.htm</a>
2	<a href="https://www.academia.edu/35314419/Bernard_Marr_Key_Business_Analytics_The_60_business_analysis_tools_every_manager_needs_to_know.pdf">https://www.academia.edu/35314419/Bernard Marr Key Business Analytics The 60 business analysis tools every manager needs to know.pdf</a>
3	<a href="https://www.researchgate.net/publication/320685945_Understanding_the_Role_of_Business_Analytics_Some_Applications">https://www.researchgate.net/publication/320685945 Understanding the Role of Business Analytics Some Applications</a>

**MOOCs:**

Resources No	Web site address
1	Swayam
2	<a href="https://www.coursera.org/specializations/business-analytics">https://www.coursera.org/specializations/business-analytics</a>
3	<a href="https://www.edx.org/course/people-management-3">https://www.edx.org/course/people-management-3</a>
4	<a href="https://www.edx.org/course/data-models-and-decisions-in-business-analytics">https://www.edx.org/course/data-models-and-decisions-in-business-analytics</a>
5	<a href="https://www.classcentral.com/course/intro-business-analytics-12295">https://www.classcentral.com/course/intro-business-analytics-12295</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	210	E-commerce Application	
Type	Credits	Evaluation	Marks
Open	2	CES	IE = 100

**Course Objectives:**

- i) To enable basic concepts about E-commerce.
- ii) To study knowledge of business models
- iii) To learn need of e-commerce security.
- iv) To enable knowledge about E-payment system.
- v) To know the e-commerce Applications.
- vi) To have an overview of M-commerce.

**Course Objectives:**

- i) Basic concepts about E-commerce will be studied.
- ii) Knowledge of business models will be used.
- iii) Students will implement e-commerce security.
- iv) Better usage will be down with help of E-payment system.
- v) Where e-commerce Applications are used.
- vi) Use of M-commerce technology.

**Subject / Course Objectives :**

- i) To enable basic concepts about E-commerce.
- ii) To study knowledge of business models
- iii) To learn need of e-commerce security.
- iv) To enable knowledge about E-payment system.
- v) To know the e-commerce Applications.
- vi) To have an overview of M-commerce.

**Learning Outcomes :**

- i) Basic concepts about E-commerce will be studied.
- ii) Knowledge of business models will be used.
- iii) Students will implement e-commerce security.
- iv) Better usage will be down with help of E-payment system.
- v) Where e-commerce Applications are used.
- vi) Use of M-commerce technology.

Name : -	Syllabus – <i>E-commerce Application</i>	Hrs.
Unit No : 1	<b>Introduction to E-Commerce</b> Brief history of e-commerce, definitions of e-commerce, technical components and their functions, e-commerce versus traditional business, requirements of e-commerce. Advantages and disadvantages of e-commerce, Value chain in e-commerce, current status of e-commerce in India.	5
Unit No : 2	<b>Business Models for e-commerce</b> Types of business models (B2B, B2C, C2B,C2C) with examples. EDI – Requirement of EDI, types of EDI, advantages and disadvantages of EDI.	5
Unit No : 3	<b>Types of ISP</b> ISP, Types of ISP, Choosing an ISP, domain name, domain name types, how to register domain name.	5
Unit No : 4	<b>E-commerce Payment System</b> Overview of Electronic payment technology, limitations of the traditional payment system, requirements of e-payment system. B2B Electronic Payments, Third-Party Payment Processing, Electronic Payment Gateway Electronic or digital cash, properties of digital cash, how it works. Online credit cardpayment system, smart card.	5
Unit No : 5	<b>E-Commerce Applications</b> E-Commerce and banking, e-commerce and retailing, e-commerce and onlinepublishing, online marketing, e-advertising, e-branding.	5
Unit No : 6	<b>Mobile Commerce</b> Overview of M-Commerce - Wireless Application Protocol(WAP), Generations of Mobile Wireless Technology, Components of Mobile Commerce, Networking Standards for Mobiles Examples of M-Commerce, Current Status of M-Commerce in India, M-commerce applications, Mobile information Services, Mobile banking and trading.	5

**Reference Books:**

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	C.S.V. Murthy	E-Commerce		Himalaya Publishing House
2 – National	P.T.Joseph	E-Commerce A Managerial Perspective		Prentice Hall of India
3 – International	Kalakota and Whinston	Frontiers of Electronic Commerce		Pearson Education

**Online resources ;**

Online Resources No	Web site address
1	<a href="http://www.udemy.com">www.udemy.com</a>

**MOOCs:**

Resources No	Web site address
1	Alison
2	Sayam
3	Coursera

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
II	211	Managerial Skills for Effectiveness	
Type	Credits	Evaluation	Marks
Elective	2	CES	IE = 100

### Course Objectives:

Subject / Course Objectives :	
i)	To offer exposure of essential managerial skills to students and developing these skills in the students.
ii)	To emphasize the development of the skills and knowledge required for successful managerial performance.
iii)	To focus on such areas as developing self-awareness
iv)	To develop creative problem-solving, supportive communication
v)	To focus on the use of power and influence, motivation techniques
vi)	To manage conflict
Learning Outcomes:	
I)	Demonstrate applicable knowledge of the common skills needed for managerial effectiveness within the functions of management.
II)	Demonstrate applicable knowledge of various human behavior and motivation techniques relating to leading individuals and teams.
III)	Demonstrate comprehension of values, power, and influence relating to organizational culture, change, and ethical decision-making in global contexts.
IV)	Identify and critically assess assumptions that influence decisions and actions on management, leadership, teamwork and relationship building
V)	Receive and integrate feedback on decision-making practices, conflict resolution skills, and teamwork behaviors with the support of a team-based coach
VI)	Demonstrate writing business messages and reports

Unit No.	Contents	Hrs.
1	Introduction to skills & personal skills: Importance of competent managers, skills of effective managers, developing self-awareness on the issues of emotional intelligence, self-learning styles, values, attitude towards change, learning of skills and applications of skills.	05
2	Problem solving and building relationship: Problem solving, creativity, innovation, steps of analytical problem solving, limitations of analytical problem solving, impediments of creativity, multiple approaches to creativity, conceptual blocks, conceptual block bursting. Skills development and application for above areas.	05
3	Building relationship Skills for developing positive interpersonal communication, importance of supportive communication, coaching and counseling, defensiveness and disconfirmation, principles of supportive communications. Personal interview management. Skill analysis and application on above areas.	05
4	Team building: Developing teams and team work, advantages of team, leading team, team membership. Skill development and skill application.	05
5	Empowering and delegating: Meaning of empowerment, dimensions of	05

	empowerment, how to develop empowerment, inhibitors of empowerment, delegating works. Skills development and skill application on above areas.	
6	Communication related to course: How to make oral presentations, conducting meetings, reporting of projects, reporting of case analysis, answering in Viva Voce, Assignment writing	05

### Evaluation and Grading:

Assignments ... 25%

Assignment on Report Writing ... 25%

Online Course ... 25%

Class Participation and Attendance ... 25%

### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year /Edition	Publisher Company
1 – National	V.S.P.Rao	Managerial Skills	2010	Excel Books, New Delhi
2 – National	Bovee, Courtland L, Thill, John V. and Raina, RoshanLal	Business Communication Today	2017	Pearson Education, New Delhi
3 – National	Ramnik Kapoor	Managerial Skills		PathMakers, Bangalore
4 – International	Barun K. Mitra	Personality Development and Soft skills		Oxford University Press
5 – International	R. Alec Mackenzie	The Time Trap: The Classic book on Time Management		
6 – International	David A Whetten, Cameron	Developing Management skills	2008	Prentice Hall

### Online Resources:

Online Resources No	Web site address
1	<a href="http://www.futurelearn.com">www.futurelearn.com</a>
2	<a href="http://www.classcentral.com">www.classcentral.com</a>
3	<a href="http://www.onlinembapage.com">www.onlinembapage.com</a>
4	<a href="http://www.businessnewsdaily.com">www.businessnewsdaily.com</a>
5	<a href="http://www.alison.com">www.alison.com</a>

### MOOCs:

Resources No	Web site address
1	<a href="http://www.mooc-list.com">www.mooc-list.com</a>
2	<a href="http://www.mbacentral.org">www.mbacentral.org</a>
3	<a href="http://www.my-mooc.com">www.my-mooc.com</a>
4	<a href="http://www.accreditedschoolsonline.org">www.accreditedschoolsonline.org</a>

# **MBA SEM III**

## **Core Courses**

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	301	Strategic Management	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

<p>Subject / Course Objectives :</p> <ul style="list-style-type: none"> <li>To provide a framework of strategic management</li> <li>To sensitize students about internal and external environments and enable them to integrate and practice strategic management skills</li> </ul>		
<p>Learning Outcomes :</p> <p>Having successfully completed this module, you will be able to demonstrate knowledge and understanding of:</p> <p>I) the key dimensions of strategic management – Analysis, Evaluation, Choice &amp; Implementation</p> <p>II) organizations’ ability to implement chosen strategies and identify the areas requiring change</p> <p>III) develop skills in generating alternative solutions to complex problem areas, underpinning each with a supportive and well researched rationale in order to achieve critical success</p> <p>IV) obtain, analyse and apply information from a variety of sources in the public domain</p>		
Units	Syllabus – <i>Strategic Management</i>	Hrs.
Unit No : 1	Introduction to Strategic Management: Concept, Definition, nature, scope, significance, Levels at which strategy operates , Process, Strategic Intent: Vision, Mission, Business Purpose, Objectives and Goals	10
Unit No : 2	External and Internal Resource Analysis External Business Environment –SWOT Analysis. Industry Analysis-Porters Five Force Model. Resource Based View – Resources – Capabilities – Competencies – Competitive Advantage, Value Chain Analysis. Strategic Analysis and Choice : BCG Matrix, Ansoff Matrix, GE 9 Cell Matrix, Business portfolio Analysis	10
Unit No : 3	Strategy Formulation Generic Strategies - Low Cost – Differentiation – Focus. Corporate Level Strategy – Stability –Expansion–Retrenchment – Combination.	10



	Functional level Strategy: H.R. Strategies, Marketing Strategies, Financial Strategies, Operational Strategies	
Unit No : 4	Implementation of Strategy Issues in implementation of strategy; Strategy Structure relationship; Implementing changes in structure; Restructuring and Re-Engineering; Resource Allocation; Behavioral issues in strategy implementation - organizational culture and change; McKinsey's 7s framework	10
Unit No : 5	Strategic Control Purpose and components of Strategic Control. Evaluation techniques. Control process and system.	10
Unit No : 6	Contemporary Strategic management Business model innovation - Disruptive Innovation, Blue Ocean Strategy. Global issues in strategic management – the global challenges, strategies for competing in global markets.	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Azhar Kazmi	STRATEGIC MANAGEMENT AND BUSINESS POLICY	2008	McGraw Hill	
2 – National	A. Bhandari, R. P. Verma	Strategic Management	2013	McGraw Hill	
3 – National	Srinivasan R	Strategic Management: The Indian Context	2014	PHI learning	
4 – International	Jay B. Barney and William S. Hesterly	Strategic Management and Competitive Advantage: Concepts (4th Edition)	2012	Pearson/Prentice Hall,	
5 – International	William F Glueck :,	Business Policy and Strategic Management		McGraw Hill International Book Co	
6 – International	1. Charles W.L Hill	<i>Strategic Management: An</i>		Houghton Mifflin	

	and Gareth R. Jones,.	<i>Integrated Approach,</i>			
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Online Resources:

Online Resources No	Web site address
1	<a href="http://www.ijsm-journal.org/IJSM">www.ijsm-journal.org/IJSM</a>
2	<a href="http://www.onlinelibrary.wiley.com/journal/10970266">www.onlinelibrary.wiley.com/journal/10970266</a>
3	<a href="http://www.emerald.com/insight/publication/issn/1755-425X">www.emerald.com/insight/publication/issn/1755-425X</a>

MOOCs:

Resources No	Web site address
1	<a href="http://www.coursera.org">www.coursera.org</a>
2	<a href="http://www.edx.org">www.edx.org</a>
3	<a href="http://www.openlearning.com">www.openlearning.com</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	302	Operations Research for Managers	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :

- i) To introduce students to use quantitative methods and techniques for effective decisions–making.
- ii) To familiarize the students with the quantitative techniques for data analysis
- iii) To formulate, analyze, and solve mathematical models that represent real-world problems.

Learning Outcomes : After completion of this course, students will

- I) Understand Operations Research Concepts.
- II) Know the importance of Operations Research tools and techniques.

Units: -	Syllabus – Operations Research for Managers	Hrs.
Unit No : 1	Introduction to Operations Research: Introduction, Historical background, Meaning, Significance, Scope and Limitations of O.R. Features of Operations Research, Phases of Operations Research. Applications of O.R. in Business and Management.	10
Unit No : 2	Linear Programming Problem (L.P.P.): Definition and Components of LPP, Formulation of LPP, Solution of LPP by Graphical Method, Examples on maximization and minimization, Examples on mixed constraints, Special cases in LPP: Alternative or multiple optimal solutions	10
Unit No : 3	Transportation problems (T.P.): Introduction and Formulation of TP, Initial Basic Feasible Solution I.B.F.S. by North West Corner Rule (NWCR), Matrix Minimum Method, Vogel’s Approximation Method (VAM), Checking Optimality by Modified Distribution Method (MODI Method), Special cases in TP: maximization, unbalanced TP, restricted TP, applications of T.P. in business.	10
Unit No : 4	Assignment Problems (A.P.): Meaning, definition of AP, Hungarian Method of solving AP, Assignment Problem for Maximization, minimization. unbalanced AP, restricted AP, Multiple /Optimal Solutions, applications of A.P. in business.	10
Unit No : 5	Simulation: Introduction to Simulation, Types of Simulation, steps of simulation process, Monte Carlo technique, business applications and	10

	limitations.	
Unit No : 6	Network Analysis by PERT and CPM: Introduction to Networks, Basic differences between PERT and CPM, Network models – PERT/CPM network components and precedence relationships. Critical Path Analysis, forward pass computation for earliest event time, backward pass computation for latest allowable event time, Program Evaluation and Review Technique (PERT). Determination of PERT times.	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Sharma J. K.	Operations Research – Theory and Applications	2009	Laxmi Publications Pvt. Ltd.
2 – National	R. Panneerselvam	Operations Research	2006	Prentice- Hall of India Pvt. Ltd. New Delhi
3 – National	S. Kalavathy	Operations Research	2013	Vikas Publishing House Company Pvt. Ltd.
4 – International	Michael Carter, Camille C Price, Ghaith Raba di	Operations Research- A Practical Introduction	2019	Taylor & Francis Group, LLC
5 – International	Greg H. Parlier, Federico Liberatore, Marc Demange	Operations Research and Enterprise Systems	2019	Springer
6 – International	S.A. Cropper, Michael C. Jackson, Paul Keys	Operations Research and the Social Sciences	2012	Springer

Online Resources:

Online Resources No	Web site address
1	<a href="http://en.wikipedia.org">en.wikipedia.org</a>
2	<a href="http://www.springer.com">www.springer.com</a>
3	<a href="http://www.pearson.com">www.pearson.com</a>
4	<a href="http://www.optimization-online.org">www.optimization-online.org</a>

MOOCs:

Resources No	Web site address
1	<a href="http://mooc.org">mooc.org</a>
2	<a href="http://www.Coursera.org">www.Coursera.org</a>
3	<a href="http://www.Udemy.com">www.Udemy.com</a>
4	<a href="http://Swayam.gov.in">Swayam.gov.in</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	303	Entrepreneurship Development and Innovation Management	
Type	Credits	Evaluation	Marks
CORE	3	CES	UE:IE = 50:50
Course Objectives:			
<ul style="list-style-type: none"> <li>i) To introduce students to the role of an entrepreneur, innovation and technology in the entrepreneurial process.</li> <li>ii) To provide background knowledge for understanding of innovation management.</li> <li>iii) To focus on the interconnection between entrepreneurial thinking and innovation.</li> <li>iv) To inspire the entrepreneurial and ambitious participants to innovate in business and prompt rapid growth;</li> <li>v) To acquire the knowledge and skills needed to manage the development of innovations,</li> <li>vi) To enable the students to effectively and efficiently evaluate the potential of new business opportunities.</li> <li>vii) To Integrate entrepreneurial thinking and problem-solving into their academic and professional aspirations</li> </ul>			
Learning Outcomes :			
<ul style="list-style-type: none"> <li>i) Think critically and creatively about the nature of business opportunities, resources and industries</li> <li>ii) Systematically integrate knowledge and understanding of different aspects of innovation and its role in business and society.</li> <li>iii) Discuss what is meant by entrepreneurship and innovation from both a theoretical and practical perspective, and the role of the entrepreneur in the new enterprise creation process.</li> <li>iv) Evaluate the various sources of raising finance for startup ventures.</li> <li>v) Understand the fundamentals of developing and presenting business pitching to potential investors.</li> <li>vi) Describe the processes by which innovation is fostered, managed, and commercialized.</li> <li>vii) Students will become familiar with the impact of innovation on competitiveness of the industry</li> <li>viii) Develop a new way of thinking to capitalize on different opportunities in an organization or business venture</li> <li>ix) Understanding how to recognize and drive their OWN creativity in the business setting and apply it to future organizations they will lead</li> </ul>			

Unit No	Syllabus: Entrepreneurship Development and Innovation Management	Hours
1	Introduction to Entrepreneurship: Entrepreneurs, entrepreneurial personality and intentions - characteristics, traits and behavior, entrepreneurial challenges.	5
2	Innovation: Meaning, Characteristics, Purpose/ goals of innovation, Sources of innovation, Types of innovation (service, process, product), Radical vs incremental innovation, Technology innovation vs business model. Challenges to innovation. Differences between invention and innovation, Sustainability and Innovation, Innovation and entrepreneurship.	7
3	Innovation management: Innovation Management Strategies, Definitions for innovation and innovation management; Innovation process, Intrapreneurship and Innovation- Innovative work environments, Driving intra-organizational innovation.	6
4	Creativity: What is Creativity? Components of Creativity, Creativity Process and Techniques, Barriers to creativity, Organization and personal factors to promote creativity. Principles and Techniques for Creative Ideas, Six Hat Thinking Exercises and Lateral Thinking Exercises. Methods and Tools for Creative Problem Solving.	7
5	Crafting Business Models And Lean Start-Ups: Introduction to business models; Creating value propositions, conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching	7
6	Organizing Business and Entrepreneurial Finance: Forms of business organizations, sources and selection of venture finance options and its managerial implications. Policy Initiatives -role of institutions in promoting entrepreneurship.	4

Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1.National	Mitra, Sramana	Entrepreneur Journeys (Volume 1),	2008	Booksurge Publishing
2.National	R. Gopal, Pradip Manjrekar.	Entrepreneurship and Innovation Management (an Industry Perspective)	2010	Excel Books

3.National	Shlomo Maital and D V R Seshadri,	Innovation Management: Strategies, Concepts and Tools for Growth and Profit.	2007	Response Books, Sage Publications, New Delhi.
4.International	Davila, Tony , Epstein, Marc J. Boston,	The innovation paradox : why good businesses kill breakthroughs and how they can change.	2014	Massachusetts (2014)
5.International	Govindarajan, Vijay & Trimble, Chris,	10 Rules for Strategic Innovators;	2005.	Boston: Harvard Business School Press,
6.International	David Holt	Entrepreneurship :New Venture Creation	1998	Prentice Hall India.
7.International	Timmons, Jeffrey A., Gillin, L. M., Burshtein, S., and Spinelli, Stephen Jr.	New Venture Creation: Entrepreneurship for the 21st Century – A Pacific Rim Perspective, ISBN: 0070277664	2011	1st Edition. McGraw-Hill Irwin.
8.International	Davila, T., Epstein, M J.,Shelton, R.	Making innovation work : how to manage it, measure it, profit from it	2006 0-13-149786-3	Upper Saddle River Wharton School Publishing
9.International	Hisrich,R.D., Peters, M.P., and Shepherd, D.	Entrepreneurship	2013	McGraw-Hill
<b>Journals:</b>				
1	Journal of Business Venturing			
2	Entrepreneurship Theory and Practice			
3	Journal of Small Business Management			
4	Academy of Management Review			
5	Journal of Small Business and Entrepreneurship			
6	Venture Capital			
7	Small Business Economics			
8	Family Business review			

**Online Resources:**

Resource	Website Address
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No	
1	<a href="http://www.brikenbulbs.com">www.brikenbulbs.com</a>
2	<a href="http://www.en.wikipedia.org/wiki/business.plan">www.en.wikipedia.org/wiki/business.plan</a>
3	<a href="http://www.brainstorming.co.uk">www.brainstorming.co.uk</a>
4	<a href="http://www.mind-mapping.co.uk">www.mind-mapping.co.uk</a>
5	<a href="http://www.ecic.adelaide.edu.au">www.ecic.adelaide.edu.au</a>
6	<a href="http://www.mckinsey.com/">www.mckinsey.com/</a>
7	<a href="http://www.ideo.com">www.ideo.com</a>
8	<a href="http://www.business.gov.au">www.business.gov.au</a>
9	<a href="http://www.wdc-econdev.com">www.wdc-econdev.com</a>
10	<a href="https://hbr.org/2013/07/innovation-isnt-an-idea-proble">https://hbr.org/2013/07/innovation-isnt-an-idea-proble</a>

### MOOCs

Resources Name	Website Address
University of Florida	<a href="http://www.coursera.org">www.coursera.org</a>
University of London	<a href="http://www.cefims.as.uk">www.cefims.as.uk</a>
Alison	<a href="https://alison.com/">https://alison.com/</a>
Khan Academy - free online courses and lessons	<a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a>
Swayam	<a href="http://swayam.gov.in">swayam.gov.in</a>

Semester	CourseCode	CourseTitle	
III	304	<i>Summer Internship</i>	
Type	Credits	Evaluation	Marks
CORE	6	CES	UE:IE = 50:50

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	305	Change Management	
Type	Credits	Evaluation	Marks
Core	2	CES	IE 100

Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To understand the fundamentals of change management and the process of planned change.</li> <li>ii) To understand the different approaches of bringing about change in organizations.</li> <li>iii) To understand the importance of culture as a change facilitator.</li> <li>iv) To understand the impact of change on HR Initiatives of the organization.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>I) Understanding the change process in organizations and the factors hindering change.</li> <li>II) Understand the Organizational Development as a change process and have a knowledge of the various interventions.</li> <li>III) Appreciate the Organizational Work Processes and its implication for bringing about change in organizations.</li> <li>IV) Realize the significance of culture and leadership in managing change.</li> <li>V) Analyze problems emanating from the human side of the enterprise and apply HR initiatives to manage them.</li> </ul>		
Units: -	Syllabus – Change Management	Hrs.
Unit No : 1	Fundamentals of Change: Defining change Management, Forces for change; internal forces, external forces. Resistance to change; individual resistance to change, organizational resistance to change. Techniques to overcome resistance to change, Types of change, Strategies to manage change, Kurt Lewin’s Model of change.	03
Unit No : 2	Changing the Human Side of the Enterprise: Organizational Development; Definition, characteristics, process of Organizational Development, OD and Action –Research based model of change, Diagnostic Models; purpose of diagnostic models, Weisbord’s Six Box Model, Congruence Model, OD Interventions; definition and classification of OD interventions, Role of OD consultant, Ethical Issues in OD.	06
Unit No : 3	Organizational Change: Defining organizational change, targets of organizational change, Lewin’s	07

	Force –Field Theory of change, Evolutionary Change in organizations; TQM, Six Sigma, Flexible workers and Flexible Work Teams, Revolutionary Change in Organizations; Business Process Re-engineering, Restructuring, Innovation.	
Unit No : 4	Leading Change: Transformational and Transactional leadership, Visionary and Charismatic leadership, Creating Shared Vision, Leadership and change, Ingredients of leadership for creativity & Innovation, Challenges in leading for creativity & Innovation.	04
Unit No : 5	Change & HR Management: Role of HR professionals in managing change, Individual Issues in managing change; communication, employee training, creating a common value orientation, participative management. Group Issues in managing change; Team building, Self-Managed Teams, Cross Functional Teams, HRD initiatives and attitudinal change, attitude surveys, Overview of Performance Management, Performance Models, performance driven organizational change, Performance Matrix, managing change through Balanced Scorecard, HR Scorecard.	06
Unit No : 6	Culture and Change: Introduction, Concept of Organizational Culture, Dimensions of Culture, Types of Culture, Assessing Organizational Culture, Role of Culture in Managing Change, Culture as an important ingredient of Organizational Creativity. Norms that promote Creativity and Innovation, Norms that promote Implementation. Organizational Politics; the link between Politics, Power and Conflict, Power and conflict in times of change. Principles of creativity and innovation. Do strong, cohesive cultures hinder innovation?	04

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Dipak Kumar Bhattacharyya	Organizational Change and Development	2011	Oxford University Press in 2011
2 – National	Maheswari, B. L and D P Sinha.	Management of Change through HRD	1991	TMGH
3 – National	Gareth R Jones & Mary	Organizational	7 <sup>th</sup> Edition	Pearson

	Mathew	Theory ,Design and Change		
4-National	Nilanjan Sengupta, Mousumi.Bhattacharya &R.N.Sengupta	Managing Change in Organizations		PHI
5-National	Wendell L. French& Cecil H. Bell.	Organizational Development: Behavioural Science Interventions for Organization Improvement.	6 <sup>th</sup> Edition 1999	Pearson
6 – International	Andrew Pettigrew & Richard Whipp.	Change Management		Infinity Books
7 – International	Jean Helms Mills, Kelly Dye & Albert J.Mills.	Organizational Change		Routledge.
8 – International	AlfranchNahavandi,	The Art and science of Leadership,	7 <sup>th</sup> Edition,2018	Pearson.
9- International	Robert A Paton & James McCalman,	Change Management	3 Edition	Sage Publication.

Online Resources:

Online Resources No	Web site address
1	<a href="http://leanchange.org/blog">leanchange.org/blog</a>
2	<a href="https://blog.simonassociates.net/">https://blog.simonassociates.net/</a>
3	<a href="http://www.mindtools.com">www.mindtools.com</a>
4	<a href="http://www.questia.com">www.questia.com</a>

MOOCs:

Resources No	Web site address
1	ii) <a href="http://www.coursera.org">www.coursera.org</a>
2	<a href="http://www.classcentral.com">www.classcentral.com</a>
3	<a href="http://alison.com">alison.com</a>
4	<a href="http://www.edx.org">www.edx.org</a>



# **MBA SEM III**

## **Open Courses**



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	306	DIGITAL MARKETING	
Type	Credits	Evaluation	Marks
Core	2	CES	IE 100

<b>Subject / Learning Objectives :</b> <ul style="list-style-type: none"> <li>i) To introduce students to the fundamental concepts of Digital marketing</li> <li>ii) To make students aware about changing consumer behavior in the digital world</li> <li>iii) To give understanding of formulation digital marketing strategy</li> <li>iv) To introduce students with various digital marketing platforms</li> <li>v) To introduce students with digital marketing analytics</li> <li>vi) To introduce students with the concept of E-CRM</li> </ul>		
<b>Learning Outcomes :</b> <ul style="list-style-type: none"> <li>I) Students will able to understand the concepts of Digital marketing</li> <li>II) Students will able to know the consumer behavior in the digital world</li> <li>III) Students will able to plan digital marketing strategy</li> <li>IV) Students will able to understand significance of various digital marketing platforms for digital marketing</li> <li>V) Students will able to understand and use CRM in digital marketing</li> </ul>		
Units: -	DIGITAL MARKETING	Hrs.
Unit No : 1	Introduction to Digital Marketing : Introduction, Nature, scope and significance of digital marketing. Difference between traditional marketing and digital marketing. Digital marketing platforms. Digital Marketing Era and the way forwards	5
Unit No : 2	Digital Consumer: Understanding Consumer behavior in digital world. Marketing Funnel. Digital marketing funnel. The digital revolution in India. Understanding the digital business. STP for digital marketing. Concept of Online marketing Mix.	5
Unit No : 3	Digital marketing Strategy : How to create effective digital marketing strategy, digital marketing planning- Strategy, Goal, Action. Digital marketing channels.	5
Unit No : 4	Digital marketing Platforms: Search Engine Optimization (SEO) CONCEPT, SIGNIFICANCE, Optimizing website, On Page Optimization, Off Page Optimization. Introduction to SEM, introduction to E mail Marketing , Mobile Marketing, content marketing, affiliate marketing, social media	5

	marketing	
Unit No : 5	Digital marketing analytics : Introduction to digital marketing analytics, difference between why digital marketing analytics, what is DMA, digital marketing analyst. Tools for digital marketing analytics.	5
Unit No : 6	CRM : Concept, significance, e-CRM, difference between CRM and e-CRM., Tools for CRM	5

Student has to upgrade Knowledge by using below inputs:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	RPrasad	Digital Marketing			
2 – National	SameerKulkarni	Virtual Marketing			
3 – National	:Vandana Ahuja (Oxford Universitypress	Digital Marketing			
4 – International	Arnold, etal	Web Marketing			
5 – International	Philip Kotler, Hermawan Kartajaya, Iw	Marketing 4.0: Moving from Traditional to Digital			
6 – International	Ryan Deiss, Russ Henneberry	Digital Marketing For Dummies		Wiley Publication	

Online Resources:

Online Resources No	Web site address
1	<a href="https://neilpatel.com/what-is-digital-marketing/">https://neilpatel.com/what-is-digital-marketing/</a>
2	<a href="https://www.digitalmarketer.com/digital-marketing/">https://www.digitalmarketer.com/digital-marketing/</a>

MOOCs:

Resources No	Web site address
1	<a href="https://learndigital.withgoogle.com/digitalunlocked/certificationhttps://www.coursera.org/specializations/digital-marketing#courses">https://learndigital.withgoogle.com/digitalunlocked/certificationhttps://www.coursera.org/specializations/digital-marketing#courses</a>
2	
3	
4	

MBA Sem III

CORPORATE TAXATION

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	307	Corporate Taxation	
Type	Credits	Evaluation	Marks
Open	2	CES	IE=100

Subject / Course Objectives :

- i) To introduce and orient the students with the definition and underlying provisions of Direct tax law and
- ii) To develop broad understanding of the tax laws and accepted practices.
- iii) To make them understood regarding practical aspects of tax planning as an important managerial decision making process.

Learning Outcomes :

- I) UNDERSTAND various basic concepts/ terminologies related Taxation
- II) Calculation of Income under differential head of income
- III) Understand Basic concepts for taxation of companies
- IV) DESIGN/ DEVELOP / CREATE tax saving plan.
- V) EXPLAIN how tax planning can be done
- VI) ILLUSTRATE how online filling of various forms and returns can be done

Units: -	Syllabus – CORPORATE TAXATION	Hrs.
Unit No : 1	Introduction to Income: Definitions: Person, Companies, Association of persons and trust , Minors, Cooperative registered firms, Income , Deemed income , Concept of Assessee , Assessment year, Previous year, Gross total income , Total income , Residential status and scope of total income on the basis of residential status, Agricultural income, Income exempt from tax	10
Unit No : 2	Calculation of Income under differential head of income: Salaries, perquisites, gratuity and retirement benefits, income from house property, capital gain, income from other sources, income from business and profession, problems arising from aggregation of income and set off and carry forward of losses. Deductions under chapter VIA. Computation of income and Return of Income Tax.	10
Unit No : 3	Basic concepts for taxation of companies: Company and types of companies, different heads of income, Deduction from gross total income for companies, basic calculation for computation of taxable income of	10

	companies, Minimum alternate tax.	
Unit No : 4	Tax Considerations for Managerial Decisions: Tax considerations for specific financial and managerial decisions like capital structure decisions, deemed dividend, dividend, own or lease, make or buy, repair or renewed, managerial remuneration, tax planning relating to mergers and demergers of companies.	10
Unit No : 5	Tax planning: Concepts relating to Tax Avoidance and Tax Evasion and tax planning, Tax planning with reference to: Location of undertaking , Type of activity , Ownership pattern, Tax incentives and Tax exemptions.	10
Unit No : 6	Tax Administration and Management: Filing of Returns and assessments, Penalties and Prosecutions, Appeals and Revisions, Review, Rectification, Advance tax, Tax deducted at source .Basic concept of International Taxation and Transfer pricing, Avoidance of double Taxation Agreements.	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Dr. V. K. Singhaniya	Corporate Tax planning and Business Tax Procedures'		, Taxman Publications New Delhi.	
2 – National	Ahuja Girish, Gupta Ravi,	, 'Simplified Approach to Corporate Tax planning and Management'		Bharat Law House Pvt. Ltd. New Delhi.	
3 – National	.) Nitin Vashisht and B.B. Lal	Direct Taxes: Income Tax ,and Tax planning',		Pearson Education	
4 – International	Alex Easson	Tax Incentives for Foreign Direct Investment		(Kluwer Law Internation).	
5 – International	Daniel Q. Posin	Corporate tax planning		(Little Brown & Company, London)	

6 – International	Christiana HJI Panayi	Double Taxation, Tax Treaties, Treaty Shopping		(Kluwer Law International).	
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Online Resources:

Online Resources No	Web site address
1	<a href="https://www.investopedia.com/terms/c/corporatetax.asp">https://www.investopedia.com/terms/c/corporatetax.asp</a>
2	<a href="https://cleartax.in/s/corporate-tax">https://cleartax.in/s/corporate-tax</a>
3	<a href="https://www.lexisnexis.com/uk/lexispsl/tax/document/393773/55KG-S061-F18C-V2X4-00000-00/Basic_principles_of_corporation_tax_overview">https://www.lexisnexis.com/uk/lexispsl/tax/document/393773/55KG-S061-F18C-V2X4-00000-00/Basic_principles_of_corporation_tax_overview</a>

MOOCs:

Resources No	Web site address
1	<a href="http://www.coursera.org">www.coursera.org</a>
2	<a href="http://www.classcentral.com">www.classcentral.com</a>
3	<a href="http://alison.com">alison.com</a>
4	<a href="http://www.edx.org">www.edx.org</a>

Course : MBA (HR) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	308	Negotiation Management	
Type	Credits	Evaluation	Marks
Core	2	CES	IE = 100

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>v) Understanding the role of manager as counsellor</li> <li>vi) comparing the techniques of counseling</li> <li>vii) appraise the ethical, cultural and gender issues in counseling</li> <li>viii) understanding the process for negotiation</li> <li>ix) comprehending the role of HR manager in negotiation</li> <li>x) improving and applying the negotiation skills</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>I) Describe the role of counsellor</li> <li>II) applying the techniques of counseling</li> <li>III) Identify the ethical, cultural and gender issues in counseling</li> <li>IV) planning the negotiation meeting</li> <li>IV) developing the negotiation skills</li> <li>V) assess the role of HR manager as negotiator</li> </ul>		
Units: -	Syllabus : <i>Negotiation Management</i>	Hrs.
Unit No : 1	Managers as Counsellors–Specific Role of HR managers in counselling–The Helping Relationship and the Helping Process– Helpers and Clients as diverse persons- Types of Counseling- Need for Counseling	10
Unit No : 2	Development of Counselling Skill–Internal Frame of Reference– Attention and Interest–Managing resistance and making referrals– Active listening–Problem-solving–Coaching, demonstrating and rehearsing	10
Unit No : 3	Important issues in managerial counseling–Multi-cultural and gender issues–Ethical issues– Specific counselling issues for HR managers	10
Unit No : 4	Significance of Negotiation skills for Managers– interpersonal skills– Understanding the Imperatives for negotiation– basic theoretical principles– Planning for effective negotiations– Negotiation Process	10
Unit No : 5	Negotiating integrative agreements—HR Manager as Negotiator – Background to Negotiation– Development of Negotiation Skill— Phases of Negotiation and the Role of HR Managers–Skills and Requirements of Negotiation	10
Unit No : 6	Current trends, issues and practices in Negotiation in Indian Industries	10

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Richard Nelson-Jones	Basic Counselling Skills: A Helper's Manual		Sage Publications Pvt. Ltd.	
2 – National	K. Singh	Counselling Skills for Managers		Prentice-Hall	
3 – National	F. Alan	Negotiation Skills and Strategies		Universities Press	
4 – International	Michael L Spangle, Myra Warren Isenhardt	Negotiation Communication for Diverse Settings		Regis University	
5 – International	Stephen Palmer, Gladeana McMahon	Handbook of Counselling		Psychology Press	

### Online Resources:

Online Resources No	Web site address
1	<a href="https://www.knowledgehut.com/tutorials/project-management/negotiation-skills">https://www.knowledgehut.com/tutorials/project-management/negotiation-skills</a>
2	<a href="https://www.pon.harvard.edu/daily/negotiation-skills-daily/top-10-negotiation-">https://www.pon.harvard.edu/daily/negotiation-skills-daily/top-10-negotiation-</a>



	<a href="#">skills/</a>
3	<a href="https://www.prweb.com/releases/2006/01/prweb329478.htm">https://www.prweb.com/releases/2006/01/prweb329478.htm</a>
4	<a href="https://www.academia.edu/24964222/New_Free_Download_Counseling_Skills_Resources_download_and_share">https://www.academia.edu/24964222/New_Free_Download_Counseling_Skills_Resources_download_and_share</a>
5	<a href="https://www.pdfdrive.com/counseling-books.html">https://www.pdfdrive.com/counseling-books.html</a>

**MOOCs:**

Resources No	Web site address
1	<a href="https://www.edx.org/">https://www.edx.org/</a>
2	<a href="https://www.coursera.org/">https://www.coursera.org/</a>
3	<a href="https://alison.com/">https://alison.com/</a>
4	<a href="https://swayam.gov.in/nc_details/NPTEL">https://swayam.gov.in/nc_details/NPTEL</a>

# **MBA SEM III**

## **SPECIALIZATION ELECTIVES**

Elective - Marketing Management: Course - Consumer Behavior.

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	MK01	Consumer Behaviour	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p>Subject / Course Objectives:</p> <ul style="list-style-type: none"> <li>xi) To understand the importance Consumer Behavior in Marketing.</li> <li>xii) To study the individual determinants of Consumer Behavior.</li> <li>xiii) To realize the environmental influences on Consumer Behavior.</li> <li>xiv) To study the Buying decision making process and its types.</li> <li>xv) To study the Consumer Behavior in Indian context.</li> <li>xvi) To understand the role of B2B marketing.</li> </ul>		
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> <li>i) To learn the knowledge of the Consumer Behavior in Marketing.</li> <li>ii) To identify the needs and wants of the customers.</li> <li>iii) To analyze the environmental influences on Consumers.</li> <li>iv) To know to the steps in Buying Behavior process.</li> <li>v) To realize the Consumer Behavior in Indian context.</li> <li>vi) To learn the Consumer Behavior in B2B marketing.</li> </ul>		
Name: -	Syllabus – <i>Consumer Behaviour</i>	Hrs.
Unit No: 1	<p>Introduction to Consumer Behavior:                      Meaning of Customers and Consumers, Difference between Customers and Consumers, Types of Customers and Consumers.                      Definition and Meaning of Consumer Behavior, Different Buying Roles in Consumer Behavior, Importance of Consumer Behavior in Marketing.</p>	5
Unit No: 2	<p>Individual Determinants of Consumer Behavior:                      Consumer Needs- Meaning of Consumer Needs, Maslow’s Hierarchy of Needs.                      Motivation and Involvement–Meaning of Motivation, Elements of Motivation, Buying Motives and its types, Positive and Negative Motivation.                      Involvement – Meaning and Types of Involvement, Measures of Involvement.                      Personality and Self-concept–Meaning of Personality, Nature of Personality.                      Self-concept – Meaning of Self-concept, Components of Self-concept.                      Perception Learning– Meaning of Perception, Elements of Perception.                      Learning - Meaning of Learning, Elements of Learning.                      Attitude and Attitude change–Meaning of Attitude, Characteristics of Attitude, Strategies for Attitude change.</p>	8

Unit No: 3	Environmental Determinants of Consumer Behavior: Cultural influences, Sub cultural influences, Social Class influences, Social Group influences, Family influences and Personal influences on Consumer Behavior.	5
Unit No: 4	Consumer Buying Decision Making Process: Need recognition, Information Search, Evaluation of alternatives, Purchase decision, Post Purchase behavior. Consumer Behavior Models: Howard Seth Model, Engel-Blackwell-Miniard Model and Nicosia Model of Consumer Buying behavior.	5
Unit No: 5	Types of Buying Behavior: Complex Buying Behavior, Dissonance-Reducing Buying Behavior, Habitual Buying Behavior and Variety Seeking Buying Behavior. E-Buying Behavior. Consumer Research: Meaning of Consumer Research, Consumer Research Process, Methods of Consumer Research, Role of Consumer Research in Consumer Behavior. Diffusion and Adoption of Innovation: Meaning of Diffusion of Innovation, Diffusion of Innovation Process, Meaning of Adoption of Innovation, Adoption of Innovation Process, Importance of Adoption and Diffusion of Innovation in Consumer Behavior.	8
Unit No: 6	Introduction to B2B Marketing - Meaning of Business Marketing, Business Market Customers, Characteristics of Business Markets, Organizational Buying Behavior, Marketing Strategies for Business Markets, Organizational Markets in India.	05

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Dr. S.L. Gupta & Sumitra Pal	Consumer Behavior: An Indian Perspective Text & Cases	2 <sup>nd</sup> Edition 2014	Sultan Chand & Sons, New Delhi.
2 – National	Suja R. Nair	Consumer Behavior in Indian Perspective Text with Cases	2 <sup>nd</sup> Edition 2015	Himalaya Publishing House.
3 – National	Michael D. Hutt &	Business Marketing	12 <sup>th</sup>	South-Western

	Thomas W. Speh	Management: B2B	Edition 2016	Publication.
4 – International	Blackwell, Miniard, Engel & Rehman	Consumer Behavior India Edition	10 <sup>th</sup> Edition 2017	Cengage Learning.
5 – International	Leon G. Schiffman, Joseph Wisenblit & S. Ramesh Kumar	Consumer Behavior	12 <sup>th</sup> Edition 2018	Pearson.
6 – International	David L. Loudon & Albert J. Della Bitta	Consumer Behavior: Concept and Applications	4 <sup>th</sup> Edition 2001	McGraw Hill Inc.

Online Resources:

Online Resources No.	Web site address
1	<a href="https://onlinelibrary.wiley.com/journal/14791838">https://onlinelibrary.wiley.com/journal/14791838</a>
2	<a href="https://www.westburn-publishers.com/journals/customer-b...">https://www.westburn-publishers.com/journals/customer-b...</a>
3	<a href="https://www.tandfonline.com/doi/ful">https://www.tandfonline.com/doi/ful</a>
4	<a href="http://www.mheducation.com/hoghered/category.10366">www.mheducation.com/hoghered/category.10366</a>
5	<a href="https://books.google.co.in/books/consumer%20behaviour">https://books.google.co.in/books/consumer behaviour</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://onlinecourses.swayam2.ac.in/imb19_mg20/preview">https://onlinecourses.swayam2.ac.in/imb19_mg20/preview</a>
2	<a href="https://onlinecourses.nptel.ac.in/noc20_mg14/preview">https://onlinecourses.nptel.ac.in/noc20_mg14/preview</a>
3	<a href="https://www.mooc-list.com/tags/consumer-behaviour">https://www.mooc-list.com/tags/consumer-behaviour</a>
4	<a href="https://alison.com/humanities/psychology%20courses/consumer%20behaviour">https://alison.com/humanities/psychology courses/consumer behaviour</a>
5	<a href="https://www.tandfonline.com/doi/full">https://www.tandfonline.com/doi/full</a>

Elective - Marketing Management: Course – Services Marketing

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	MK02	Services Marketing	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p>Subject / Course Objectives:</p> <p>xvii) To provide in-depth insight in managing and delivering of quality services</p> <p>xviii) To create awareness about the services sector, the challenges and opportunities therein.</p> <p>xix) To understand the need and importance of people, process and physical evidence in Services Marketing Mix.</p>		
<p>Learning Outcomes:</p> <p>After studying this course the learner would be able to</p> <p>i) Understand the challenges and opportunities involved in services sector.</p> <p>ii) Understand the aspects of developing new services, promoting the services and making it available in a convenient manner.</p>		
Name: -	Syllabus – Services Marketing	Hrs.
Unit No: 1	Introduction to Services: Meaning, Goods Vs Services, Characteristics of Services – Intangibility, Inconsistency, Inseparability and Inventory; Classification of Services; Growth of Service Sector in India, Factors responsible for growth of service sector in India.	8
Unit No: 2	Services Marketing Mix: Introduction to the 7 Ps of Services Marketing Mix; Product-Levels of service product, the Flower of Service, Service Blueprint- the concept, components of service blueprint, Steps involved in preparing service blueprint, Stages in new service product development, Service Life Cycle Place : Place – Distribution Strategies for Services, channels of distribution in services, Challenges in distribution of Services Promotion: Promotion objective for Services; Personnel Selling, Advertising and Sales Promotion; Services marketing triangle Pricing: Pricing objectives, Pricing strategies- market skimming , market penetration, synchro pricing, psychological or odd pricing , market segmentation pricing	11
Unit No: 3	People: role of service employees in a service business, Service profit chain, Concept of Service encounter – Moment of Truth; Training and development of employees Physical evidence: Nature, Importance of physical evidence in	5

	services; Service scope. Process: Service as a process & as a system– Strategies for managing inconsistency –Customers as ‘co-producers’ of services; Self Service Technologies	
Unit No: 4	Service Guarantee – Concept, Handling complaints effectively; Defects, Failures and Recovery.	4
Unit No: 5	Service Quality: Meaning, Determinants /dimensions of service quality; How customers evaluate service performance, Service Quality Models- Gaps Model, SERVQUAL	10
Unit No: 6	Managing the demand and supply of services: patterns and determinants of demand, strategies for managing the demand, managing the capacity- capacity planning – waiting line strategies, inventorying the demand through reservations.	07

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Valarie A Zeithaml, Dwayne D. Gremler, Mary Jo Bitner and Ajay Pandit	Services Marketing	4 <sup>th</sup> Edition	Tata McGraw Hill Publications
2 – National	K Ram Mohan Rao	Services Marketing	2 <sup>nd</sup> Edition	Pearson Education
4 – International	Chrostopher Lovlock, Jayanta Chaterjee	Services Marketing	7 <sup>th</sup> Edition	Pearson Education

Online Resources:

Online Resources No.	Web site address
1	<a href="https://onlinelibrary.wiley.com/journal/14791838">https://onlinelibrary.wiley.com/journal/14791838</a>
2	<a href="https://www.tandfonline.com/doi/ful">https://www.tandfonline.com/doi/ful</a>
3	<a href="http://www.mheducation.com/hoghered/category.10366">www.mheducation.com/hoghered/category.10366</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://onlinecourses.swayam2.ac.in/imb19_mg20/preview">https://onlinecourses.swayam2.ac.in/imb19_mg20/preview</a>
2	<a href="https://onlinecourses.nptel.ac.in/noc20_mg14/preview">https://onlinecourses.nptel.ac.in/noc20_mg14/preview</a>
3	<a href="https://www.tandfonline.com/doi/full">https://www.tandfonline.com/doi/full</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	FM01	<i>Investment Analysis and Portfolio Management</i>	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

#### Subject / Course Objectives :

- i) To acquaint the students with basic concepts and avenues of investment, concept of risk and return related to investment.
- ii) To explain the concept of Mutual Funds and derivatives and how to evaluate them.
- iii) To explain the concept and applications of fundamental analysis and technical analysis for stock investments.
- iv) To clarify how to construct the Investment plans for Individuals in different stages of life cycles and different situations.
- v) To explain the calculation of the risk and return for securities and for portfolios.
- vi) To elucidate the modern portfolio theory and market efficiency using both theoretical and empirical arguments.

#### Learning Outcomes :

At the end of the programme students will able to-

- i) Understand the risk and return relationship and various investment alternatives available in India.
- ii) Comprehend the concept of Mutual Funds and derivatives and how to evaluate them.
- iii) Understand how to use fundamental analysis and technical analysis for stock investments.
- iv) Create a policy statement to showcase the objectives and risk tolerances of numerous categories of individual and institutional investors which can help in making Investment plans for Individuals in different stages of life cycles and different situations.
- v) Evaluate the effect of risk on investment decisions. Students will able to calculate the risk and return for securities and for portfolios.
- vi) Understand the modern portfolio theory and market efficiency using both theoretical and empirical arguments.

Units: -	<i>Investment Analysis and Portfolio Management</i>	Hrs.
Unit No : 1	Introduction: Meaning, objectives, Scope, and Constraints Process of Investment, Avenues of Investments, Concepts of risk and return with reference to Investment, basic principles of risk management, risks involved in Investment, Current scenario of Investment in India, Role of Securities Market in Indian economy	8
Unit No : 2	Mutual Fund and Derivatives: Basic concepts, Functioning and Objectives of Mutual Fund, Types of Mutual Fund Schemes, Analysis of	7

	MF, Performance Evaluation of MF Schemes using Sharpe, Treynor and Jensen's Models, Basic concept and types of Derivatives, Developments in Derivative and MF market in India	
Unit No : 3	Fundamental Analysis and Technical Analysis: Fundamental Analysis - Economic, Industry and Company analysis, Valuation of Equity and Preference shares, Technical Analysis - Concept, Importance and Limitations of Technical Analysis, Dow Theory, Technical Indicators and charts used in technical Analysis, Behavioral Finance and its impact on Investment decision making	8
Unit No : 4	Portfolio Management: Portfolio Meaning, Characteristics and Objectives, Process of Portfolio Management, Investment policy statement and asset allocation, Equity Management Strategies, Systematic Investment Plan (SIP), Analysis of Debt Instrument, Bond Management Strategies, preparation of Investment plans for Individuals in different stages of life cycles and different situations	7
Unit No : 5	Calculation for risk and return for Security/Portfolio: Problems on calculation of risk and return for security (mean, variance, and standard deviation), Problems on risk and return associated with portfolio consisting maximum three securities (mean, variance, and standard deviation), Capital Asset Pricing Model and its application	8
Unit No : 6	Portfolio Theories: Efficient Market Hypothesis concepts and forms of EMH, Testing techniques of Weak Form, Random Walk Theory, High Frequency Trading and its impact on EMH, Arbitrage Pricing Theory, Efficient Frontier, Optimal Portfolio, Efficient Frontier and Investor Utility, Indifference Curve	7

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Prasanna Chandra	Investment Analysis and Portfolio Management	2012, 4 <sup>th</sup> Edition	Tata McGraw Hill, New Delhi
2 – National	I M Pandey	Financial Management	2010, , 10 <sup>th</sup> revised Edition	Vikas Publishing House
3 – National	Bhalla, V.K.	Investment Management: Security Analysis and Portfolio Management	2010, 17th Edition.	S.Chand& Sons,

4 – International	Frank K. Reilly, Keith C Brown	Investment Analysis and Portfolio Management	2012, 10 <sup>th</sup> Edition	Cengage Learning
5 – International	<a href="#">E. Fischer Donald</a> , <a href="#">J. Jordan Ronald</a> , <a href="#">K. Pradhan Ashwini</a>	Security Analysis  Portfolio Management	2018, 7 <sup>th</sup> edition.	Pearson Education,
6 – International	<a href="#">Eugene F. Brigham, Michael C. Ehrhardt</a>	Financial Management :Theory and Practice	2017	Cengage Learning

### Online Resources:

Online Resources No	Web site address
1	<a href="https://www.moneycontrol.com">https://www.moneycontrol.com</a>
2	<a href="https://www.nseindia.com">https://www.nseindia.com</a>
3	<a href="https://www.sebi.gov.in">https://www.sebi.gov.in</a>
4	<a href="https://www.rbi.org.in">https://www.rbi.org.in</a>
5	<a href="https://www.investopedia.com">https://www.investopedia.com</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://swayam.gov.in">https://swayam.gov.in</a>
2	<a href="https://www.edx.org">https://www.edx.org</a>
3	<a href="https://alison.com/certificate-courses">https://alison.com/certificate-courses</a>

Dr. Ranpreet Kaur

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	FM02	Management of Financial Services	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

<p>Subject / Course Objectives :</p> <ol style="list-style-type: none"> <li>To give the students an insight into the principles, practices of the prominent Financial services and their functioning in the changing economic scenario.</li> <li>To make critical appraisal of the working of the specific financial Services in India.</li> <li>To brief the students about developments in financial services.</li> <li>To provide a judicious mixture of theory and business practices of the contemporary Indian financial services.</li> </ol>		
<p>Learning Outcomes : After completion of this course, the student will be able to</p> <ol style="list-style-type: none"> <li>Understand the role and function of the Indian financial system , Financial Market and Various instruments of Financial Services.</li> <li>Demonstrate an awareness of the current structure and regulation of the Stock Exchange Mutual Fund Industry, Merchant Banking and Venture capital concept in Indian Context.</li> <li>Understand the concept of Rural Banking, Microfinance in Indian Financial service.</li> <li>Evaluate and create strategies to promote financial products and services.</li> </ol>		
Units: -	Syllabus – Management of Financial Services	Hrs.
Unit No : 1	<p>Introduction to Indian Financial System: Meaning and Functions of IFS, Development of Financial System in India, Weakness of Indian Financial Systems. Structure of Financial System-Financial Market, Financial Institutions /Intermediaries and Instruments.</p> <p>Financial Service : Meaning, Features of Financial Service, Classifications, Importance and Scope of Assets/Fund Based Services:- Hire purchase finance, Leasing , Factoring , Forfeiting, Loan Syndication, Consumer Credit, Challenges facing the financial services sector .</p>	5
Unit No : 2	<p>Financial Market Operations: Recent Development of Indian Capital and Money Market ,</p> <p>Capital Market Operation: New Issue Market- Functions of New issue market, players of New issue market, Primary and Secondary market Operation, Procedure of (IPO), Book Building. Role of Capital market Intermediaries Recent cases of IPO's in India.</p> <p>Money Market Operation: features and objective of money market,</p>	6

	Recent Developments, Composition of Money Market.  Stock Market Operations: Stock Exchange functions in India, Listing of securities-Stock Indices in India- SENSEX and NIFTY - BSE&NSE	
Unit No : 3	Investment Banking Overview of commercial vs. Investment banking, capital raising, debt, equities, Merchant Banking: Origin, Nature and scope of merchant banking , Role of Merchant Banker, types of Merchant banking services, Project Counseling , Pre-issue and Post –Issue Management ,Progress of Merchant banking in India, guidelines for merchant bankers issued by SEBI. Mutual Fund: Concept, Structure of Mutual fund Operations in India, Types of Mutual Fund, Advantages and Limitations of Mutual Fund, Problems for Slow growth of Mutual fund concept in India, Guidelines for Mutual fund service, Rights &facilities for Investors, Future of Mutual fund industry. Recent cases on Mutual Fund Industries in India	10
Unit No : 4	Venture Capital: Venture capital: Origin, concept, features, Advantages and Limitations, Stages in venture capital financing, Venture capital Guidelines-Methods of venture financing. Case studies of Venture capitalist companies	6
Unit No : 5	Credit Rating and Securitization: Credit Rating: Introduction, Meaning, functions of credit rating agencies, Major Players in credit rating agencies in India, Debt Rating System of CRISIL, ICRA and CARE.  Securitization: Concept and Meaning, modus Operandi, Securitization in India and new guidelines on Securitization	5
Unit No : 6	Rural Banking and Microfinance: -Financing Rural Development: Functions and policies of RBI and NABARD; Rural Credit Institutions- Role and function, Regulation of Rural Financial Services.  Microfinance: Origin, Meaning and Concept, advantages and Limitations, Micro credit, micro insurance scheme, SHGs/NGOs, linkages with banking, Role and Functions of Linkage banks towards development of Microfinance Industry in India.	4

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	E-Gordon, K Natarajan	Financial Markets and Services	Revised 6 <sup>th</sup> Edition 2010	Himalaya Publishing House
2 – National	M.Y.Khan	Financial Services,.	2010	Tata McGraw Hill
3-National	<u>Bharati V. Pathak</u>	The Indian Financial System: Markets, Institutions and Services	2010	Tata McGraw Hill
5 –National	Ramesh Babu	Indian Financial System	2011	
6 –National	G.S. Batra	Financial Service New Innovation	2015	ND publication
7–National	<u>Gurusamy</u>	Financial Services	2009	Tata McGraw-Hill Education, 2009

Journals :

1. Indian Journal of Finance.
2. ICFAI Journal of Applied Economics
3. ICFAI Journal of Emerging Market Finance
4. Journal of Financial Research

Online Resources:

Online Resources No	Web site address
1	corporatefinanceinstitute.com
2	<a href="https://www.pdfdrive.com/banking-and-indian-financial-systems">https://www.pdfdrive.com/banking-and-indian-financial-systems</a>
3	<a href="https://www.pdfdrive.com/indian-financial-system-and-management-of-financial-institutions">https://www.pdfdrive.com/indian-financial-system-and-management-of-financial-institutions</a>
4	<a href="https://www.pdfdrive.com/capital-markets-financial-management-and-investment-management-">https://www.pdfdrive.com/capital-markets-financial-management-and-investment-management-</a>
5	<a href="https://www.google.co.in/books/edition/The_Indian_Financial_System_Markets_Inst">https://www.google.co.in/books/edition/The Indian Financial System Markets Inst</a>

MOOCs:

Resources No	Web site address
1	<a href="#">FinTech and the Transformation in Financial Services (Coursera)</a>

2	<a href="http://ugcmooocs.inflibnet.ac.in/">http://ugcmooocs.inflibnet.ac.in/</a> Subject : Indian Financial Markets and Services (26)
3	<a href="https://www.edx.org/course/financial-development-and-financial-inclusion">https://www.edx.org/course/financial-development-and-financial-inclusion</a>
4	<a href="https://www.coursera.org/specializations/digital-transformation-financial-services">https://www.coursera.org/specializations/digital-transformation-financial-services</a>

Experts for framing Syllabus (Corporate and other University)

Sr.No	Name of the Experts & Designation	Contact No
1	Mr.Gaurav Kothawale Financial Analyst – BNY Mellon ,Pune	91+9225857077
2	Dr. Suyog Amrutrao Professor and I/C Director – Dr.Babasaheb Ambedkar Marthwada University ,Sub Campus (Osmanabad )	91+ 9766350127
3.	Dr.Nanda Bhattad (Director -Disha Acadamay –FCA)	91+8805127099

Faculty from BVDU (Centers)

Sr.No	Name of the Experts & Designation
1	Dr.Sonali Dharmadhikar (Associate Professor-IMED,Pune)
2	Dr.Rodrigues (YMIM, Karad centre)
3	Dr.Anuradha Yesgunde (IMED,Pune)
4.	Prof.CA. S.R.Hiremath (BVAKIMSS,Solapur)

Prof.Shivganga C.Maindargi

BVAKIMSS-Solapur

Email-id: [shivgangam6@gmail.com](mailto:shivgangam6@gmail.com)

Contact No: 91-9960199696

Course : MBA (HR) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
I	HR01	Human Resource Planning and Development	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) Understanding the process of Human resource planning</li> <li>ii) Appraise the techniques of HR planning</li> <li>iii) Formulating the HR procurement and deployment</li> <li>iv) Understanding the role of training and executive development</li> <li>v) comparing and applying various methods of training</li> <li>vi) Determining the training designs and evaluation</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i) Describe the process of human resource planning</li> <li>ii) applying the techniques for human resource planning</li> <li>iii) Identify the human resource procurement and deployment</li> <li>iv) IV) Explain the role of training and development</li> <li>v) distinguish different methods of training and their applications</li> <li>vi) assess the design and outcome of training</li> </ul>		
Units: -	Syllabus : <i>Human Resource Planning and Development</i>	Hrs.
Unit No : 1	Concept of Human Resource Planning ; Objectives ; Need and Importance ; Process ; Levels ; problems in HR planning and Factors influencing Human Resource Planning	10
Unit No : 2	Human Resource Demand & Supply forecasting tools and techniques – Managerial Judgment ; Work-study methods ; ratio-trend analysis ; work-force analysis; work-load analysis ; job analysis ; Staffing table ; markov analysis; skill inventory ; replacement chart ; labour supply ; cohort analysis ; scenario analysis	10
Unit No : 3	Recruitment plan ; career planning ; succession planning; redeployment planning; redundancy plan – retaining, retrenchment, VRS; Job-design	10
Unit No : 4	Concept of training, terms - education Knowledge, Skills, attitudes, need of training, importance, objectives of training, ADDIE model, Principles of training; concept of executive development: Objectives, importance, process of executive development	10
Unit No : 5	Training needs analysis (TNA): Meaning and purpose of TNA, TNA at different levels, Process of TNA, output of TNA, Training and Development methods : On-the-Job & Off-the-job, job instructions training, apprenticeship, internship, demonstrations, self-directed learning, coaching, job rotation, project assignment, simulation methods, lectures, case studies, group discussion, conferences, role playing,	10



	management games, in basket exercise, sensitivity training, vestibule training, e-training.	
Unit No : 6	Designing training programme – considerations in designing effective training programs selection of trainers, training material & aids, use of technology in training Evaluation of training – Need for evaluating training, Kirkpatrick evaluation criteria – reactions, learning, behavior, results, ROI, Cost-benefits analysis	10

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Dr. Rishipal	Training and Development methods	2011	S. Chand	
2 – National	Rolf, P., and Udai Pareek	Training for Development		Sage Publications Pvt. Ltd.	
3 – National	J.W. Walker	Human Resource Planning		Mc Graw Hill.	
4 – International	Noe, Raymond A., and Amitabh Deo Kodwani	Employee Training and Development		Tata McGraw Hill.	
5 – International	Edward, Leek	Manpower Planning, Strategy and Techniques in Organizational Context		Wiley	
6 – International	Paul Turner	HR Forecasting		CIPD	

		and Planning			
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**Online Resources:**

Online Resources No	Web site address
1	<a href="http://www.eiilmuniversity.co.in/downloads/Human-Resource-Planning-Development.pdf">http://www.eiilmuniversity.co.in/downloads/Human-Resource-Planning-Development.pdf</a>
2	<a href="https://www.pdfdrive.com/human-resource-planning-human-resource-planning-e15282999.html">https://www.pdfdrive.com/human-resource-planning-human-resource-planning-e15282999.html</a>
3	<a href="https://www.pdfdrive.com/human-resource-planning-development-e38508079.html">https://www.pdfdrive.com/human-resource-planning-development-e38508079.html</a>
4	<a href="https://www.pdfdrive.com/understanding-human-resource-development-philosophy-processes-practices-routledge-studies-in-human-resource-development-e184374786.html">https://www.pdfdrive.com/understanding-human-resource-development-philosophy-processes-practices-routledge-studies-in-human-resource-development-e184374786.html</a>

**MOOCs:**

Resources No	Web site address
1	<a href="https://www.edx.org/">https://www.edx.org/</a>
2	<a href="https://www.coursera.org/">https://www.coursera.org/</a>
3	<a href="https://alison.com/">https://alison.com/</a>
4	<a href="https://swayam.gov.in/nc_details/NPTEL">https://swayam.gov.in/nc_details/NPTEL</a>

Course : MBA (HR) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	HR02	Labour Laws-I	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i. To understand the laws and rules pertaining to labor</li> <li>ii. To understand the various concepts and laws in Labour Welfare, health and safety</li> <li>iii. To understand the laws and rules pertaining to social security</li> <li>iv. To understand the laws related to discipline</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i. Understanding various importance's of labour laws in effective business management.</li> <li>ii. Understanding the legislation related to Labour Welfare, health and safety.</li> <li>iii. Understand various statutory provisions related with industrial relations and labour welfare.</li> <li>iv. Analyze issues and challenges of applying provisions as per legislations in the industry</li> <li>v. Familiarizing, analyzing and applying the role of labor welfare in employee motivation and satisfaction.</li> </ul>		
Units: -	Syllabus <i>Labour Laws-I</i>	Hrs.
1	Industrial Jurisprudence History and types of labour legislations, Concept of Jurisprudence, an overview of industrial jurisprudence, principles of social justice, natural justice, equity and economy, unique characteristics of Indian labour.	8
2	Laws relating to working condition - Factories Act 1948 Definition, provisions relating to health, safety and welfare, provisions relating working hours for adults, hazardous process, restriction on employment of women and children, Certifying officers, enforcement of the act and penalties	8
3	Laws relating to wages Payment of Wages Act 1936 ; definition, provisions for payment of wages, authorized deduction, enforcement of the act, Minimum Wages Act, the Equal Remuneration Act, 1976 - definitions, payment of equal remuneration, advisory committee, enforcement of the act	8

4	<b>Social Security</b> 1. The Employee Provident Fund, Miscellaneous Provisions Act, 1952 2. The Employee State Insurance Act, 1948 3. The Workmen Compensation Act 1923 4. The Bombay Labour Welfare Act The role of ILO in promoting social security, Contribution of ILO to Labour Welfare	7
5	<b>The INDUSTRIAL EMPLOYMENT ACT (STANDING ORDERS) 1946</b> Definition, Special features, Matters to be provided in Standing Orders, Submission and certification of Standing Orders. Payment of Bonus Act, Payment of Gratuity Act,	7
6	<b>The Maternity Benefit Act</b> Definition, right to payment of maturity benefit, provision pertaining to leave, forfeiture of the benefit, Minimum Wages Act - Definition, provisions - meaning of the term "Wage" - Wage Vs. Salary, "Workmen Compensation Act"	7

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book
1 – National	J.K.Bareja,	Industrial Laws, Galgotia and Sons
	P.R.N.Sinha	Industrial relations, Trade unions and Labour legislation, Pearson Edu
2 – National	Paul Blyton, Peter Turnbull,	Dynamics of employee relations, Macmillan
3 – National	V.P.Micheal,	Industrial relations in India and Workers Involvement
4 – National	C.B.Memoria,	Dynamics of Industrial Relations
5 – National	Agalgatti B B	- Labour Welfare and Industrial Hygiene , Nirali Prakashan

Online Resources:

Online Resources No	Web site address

1	<a href="https://www.ilo.org/inform/online-information-resources/research-guides/national-labour-law/lang--en/index.htm">https://www.ilo.org/inform/online-information-resources/research-guides/national-labour-law/lang--en/index.htm</a>
2	<a href="https://guides.loc.gov/employment-and-labor-law/online-resources">https://guides.loc.gov/employment-and-labor-law/online-resources</a>
3	<a href="https://guides.library.utoronto.ca/c.php?g=251198&amp;p=1673409">https://guides.library.utoronto.ca/c.php?g=251198&amp;p=1673409</a>
4	<a href="https://labour.gov.in/">https://labour.gov.in/</a>
5	<a href="https://ec.europa.eu/social/main.jsp?catId=157">https://ec.europa.eu/social/main.jsp?catId=157</a>

MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/lecture/eu-law-doing-business/labour-law-and-social-policy-oKS5T">https://www.coursera.org/lecture/eu-law-doing-business/labour-law-and-social-policy-oKS5T</a>
2	<a href="https://swayam.gov.in/explorer?category=Law">https://swayam.gov.in/explorer?category=Law</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	PM01	Quality Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
i) To understand the Quality Management concept and principles and the various tools available to achieve Quality Management. ii) Provide a basic understanding of "widely-used" quality analysis tools and techniques. Create an awareness of the quality management problem-solving techniques currently in use. iii) Stressing upon the importance of the quality principles on the business performance.		
Learning Outcomes :		
1. Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems. 2. Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality. 3. Critically appraise the organizational, communication and teamwork requirements for effective quality management 4. Critically analyze the strategic issues in quality management, including current issues and developments, and to devise and evaluate quality implementation plans		
Units: -	Syllabus – Quality Management	Hrs.
Unit No : 1	Introduction : Definition, importance, objectives of quality, Types of Quality, Customer driven quality, determinants of quality, cost of quality, dimensions of quality	10
Unit No : 2	Quality Control: Quality and Financial performance, quality control objectives, quality control and inspection, quality assurance.	10
Unit No : 3	Control Charts for SQC :Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart,np-chart, c-chart. Construction & use of the control charts.	10
Unit No : 4	Acceptance Sampling for SQC :Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.	10
Unit No : 5	Customer Focus: The importance of customer satisfaction, ACSI Model, Kano's model of customer satisfaction, customer – driven quality cycle.	10
Unit No : 6	Quality Systems: Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality, Quality Auditing, Six Sigma, Taguchi method, TS	10

16949, Kaizen.	
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Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National					
2 – National	Sundarrajan	Total Quality Management 3rd Edition		PEARSON INDIA	
3 – National	P. I. Jain	Quality Control & Total Quality Management		Tata McGraw-Hill Education	
4 – International	John Bank	The essence of Total Quality Management		Prentice Hall	
5 – International	N. Logothetis	Managing for Total Quality		Prentice Hall; International Ed Edition	
6 – International	Dale H Bester field	Quality Control		Pearson Education	

Online Resources:

Online Resources No	Web site address
1	<a href="http://www.iso.org">www.iso.org</a>
2	<a href="http://www.bis.gov.in">www.bis.gov.in</a>
3	<a href="https://asq.org/quality-resources/total-quality-management">https://asq.org/quality-resources/total-quality-management</a>

MOOCs:

Resources No	Web site address
1	<a href="http://www.coursera.org">www.coursera.org</a>
2	<a href="http://www.edx.org">www.edx.org</a>
3	<a href="http://www.openlearning.com">www.openlearning.com</a>
Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021	

Semester	Course Code	Course Title	
III	PM02	Business Process reengineering	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To explain how organizational performance in terms of efficiency and effectiveness can be improved through BPR.</li> <li>ii) To introduce BPR as a change management tool.</li> <li>iii) To explore and master the fundamental principles of BPR.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>I) DEFINE the key terms associated with Business Process Reengineering.</li> <li>II) EXPLAIN the various supporting and opposing forces to Business Process Reengineering in simple business situations.</li> <li>III) APPLYING APPLY modeling tools for simple business processes</li> <li>IV) FORMULATE a working plan to establish a Business Process Reengineering team</li> <li>V) EVALUATE the success of a BPR initiative in relation to the impact on organizational KPIs.</li> <li>VI) IMAGINE ways to improve business or non-business processes.</li> </ul>		
Units: -	Syllabus <i>Business Process reengineering</i>	Hrs.
Unit No : 1	Introduction to business processes: Definition of business process, Dimension of business process, Common business processes in an organization, Definition of business process redesign, Definitions of various management-related terms, Overview of business process reengineering, Business processes improvement	10
Unit No : 2	Introduction to Business Process Reengineering (BPR): Definition of business processes – Concept of BPR - Definition of business process redesign, BPR - Evolution, Definition, Need for reengineering, Benefits, Role of leader & manager, Breakthrough reengineering model, BPR guiding principles, Business process reengineering & performance improvement, Key targets of BPR, Myths about BPR , What reengineering isn't , BPR and other management concepts: TQM, Quality function deployment, ISO standards, ERP. BPR and Process Simplification, BPR and Continuous Improvement	10
Unit No : 3	Enablers of BPR: Enablers of BPR in manufacturing – Agile Manufacturing, Lean Manufacturing, JIT, Collaborative Manufacturing, Intelligent Manufacturing, Production Planning, Product design & development. Relationship between BPR and information technology, Role of information technology in reengineering, Criticality of IT in	10



	business process.	
Unit No : 4	BPR & Information Technology: Introduction ,Relationship between BPR & Information Technology, Role of Information Technology in reengineering, Role of IT in BPR (with practical examples), Criticality of IT in business process, BPR tools & techniques, Enablers of process reengineering, Tools to support BPR ,Future role of IT in reengineering	10
Unit No : 5	BPR implementation methodology: Reasons of implementation of BPR, Necessary attributes, BPR team characteristics, Key concepts of BPR, BPR methodology, Different phases of BPR, BPR model, BPR methodology selection guidelines, Common steps to be taken for BPR implementation	10
Unit No : 6	The Power of Habit in organizations, Planned changes in business re-engineering projects; Factors relating to change management systems and culture, Committed and strong leadership, Factors relating to organizational structure, Factors related to BPR program management, Factors related to IT infrastructure, Factors Relating to BPR Failure, Problems in communication and organizational resistance, Lack of organizational readiness for change, Problems related to creating a culture for change, Lack of training and education, Factors related to management support, Ineffective BPR teams, A framework for barrier management. Success factors of BPR: Reengineering success factors, Critical success factors of BPR,	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	- Radhakrishnan, Balasubramanian	Business Process Reengineering		, PHI, Eastern Economy Edition, 2008	
2 – National	- Jayaraman, Ganesh Natrajan and Rangaramanujan	Business Process Reengineering		MGH.	
3 – National	- Dey,	Business Process Reengineering and Change		Biztantra.	

		Management			
4 – International	Harmon, P , Elsevier/Morgan	Business Process Change : A Guide for Business Managers and BPM and Six Sigma Professionals,		Kaufmann Publishers.	
5 – International	Walford, R.B.,	Business Process Implementation for IT Professionals and Managers,		Artech House.	
6 – International	Hammer, M. and Champy, J,	Re-engineering the Corporation: A Manifesto for Business Revolution,		Harper Business	

Online Resources No	Web site address
1	<a href="https://en.wikipedia.org/wiki/Business_process_re-engineering">https://en.wikipedia.org/wiki/Business_process_re-engineering</a>
2	<a href="https://searchcio.techtarget.com/definition/business-process-reengineering">https://searchcio.techtarget.com/definition/business-process-reengineering</a>
3	<a href="https://www.minit.io/blog/business-process-reengineering-examples#accept">https://www.minit.io/blog/business-process-reengineering-examples#accept</a>
4	<a href="https://www.cleverism.com/business-competitive-business-process-reengineering-bpr/">https://www.cleverism.com/business-competitive-business-process-reengineering-bpr/</a>
5	<a href="https://www.sweetprocess.com/business-process-reengineering/#chapter-8">https://www.sweetprocess.com/business-process-reengineering/#chapter-8</a>

MOOCs:

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	IT01	System Analysis and Design	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	IE:UE:50:50

### Course Objectives:

#### Subject / Course Objectives :

- i) Explain what systems are and how they are developed.
- ii) Identify and describe the phases of the systems development life cycle.
- iii) Follow the analysis portion of the Systems Development Life Cycle in a disciplined manner.
- iv) Develop and evaluate system requirements.
- v) Work effectively in a team environment.
- vi) Describe the role and responsibilities of the systems analyst in the development and management of systems.

#### Learning Outcomes :

- i) Explain the need for and value of a formalized step-by-step approach to the analysis, design, and implementation of computer information systems.
- ii) Use tools and techniques for process and data modeling.
- iii) Describe the role and responsibilities of the participants in information systems<sup>o</sup> development.
- iv) Develop a feasibility analysis of a proposed system.
- v) Develop and deliver a Requirements Definition Proposal for a new system in a well-structured business proposal.
- vi) Explain the common ways projects fail and how to avoid these failures.
- vii) Implement various project management tools.

Units: -	Syllabus – System Analysis and Design	Hrs.
Unit No : 1	Introduction to system concepts: Introduction to System, characteristic, elements of system, types of system, categories of information system	10
Unit No : 2	General phases of system development life cycle: SDLC, waterfall model, prototyping model, spiral model and 4GT, system analysis	10
Unit No : 3	3 Requirement and Structured Analysis: Feasibility Study, Fact-finding techniques, Decision Tree and Decision Table Pseudocode, Structured English, DFD	10
Unit No : 4	Database Design and Documentation Techniques: ERD, System Flow Charts; Functional Decomposition Diagram; Structured Flow-Charts.	10
Unit No : 5	User Interface Design: Interface Design Dialogue, Strategies, Screen Management	10
Unit No : 6	Practical and case studies	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Awad	System Analysis and Design			
2 – National	Senn	System Analysis and Design:			
3 – National	Roger S. Pressman	. Software Engineering a Practioner's Approach			
4 – International					
5 – International					
6 – International					

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_quick_guide.htm">https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_quick_guide.htm</a>
2	<a href="https://www.yourarticlelibrary.com/management/mis-management/system-analysis-objectives-reasons-and-tools-mis/70388">https://www.yourarticlelibrary.com/management/mis-management/system-analysis-objectives-reasons-and-tools-mis/70388</a>

**MOOCs:**

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	IT02	Information System Security & Audit	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>xx) Describe the general framework for IT risks and control.</li> <li>xxi) Identify the unique elements of computer environment and discuss how they affect the audit process.</li> <li>xxii) Describe the security aspect and audit issues related to computer security.</li> <li>xxiii) To enable the students to grasp knowledge of Auditing along with exposure to modern business information systems.</li> <li>xxiv) Understand the audit objectives and procedures used to test data management controls.</li> <li>xxv) Discuss the stages in the SDLC</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>I) Understand the difference between Security Metrics and Audits.</li> <li>II) Knowledge on Vulnerability Management</li> <li>III) Know the Information Security Audit Tasks, Reports and Post Auditing Actions</li> <li>IV) Understand Information Security Assessments</li> <li>V) Examine the multiple layers of IS security in organizations.</li> <li>VI) Analyze the risk management approach to information assets' security with respect to operational and organizational goals.</li> <li>VII) Evaluate physical and logical security controls, and the automated approaches in IS security.</li> </ul>		
Units: -	Syllabus – <i>Information System Security &amp; Audit</i>	Hrs.
Unit No : 1	What is Information Systems (IS) Auditing? ,Need for control and audit of computers, Effects of computers on internal controls, Effects of computers on auditing, Foundations of Information Systems Auditing, Organizational Responsibilities( Executive management, Auditors, IT and Information security and General users) Information system control techniques, categories of internal control, organizational controls, data processing environmental control, Business continuity planning control, user control, boundary control, input control, control over data integrity and security, logical access controls and issues , preventative, detective, deterrent, corrective, recovery, Administrative, Technical, Physical Types of audit procedures, Overview of steps in an audit, Auditing around or	10

	through the computer	
Unit No : 2	Meaning of Risk, Business risk, audit risk, security risk, and continuity risk. SEI risk statement (two things needed to express risk clearly) Components of risk: threat, vulnerability, exposure, impact, consequence Risk response options: manage, reduce, transfer, ignore, monitor Threat classes: natural, accidental and unintentional, intentional, political unrest, Threat agents, threat agent motives, Four basic steps to a risk assessment.	10
Unit No : 3	Information security programs- Relative importance of people, policy, and technology, Legal, Ethical and Professional Issues in Information Security Program foundation: policy, education, ownership, defined responsibilities Role of risk management in information security programs Information Security Management- Supporting role and purpose of: policy, training, culture, baselines, system acquisition and development, change management, configuration management, monitoring, personnel policies, assessments, metrics, and evaluation Incident response and basic steps: identification, containment, collection, recovery, analysis Cyber frauds, cyber attacks, impact of cyber frauds on enterprise, techniques to commit cyber frauds	10
Unit No : 4	Software / System Development Life Cycle- Four basic steps in SDLC: analysis, development, testing, implementation General sense for SDLC risks , Differences between pre- and postimplementation audits Pre-implementation and Post-implementation: approaches, role of auditor, advantages, disadvantages ( in both phases)	10
Unit No : 5	5 Evidence Collection- Audit software, Code review, test data, and code comparison, Concurrent auditing techniques, Interview, questionnaires, and control flowcharts, Performance measurement tools. Evaluating Asset Safeguarding and Data Integrity Introduction, measures of asset safeguarding and data integrity, Nature of the global evaluation decision, Determinants of judgment performance, Audit technology to assist the evaluation decision, Cost-effectiveness considerations, Overview of the efficiency evaluation process, Performance indices, Workload models, System models, combining workload and system models, Overview of the effectiveness evaluation process, A model of Information System effectiveness, Evaluating system quality, Evaluating information quality, Evaluating perceived usefulness, Evaluating perceived ease of use, Evaluating computer self-efficacy, Evaluating Information System use, Evaluating individual impact, Evaluating Information System satisfaction, Evaluating organizational impact	10
Unit No : 6	6 Audit planning - Scope, objectives, Audits vs. assessments Need for business continuity management, Business Continuity policy and Planning, objectives Goals, plan, implementation, testing, Types of Back up, Disaster recovery plan, Audit of BCP and DRP New trends- cloud computing, security issues, mobile computing, BYOD(bring your own device) threats of BYOD, web 2.0, social media and network – social network threats , Green IT security service and challenges	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Doug Dayton, Daug Dayton	“Information Technology Audit Handbook”,	(1997),	Prentice Hall, ISBN: 0136143148	
2 – National	Ron Weber	Information Systems Control and Audit”,		Pearson Education Inc., Ninth Impression, 2013, ISBN 978-81-317-0472-1	
3 – National	Richard E. Cascarino	Auditor's Guide to Information Systems Auditing		- 978-0-470-00989-5 Willey publication	
4 – International	Frederick Gallegos, Sandra Allen-Senft, Daniel P. Manson (1999)	“Information Technology Control and Audit”		Auerbach Pub, ISBN: 0849399947	
5 – International	James A. Hall	. “Information Systems Auditing and Assurance,”		South Western College Publishing, 1999.	
6 – International	Michael E. Whitman and Herbert J. Mattord	Principles of Information Security,”		“Thomson Course Technology, 3rd Ed., 2008.	

Online Resources No	Web site address
1	<a href="https://core.ac.uk/download/pdf/6673169.pdf">https://core.ac.uk/download/pdf/6673169.pdf</a>

2	<a href="https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_security_audit.htm">https://www.tutorialspoint.com/system_analysis_and_design/system_analysis_and_design_security_audit.htm</a>
3	<a href="https://www.isaca.org/resources/isaca-journal/issues/2016/volume-5/information-systems-security-audit-an-ontological-framework">https://www.isaca.org/resources/isaca-journal/issues/2016/volume-5/information-systems-security-audit-an-ontological-framework</a>
4	<a href="https://en.wikipedia.org/wiki/Information_security_audit">https://en.wikipedia.org/wiki/Information_security_audit</a>
5	<a href="https://www2.deloitte.com/me/en/pages/technology/solutions/it_audit_and_information_system_security_deloitte_montenegro_technology_services_solutions.html">https://www2.deloitte.com/me/en/pages/technology/solutions/it_audit_and_information_system_security_deloitte_montenegro_technology_services_solutions.html</a>

MOOCs:

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	IB01	<i>Regulatory Aspects of International Business</i>	
Type	Credits	Evaluation	Marks
Core elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>• To enable the student to understand the international business transactions and legal compliances related to the smooth conduct of business.</li> <li>• To give background of legal framework of Cross border trade.</li> <li>• To make students aware of Regulatory framework and also keep abreast with latest cross border trade regulations</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>▪ The course will help students to understand the scenario of world trade and how regulations help the smooth conduct of trade processes.</li> <li>▪ The course will help students to know the various legal compliances and documentations in the cross border trade.</li> </ul>		
Units: -	Syllabus – <i>Regulatory Aspects of International Business</i>	Hrs.
Unit No : 1	International Business transactions – Nature of cross border trade, Need to govern the cross border trade, International Law, choice of Law, conflict of Laws, Legal & Regulatory aspects	10
Unit No : 2	Framework of Statutes that govern cross border trade, Statutes framed by country of origin of transaction & International Guidelines	10
Unit No : 3	Regulation of International Banking, High Financial gearing, BCCI International affair, Bank for International Settlement	10
Unit No : 4	Regulation of Monetary System, Period between wars, Breton Woods, Euro, Smithsonian Agreement, Snake in Tunnel, Plaza & Louvre Accord, Regulatory Arbitrage, Labuan Model, Currency Board	10
Unit No : 5	Indian scenario – Process of Regulation & Deregulation ,Exchange Control Manual, An Introduction to FEMA, FEDAI Role & Rules , UCPDC – ICC Publication URC – ICC Publication Important clauses & interpretation ,Customs & Baggage Rules – Sale of Goods Act, INCOTERMS	10
Unit No : 6	International Debt Crises, Herstst Bank Crisis, Asian & other crises, Sovereign Risk – State Immunity Act, International Accounting Standards, Trade related Intellectual Property Rights, World Transfer Pricing	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books	Name of the Author	Publishers
International	ICC Publication UCPDC -Uniform Customs and Practice for Documentary Credits	International Chamber of Commerce
International	Global Business Regulation by <a href="#">John Braithwaite</a>	Cambridge University Press (February 13, 2000)
International	Legal & Ethical Aspects of International Business (Aspen College) by <a href="#">Eric L. Richards</a>	Wolters Kluwer Law & Business (February 27, 2014)
International	International Banking Legal and Regulatory Aspects(Diploma in International Banking and Finance) by Indian Institute of Banking and Finance, Mumbai 2007-2008	Publisher-Rajiv Beri from Macmillan India Ltd.
National	Regulatory requirements under FEMA 1999 Vol I FEDAI Publication	FEDAI Publications,Govt.of India
National	Foreign Trade Policy – R- Return XOS & BEF, FEDAI Publication	

Online Resources:

Online Resources	Web site address
1	<a href="http://www.ipindia.nic.in/">http://www.ipindia.nic.in/</a>
2	<a href="https://udyamregistration.gov.in/docs/nic_2008_17apr09.pdf">https://udyamregistration.gov.in/docs/nic_2008_17apr09.pdf</a>
3	<a href="https://dgft.gov.in/CP/">https://dgft.gov.in/CP/</a>
4	<a href="https://www.fieo.org/">https://www.fieo.org/</a>
5	<a href="https://www.trademap.org/">https://www.trademap.org/</a>
6	<a href="https://msme.gov.in/know-about-msme">https://msme.gov.in/know-about-msme</a>
7.	<a href="https://www.google.co.in/books/edition/International_Banking_Legal_Regulatory_A/IhYsJqiKj8EC?hl=en&amp;gbpv=1&amp;dq=regulatory+aspects+of+international++business+books+indian+author&amp;printsec=frontcover">https://www.google.co.in/books/edition/International_Banking_Legal_Regulatory_A/IhYsJqiKj8EC?hl=en&amp;gbpv=1&amp;dq=regulatory+aspects+of+international++business+books+indian+author&amp;printsec=frontcover</a>

MOOCs:

Resources No	Web site address
1	<a href="https://www.edx.org/learn/international-trade">https://www.edx.org/learn/international-trade</a>
2	<a href="https://www.openlearning.com/courses/GFML3073/">https://www.openlearning.com/courses/GFML3073/</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	IB02	<i>Export Import Policies Procedures and Documentation</i>	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>To make students aware about the cross border trade procedures and practices in International Logistics</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>The course will provide a clarity on the Import-Export cycle.</li> <li>The course will help students to know the various compliances and documentations in the Import Export Process</li> <li>The course will help students to know the logistic process and various agencies involved the export –import process.</li> </ul>		
Units: -	Syllabus – <i>Export Import Policies Procedures and Documentation</i>	Hrs.
Unit No : 1	International Business – Nature & Scope, Framework of International Business, Meaning of Export/ Deemed Export/ Import	10
Unit No : 2	World’s Foreign Trade Scenario and Trade Composition, India’s Foreign Trade, Important Statutes/Acts/Policies for International Trade, Export Procedure step by step from registration to final shipment and post shipment.	10
Unit No : 3	Documentation in Export/ Import required for Sales Contract, Shipment, Custom Clearance, Banks, Insurance and Transport etc.	10
Unit No : 4	Cross Border Payment Settlement Procedure with Advanced Payment Method, Open Account Method, Documentary Credit, Documentary Collection and Consignment Trading	10
Unit No : 5	International Trade Logistics – Meaning, Objective, International Logistic Agencies in India and outside India, their functions.	10
Unit No : 6	Warehousing, Ports in India, Port Efficiency and Productivity, Freight Forwarder, Custom House Agent, Multimodal Transport Operator,	10

	<p>Containerization – Types and Dimensions, Linear Shipping Services</p> <p><u>Project</u> –Students are supposed to select a product for export with the help of Product and Market selection techniques and need to explain each step involved in the export process from the registration stage to post shipment stage.</p>	
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Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1-National	Aseem Kumar	Export Import Management	2007	Excel Books
2-National	C. Rama Gopal	Export Import Procedure and Documentation	2019	New age International Publisher's, New Delhi
3-National	W.K. Acharya and Jain K.S	Export Import Procedure and Documentation	2019	Himalaya Publishing House, Mumbai
4-National	CA Shiva Chaudhary	How to start Export Import Business	2018	Educreation Publishing

**Online Resources:**

Online Resources No	Web site address
1	<a href="http://www.ipindia.nic.in/">http://www.ipindia.nic.in/</a>
2	<a href="https://udyamregistration.gov.in/docs/nic_2008_17apr09.pdf">https://udyamregistration.gov.in/docs/nic_2008_17apr09.pdf</a>
3	<a href="https://dgft.gov.in/CP/">https://dgft.gov.in/CP/</a>
4	<a href="https://www.fieo.org/">https://www.fieo.org/</a>
5	<a href="https://www.trademap.org/">https://www.trademap.org/</a>
6	<a href="https://msme.gov.in/know-about-msme">https://msme.gov.in/know-about-msme</a>

**MOOCs:**

Resources No	Web site address
1	<a href="http://niryatbandhu.iift.ac.in/exim/">http://niryatbandhu.iift.ac.in/exim/</a>
2	<a href="https://www.edx.org/learn/international-trade">https://www.edx.org/learn/international-trade</a>
3	<a href="https://www.openlearning.com/courses/GFML3073/">https://www.openlearning.com/courses/GFML3073/</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	AM01	Rural Marketing	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
i) To sensitize the students towards the Agriculture and Rural Marketing environment so as to help them in understanding the emerging challenges in the Global Economic Environment ii) To familiarize the students with the basic concepts of Rural Marketing, iii) To make the students aware of nature of the Rural Consumer iv) To give insights of marketing of agricultural inputs and produce.		
Learning Outcomes :		
I) Understand the importance of Rural Markets II) Sensitize to the needs and behavior of consumers and channels III) Utilize the understanding on peculiarities of rural markets, channels and competition in marketing decision making IV) Understand the Rural Market Segmentation and Rural Products V) Expose the students to Rural Market Distribution and services		
Units: -	Syllabus – <i>Rural Marketing</i>	Hrs.
Unit No : 1	Rural marketing management perspectives, challenges to Indian marketer. Rural – urban disparities, policy interventions required rural face to reforms, towards cyber India	10
Unit No : 2	Rural marketing – concept, scope, nature, taxonomy attractiveness. Urban vs. rural marketing. Rural consumer behavior – buyer characteristics, decision process, and behavior patterns, evaluation procedure, brand loyalty, innovation adoption.	10
Unit No : 3	3 Information system for rural marketing – concepts, significance, internal reporting system, marketing research system, decision support system. Selecting and attracting markets – concepts and process, segmentation, degrees, bases, and guides to effective segmentation, targeting and positioning	10
Unit No : 4	Product strategy for rural markets. Concept and significance. Product mix and product item decisions. Competitive product strategies. Pricing strategy in rural marketing: Concept, Significance, Objectives, Policy and strategy.	10
Unit No : 5	Promotion towards rural audience, exploring media, profiling target audience, designing right promotion strategy and campaigns. Rural distribution – channels, old setup, new players, new approaches, coverage strategy	10

Unit No : 6	Cases related to the topics covered under earlier units.	10
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Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	C.S.G. Krishnamacharyulu & Lalitha Ramakrishnan,	“Rural Marketing” – Text and Cases		, Pearson education.	
2 – National	C.S.G. Krishnamacharyulu & Lalitha Ramakrishnan	, “Cases in rural marketing an integrated approach”.		Pearson education.	
3 – National	Robert Chambers	“Rural Development: Putting the last first		Pearson education.	
4 – International					
5 – International					
6 – International					

Online Resources:

Online Resources No	Web site address
1	
2	
3	
4	
5	

MOOCs:

Resources No	Web site address
1	mooc.org

2	<a href="http://www.Coursera.org">www.Coursera.org</a>
3	<a href="http://www.Udemy.com">www.Udemy.com</a>
4	<a href="http://Swayam.gov.in">Swayam.gov.in</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	AM02	<i>Supply Chain Management in Agribusiness</i>	
Type	Credits	Evaluation	Marks
Core elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
I) Understand the principles of supply chain management and its importance in business management.		
II) Know the emerging practices, challenges and trends in supply chains.		
III) Understand the Supply Chain Strategy		
IV) Understand the Logistics Management in Supply Chains		
V) Understand the Information Technology for Supply Chain Management		
Learning Outcomes :		
I) Understand the principles of supply chain management and its importance in business management.		
II) Know the emerging practices, challenges and trends in supply chains.		
III) Understand the Supply Chain Strategy		
IV) Understand the Logistics Management in Supply Chains		
V) Understand the Information Technology for Supply Chain Management		
Units: -	<i>Syllabus Supply Chain Management in Agribusiness</i>	Hrs.
Unit No : 1	Supply Chain: Changing Business Environment; SCM: Present Need; Conceptual Model of Supply Chain Management; Evolution of SCM; SCM Approach; Traditional Agri. Supply Chain Management Approach; Modern Supply Chain Management Approach; Elements in SCM.	10
Unit No : 2	Demand Management in Supply Chain: Types of Demand, Demand Planning and Forecasting; Operations Management in Supply Chain, Basic Principles of Manufacturing Management.	10
Unit No : 3	Procurement Management in Agri. Supply chain: Purchasing Cycle, Types of Purchases, Contract/Corporate Farming, Classification of Purchases Goods or Services, Traditional Inventory Management, Material Requirements Planning, Just in Time (JIT), Vendor Managed	10



	Inventory.	
Unit No : 4	Logistics Management: History and Evolution of Logistics; Elements of Logistics; Management; Distribution Management, Distribution Strategies; Pool Distribution; 28 Transportation Management; Fleet Management; Service Innovation; Warehousing; Packaging for Logistics, Third-Party Logistics (TPL/3PL); GPS Technology.	10
Unit No : 5	Concept of Information Technology: IT Application in SCM; Advanced Planning and Scheduling; SCM in Electronic Business; Role of Knowledge in SCM; Performance Measurement and Controls in Agri. Supply Chain Management- Benchmarking: introduction, concept and forms of Benchmarking.	10
Unit No : 6	Food supply chain Networks, The advantages for supply chain members, Components of an Agri supply chain, Agri marketing and emergence of coordinated supply chains in India, Coordinated supply chains, Supply Chain Management in Horticulture, Value chain – Some Horticulture crops,	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Altekar RV. 2006.	Supply Chain Management: Concepts and Cases		. Prentice Hall of India.	
2 – National	Monczka R, Trent R• & Handfield R.	. Purchasing and Supply Chain Management.		2002 Thomson Asia	
3 – National	. van Weele AJ. 2000.	Purchasing and Supply Chain Management Analysis ,Planning and• Practice		Vikas Publ. House	
4 – International	Fawcett, S., Ellram, L. and Ogden, J. (2007):	Supply Chain Management – From Vision to Implementation.		Pearson Prentice Hall, Upper Saddle River, NJ, USA.	
5 –	Fischer, C.	Agri-food		CAB	

International	and Hartmann, M. (2010):	Chain Relationships..		International, UK and US.	
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. Online Resources:

Online Resources No	Web site address
1	<a href="https://www.academia.edu/40734182/Principles_of_Agribusiness_Management">https://www.academia.edu/40734182/Principles_of_Agribusiness_Management</a>
2	<a href="https://en.wikipedia.org/wiki/Agribusiness">https://en.wikipedia.org/wiki/Agribusiness</a>
3	<a href="https://zalamsyah.files.wordpress.com/2018/02/6-agribusiness-management.pdf">https://zalamsyah.files.wordpress.com/2018/02/6-agribusiness-management.pdf</a>
4	<a href="http://eagri.org/eagri50/AECO341/index.html">http://eagri.org/eagri50/AECO341/index.html</a>

MOOCs:

Resources No	Web site address
1	<a href="http://mooc.org">mooc.org</a>
2	<a href="http://www.Coursera.org">www.Coursera.org</a>
3	<a href="http://www.Udemy.com">www.Udemy.com</a>
4	<a href="http://Swayam.gov.in">Swayam.gov.in</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	R01	Introduction to Retailing	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

Course Objectives:

Subject / Course Objectives :		
i) To familiarize the students with evolution and growth of Retailing, expectations of customers and		
ii) To study the importance of retailing in the current business scenario.		
Learning Outcomes :		
I) Enable the students to gain knowledge on concepts, formats and managerial practices of retailing		
II) Enable the students to gain skills on analysis and decision making in retailing management		
III) Understand to the Product Categories, Types and Formats		
IV) Understand to the Retail Strategy		
V) Understand to the Store Operation and Services		
Units: -	Syllabus – <i>Introduction to Retailing</i>	Hrs.
Unit No : 1	Retailing- Meaning, Nature, Classification, Growing Importance of Retailing, Factors Influencing Retailing, Functions of Retailing, Retail as a career.	10
Unit No : 2	Developing and applying Retail Strategy, Strategic Retail Planning Process, Retail Organization,	10
Unit No : 3	The changing Structure of retail, Classification of Retail Units, Retail Formats: Corporate chains, Retailer Corporative and Voluntary system, Departmental Stores, Discount Stores, Super Markets, Warehouse Clubs.	10
Unit No : 4	4 Varsity of Merchandising Mix, Retail Models and Theory of Retail Development, Business Models in Retail, Concept of Life cycle Retail.	10
Unit No : 5	Emergence of Organized Retailing, Traditional and Modern retail Formats in India, Retailing in rural India, Environment and Legislation For Retailing, FDI in Retailing	10
Unit No : 6	Case Studies in Retail Management	10

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference	Name of	Title of the	Year Edition	Publisher	
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Books (Publisher)	the Author	Book		Company	
1 – National	Swapana Pradhan-	Retailing Management			
2 – National	Dravid Gilbert	- Retail Marketing			
3 – National	George H, Lucas Jr., Robert P. Bush, Larry G Greshan-	Retailing			
4 – International	A. J. Lamba	The Art of Retailing			
5 – International	. Barry Berman, Joel R Evans	Retail Management; A Strategic Approach			
6 – International					

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#### Online Resources:

Online Resources No	Web site address
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#### MOOCs:

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
III	R02	Retail Management and Franchising	
Type	Credits	Evaluation	Marks

Core Elective	3	CES	UE:IE = 50:50
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Course Objectives:

Subject / Course Objectives :		
To familiarize the students with evolution and growth of Retailing, expectations of customers and to study the importance of retailing in present business scenario.		
Learning Outcomes :		
<p>I) Understand the retail sector and the range of retail occupations.  II) describe the characteristics of the local retail environment  III) identify different retail occupations and the related skills, attributes and behaviours.  IV) state factors that influence customer expectations.  V) explain how a Point of Sale is used in retail.</p>		
Units: -	Syllabus Retail Management and Franchising	Hrs.
Unit No : 1	Introduction: Definition, Relationship between retailing & marketing, Customer Relationship Management for retail store, Features of retailing, retailing structure. Retailing & channels of distribution, place of retailing in channels of distribution, Structural dynamics, alternative ways of classifying, retail structure, essentials of successful retailing, non store retailing.	10
Unit No : 2	Retail Strategic Planning: Meaning, importance, steps involved in retail strategic planning.	5
Unit No : 3	Franchising: Introduction, meaning, Advantages & disadvantages of becoming a franchisee, Legal restrictions in franchising, types of franchises, elements of an ideal franchise programme, forms of franchise arrangement, Evaluating the franchise company, trends in franchising.	7
Unit No : 4	Location: Introduction, Geographic location decision, location site and types of retail development, location techniques, catchment area analysis, leasing of a retail outlet.	7
Unit No : 5	Store Design & Layout: Introduction, Store & its image, The External Store, Internal Store, Display, visual merchandising & atmospherics, types of layout.	8
Unit No : 6	Consumerism & Ethics in Retailing: Introduction, Pressures for a company to be socially responsible, criticism of marketing activity, product misuse and safety issues, acceptability of social responsibility.	8

Student has to upgrade Knowledge by using below inputs:

Reference Books:

Reference	Name of	Title of the	Year Edition	Publisher	
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Books (Publisher)	the Author	Book		Company	
1 – International	David Gilbert	Retail Marketing Management		Pearson Education	
2 –International	Andrew J. Newman & Peter Cullen	Retailing Environment & operations		Change learning	
3 –International	Barry Berman & Jeol R. Evans	Retail Management – A Strategic Approach		Pearson Education	
4 –National	Agarwal, Bansal, Yadav & Kumar	Retail Management, Pragati Prakashan		W.K. Road, Merut.	
5-International	Barbara E.Kahn	The Shopping Revolution		Wharton School Press	
6-International	John Stanley	Just About Everything a Retail Manager Needs to Know		Gray & Nash	
7-National	<a href="#">Swapna Pradhan</a>	Retailing Management	2011	Tata McGraw-Hill Education	

Online Resources:

Online Resources No	Web site address
1	<a href="https://www.vectorconsulting.in/research-publications/consumer-industry-insights/leveraging-franchisees-for-profitable-growth-in-retail/">https://www.vectorconsulting.in/research-publications/consumer-industry-insights/leveraging-franchisees-for-profitable-growth-in-retail/</a>
2	<a href="https://courses.lumenlearning.com/clinton-marketing/chapter/reading-types-of-retailers/">https://courses.lumenlearning.com/clinton-marketing/chapter/reading-types-of-retailers/</a>
3	<a href="https://www.primaseller.com/knowledge-base/retail-">https://www.primaseller.com/knowledge-base/retail-</a>

	store-management/
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MOOCs:

Resources No	Web site address
1	<a href="https://www.shortcoursesportal.com/disciplines/244/retail-management.html">https://www.shortcoursesportal.com/disciplines/244/retail-management.html</a>
2	<a href="https://onlinecourses.swayam2.ac.in/cec19_mg40/preview">https://onlinecourses.swayam2.ac.in/cec19_mg40/preview</a>

Elective - Project Management: Course - Project Risk Management.

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2021– 2022			
Semester	Course Code	Course Title	
III	PR01	Project Risk Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p><b>Subject / Course Objectives:</b></p> <p>xxvi) To understand how to apply customizable, industry-robust Templates to create a Risk Management Plan and Risk Register</p> <p>xxvii) To understand how to Use Qualitative Risk analysis process to Identify Risk Exposure</p> <p>xxviii) To understand how to Translate Risk into actual Time and Cost impact using proven Quantitative Risk Analysis Tools</p> <p>xxix) To understand how to Utilize Technique to Design your Risk Response Strategies</p> <p>xxx) To understand how to Monitor Risk Triggers to control uncertainties and maximize project payoff</p>		
<p><b>Learning Outcomes:</b></p> <p>vii) Develop skills to help you enhance your skills on project risk management.</p> <p>viii) Help in identifying and measuring risks in project development and implementation,</p> <p>ix) Learn to quantify risks and create risk response strategies to deliver projects that meet stakeholder expectations..</p>		
Name: -	Syllabus – Project Risk Management	Hrs.
Unit No: 1	<p><b>Introduction to Risk Management</b></p> <p>Difference between Risk and Issue Management, Definitions of Risk and Key Terms, Risk vs. Opportunities, Impact of Risk on Organizations, Internal Control and Risk Management, Maturity in Risk Culture, Risk Management Strategy, Perspectives – Strategic, Programme, Project, Operations, Risk Management Policy and Processes, Risk Management Responsibilities, Risk Management Templates for Risk Management, Strategy and Risk Register</p>	5
Unit No: 2	<p><b>Risk Management Planning</b></p> <p>Risk Management Planning Process, Inputs to Risk Planning, Techniques for Risk Planning, Tailoring the Risk Register, Tailoring the Probability Impact Matrix, Define Roles and Responsibilities, Develop Project Risk Management Plan</p>	8
Unit No: 3	<p><b>Identify Risks</b></p> <p>Risk Identification Process, Inputs to Risk Identification, Techniques in Risk Identification, Determine Project Risk and Opportunities, Using Expert Judgment and historical Data Analysis, Discuss SWOT, Taxonomy, Checklist, Delphi, Cause and Effect, Pareto analysis, Where to look for Project Risks, Risk Breakdown Structure, Common risks in</p>	5



	Software Project	
Unit No: 4	<b>Risk Analysis</b> Risk Analysis Process, Qualitative vs. Quantitative Risk Analysis, When to use Quantitative Risk Analysis, Inputs for Qualitative Risks Analysis, Determine Risk Probability and Impact, Risk Urgency Assessment, Categorize Risks, Update Risk Register, Quantifying with Expected Monetary Value, Decision Tree Analysis	5
Unit No: 5	<b>Planning Risk Responses</b> Risk Response planning process, Inputs for Risk response planning, Strategies for Negative Risks, Strategies for Positive Risks, Secondary Risks and Residual Risks, Assigning Risk Ownership and Responsibilities, Contingency Planning	8
Unit No: 6	<b>Monitoring and Controlling Risks</b> Risk Monitoring and Controlling Process, Inputs to Risk Monitoring and Controlling Process, Techniques in Risk Monitoring and Controlling Risk Reassessment, Risk Audits, Variance and Trend Analysis Documenting Risk Data for future projects, Managing Issues	05

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – International	Tom Kendrick	Identifying and Managing Project Risk	3rd edition (16 April 2015)	AMACOM, United Kingdom
2 – International	Michel Crouhy	The Essentials of Risk Management	2nd Edition 2015	McGraw-Hill Education; 2nd edition, USA
3 – National	Yadav Manoj	101 Secrets of Project Risk Management	1st Edition 2016	Vitasta Publishing Pvt.Ltd
4 – National	P Gopalakrishnan & V E Ramamoorthy	Textbook of Project Management	1st Edition 2017	Laxmi Publications
5 – National	IIBF	Risk Management	2nd edition	Macmillan Publishers India Pvt. Ltd.;

Online Resources:

Online	Web site address
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Resources No.	
1	<a href="https://www.pmi.org/-/media/pmi/documents/public/pdf/certifications/practice-standard-project-risk-management.pdf?v=1e0b5985-74af-4c57-963c-b91a9af6fecb">https://www.pmi.org/-/media/pmi/documents/public/pdf/certifications/practice-standard-project-risk-management.pdf?v=1e0b5985-74af-4c57-963c-b91a9af6fecb</a>
2	<a href="https://www.edureka.co/blog/project-risk-management/">https://www.edureka.co/blog/project-risk-management/</a>
3	<a href="https://www.oreilly.com/library/view/pmp-project-management/9780470479582/9780470479582_monitor_and_control_risks.html">https://www.oreilly.com/library/view/pmp-project-management/9780470479582/9780470479582_monitor_and_control_risks.html</a>
4	<a href="https://projectriskcoach.com/identify-project-risks/">https://projectriskcoach.com/identify-project-risks/</a>
5	<a href="https://www.greycampus.com/opencampus/project-management-professional/risk-categories">https://www.greycampus.com/opencampus/project-management-professional/risk-categories</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://onlinecourses.swayam2.ac.in/cec21_ge06/preview">https://onlinecourses.swayam2.ac.in/cec21_ge06/preview</a>
2	<a href="https://onlinecourses.swayam2.ac.in/nou21_ag10/preview">https://onlinecourses.swayam2.ac.in/nou21_ag10/preview</a>
3	<a href="https://onlinecourses.swayam2.ac.in/cec21_ge06/preview">https://onlinecourses.swayam2.ac.in/cec21_ge06/preview</a>

Elective - Project Management: Course – Microsoft Project 2010

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2021– 2022			
Semester	Course Code	Course Title	
III	PR02	Microsoft Project 2010	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p>Subject / Course Objectives:</p> <ul style="list-style-type: none"> <li>i) To understand best in class templates</li> <li>ii) To schedule tasks effectively.</li> <li>iii) To collaborate with project partners with ease.</li> <li>iv) To understand how to get updates and stay current</li> </ul>		
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> <li>i) Understand the Microsoft Project 2010 Interface</li> <li>ii) Learn Best Practices in Planning and Scheduling using Microsoft Project and Checklists</li> <li>iii) Learn Resource Planning, How to resolve Resource Workload, Re-Assignments and Performance Review</li> </ul>		
Name	Syllabus – Microsoft Project 2010	Hrs.
Unit No: 1	<b>Best Practice Guidelines and Checklists on Project Scheduling</b> Scheduling in a Nut Shell, Scheduling Best Practices and Guidelines, Do's and Don'ts, Overview of Microsoft Project 2010	8
Unit No: 2	<b>Resolving Resource Workload Over Allocation</b> Determine Resource Workloads, Sharing Resources across Multiple Projects, Strategies for resolving Resource Workload over allocation, Level the Workload yourself, Let Microsoft Project level the Workload for you, Best practices on Workload Leveling	11
Unit No: 3	<b>Optimizing for Scope, Time, Cost and Resource</b> Strategies for Optimizing the Schedule, Managing Critical Path using Microsoft Project, Running What-if Scenarios in Microsoft Project, Determining Critical Resources	5
Unit No: 4	<b>Managing Multiple Projects</b> Project, Program and Portfolio Management Concepts, Combining Projects for Progress Review, Creating and Managing Sub Projects and Master Projects, Managing Project Task Dependencies, Sharing Resources amongst Projects	4
Unit No: 5	<b>Customizing and Sharing Objects</b> Customizing Project Objects, Sharing Objects between Projects, Using Project Templates	10
Unit No: 6	<b>Analyzing Projects</b> Analyzing Project Progress, Measuring Performance using Earned Value	07

	Analysis, Responding to Changes in your Project	
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Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – International	Bonnie Biafore	Microsoft Project 2010: The Missing Manual	1 <sup>st</sup> Edition	O'Reilly Media, Inc.
2 – International	Nancy C. Muir	Project 2010 For Dummies	May 2010	For Dummies
3 – International	Robert Happy	Microsoft Project 2010 Project Management: Real World Skills for Certification and Beyond	1 <sup>st</sup> Edition	Sybex

Online Resources:

Online Resources No.	Web site address
1	<a href="http://cnaiman.com/PM/MIT-LabText/2013/microsoft-project-2013-step-by-step.pdf">http://cnaiman.com/PM/MIT-LabText/2013/microsoft-project-2013-step-by-step.pdf</a>
2	<a href="http://www.asciutto.com/project2010/Project2010_eBook.pdf">http://www.asciutto.com/project2010/Project2010_eBook.pdf</a>
3	<a href="https://www.uis.edu/informationtechnologyservices/wp-content/uploads/sites/106/2013/04/IntroductiontoProject2010.pdf">https://www.uis.edu/informationtechnologyservices/wp-content/uploads/sites/106/2013/04/IntroductiontoProject2010.pdf</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://www.my-mooc.com/en/mooc/managing-projects-microsoft-project-microsoft-cld213x/">https://www.my-mooc.com/en/mooc/managing-projects-microsoft-project-microsoft-cld213x/</a>
2	<a href="https://www.classcentral.com/course/edx-managing-projects-with-microsoft-project-6718">https://www.classcentral.com/course/edx-managing-projects-with-microsoft-project-6718</a>
3	<a href="https://www.coursera.org/lecture/uva-darden-project-management/supplemental-tutorial-getting-started-with-microsoft-project-ojHba">https://www.coursera.org/lecture/uva-darden-project-management/supplemental-tutorial-getting-started-with-microsoft-project-ojHba</a>

# **MBA SEM IV**

## **Core Courses**

<b>Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021</b>			
<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	
IV	401	<b>Project Management</b>	
<b>Type</b>	<b>Credits</b>	<b>Evaluation</b>	<b>Marks</b>
Core	3	UE and IE	UE:IE = 50:50

**Course Objectives:**

Subject / Course Objectives :		
<ol style="list-style-type: none"> <li>To understand the concepts of project planning and organization, budgeting and control, and project life cycles.</li> <li>To master several basic project scheduling techniques including WBS, CPM, PERT, GANTT CHARTS, and resource constrained scheduling.</li> <li>To understand the related concepts of organizational forms, conflict resolution, and issues related to leadership and task management in a project environment.</li> <li>To become familiar with Microsoft Project in performing simple project management tasks.</li> </ol>		
Learning Outcomes :		
<ol style="list-style-type: none"> <li>Evaluate project to develop scope of work, provide accurate cost estimation and to plan the various activities.</li> <li>Identify resources required for a project and to produce a work plan and resources schedule.</li> <li>Evaluate project for quality concept.</li> <li>Use of project management tools for project management.</li> </ol>		
Units	Syllabus – <b>Project Management</b>	Hrs.
Unit No : 1	Introduction, Need for Project Management, characteristics of project, Problems with projects, All parties (stakeholders) involved in project. Role of Project Manager. Project management body of knowledge (PMBOK), Project Management Knowledge Areas, Phases of project management life Cycle.	10
Unit No : 2	Organizational Structure and Organizational Issues: Introduction, Organizational Structures, Team structures, Team development process, team building process, stages in developing a high performance project team, project team pitfalls, Roles and Responsibilities of Project Leader Leadership Styles for Project Managers, Conflict Resolution, Team Management and Diversity Management	10
Unit No : 3	Project Planning and scheduling: Introduction, Project Planning, Need of Project Planning, Project Planning Process, Work Breakdown Structure (WBS), Gantt chart, Network Planning models, formulating network model , Critical path analysis , PERT, Resource Allocation, Scheduling, Project Cost Estimate and Budgets, Cost Forecasts	10
Unit No : 4	Project Risk Management: Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Risk prioritization, Risk	10

	mitigation.	
Unit No : 5	Project Quality management :Introduction, Quality, Quality Concepts, Place of quality in planning, importance of it, quality measures, ISO standards, CMM standards, Quality Assurance document	10
Unit No : 6	Project Management Software: Introduction, Advantages of Using Project Management Software, Common Features Available In Most of the Project Management Software, Study of MS project or any other project management	10

Student has to upgrade Knowledge by using below inputs:

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National					
2 – National					
3 – National	John M Nicholas	Project Management For Business And Technology		Prentice Hall Of India Pvt Ltd	
4 – International	Clifford F Gray, Erik W Larson	“Project Management : The Managerial Process		Tata Mcgraw - Hill Publishing Co Ltd	
5 – International	Jack Meredith, Samuel J. Mantel Jr.	Project Management - A Managerial Approach		John Wiley and Sons	
6 – International					

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://en.wikipedia.org/wiki/Project_Management_Institute">https://en.wikipedia.org/wiki/Project_Management_Institute</a>
2	<a href="https://www.projectengineer.net/the-10-pmbok-knowledge-areas/">https://www.projectengineer.net/the-10-pmbok-knowledge-areas/</a>
3	<a href="https://en.wikipedia.org/wiki/Project_management">https://en.wikipedia.org/wiki/Project_management</a>
4	<a href="https://pmstudycircle.com/2012/03/stakeholders-inproject-management-definition-and-types/">https://pmstudycircle.com/2012/03/stakeholders-inproject-management-definition-and-types/</a>
5	<a href="https://opentextbc.ca/projectmanagement/chapter/chapter-8-overview-of-project-planning-project-management/">https://opentextbc.ca/projectmanagement/chapter/chapter-8-overview-of-project-planning-project-management/</a>

**MOOCs:**

Resources No	Web site address
1	Please refer these websites for MOOCs: NPTEL / Swayam
2	<a href="http://www.edx.com">www.edx.com</a>
3	<a href="http://www.coursera.com">www.coursera.com</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	402	Environment and Disaster Management	
Type	Credits	Evaluation	Marks
Core	2	CES	IE = 100

### Course Objectives:

<b>Subject / Course Objectives :</b>		
<ul style="list-style-type: none"> <li>Understand and realize the multi-disciplinary nature of the environment, its components, and inter-relationship between man and environment.</li> <li>Understand the relevance and importance of the natural resources in the sustenance of life on earth and living standard.</li> <li>Comprehend the importance of ecosystem, biodiversity and natural bio geo chemical cycle.</li> </ul>		
<b>Learning Outcomes :</b>		
<ul style="list-style-type: none"> <li>Understand the natural environment and its relationships with human activities.</li> <li>Characterize and examine human affects at the environment.</li> <li>Capacity to obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios</li> <li>Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems of disaster events at a local and global levels.</li> <li>Capacity to integrate knowledge and to analyse, evaluate and manage the different public health aspects</li> </ul>		
Units-	Environment and Disaster Management	Hrs.
<b>Unit No : 1</b>	<b>The Environment and Ecosystem:</b> Environment and Environmental studies: Definition, concept, components and importance Ecosystem and Ecology: Structure and Function of ecosystem, Brief concept of Autecology and Synecology. Food chain, food web and ecological pyramids . Biogeochemical cycles in an ecosystems: (Carbon, Nitrogen and Phosphorous cycle) Ecological succession: Definition, types, concept and process (Hydrosere, Xerosere and Lithosere).	4
<b>Unit No : 2</b>	<b>Environment as Science:</b> Introduction, Types of environment- Physical & Cultural, Environmental Science- meaning and definition, nature and scope, methods and importance of study. Impact of Technology on the environment, Environmental Degradation, Sustainable Development, Environmental Education.	4
<b>Unit No : 3</b>	<b>Biodiversity and its conservation:</b> Definition, genetic, species and ecosystem diversity.	4

	Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values Biodiversity at global, National and local levels. India as a mega-diversity nation Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	
<b>Unit No : 4</b>	<b>Definition and types of disaster:</b> Hazards and Disasters, Risk and Vulnerability in Disasters, Natural and Man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.	4
<b>Unit No : 5</b>	Natural Disasters: Epidemic, Cyclone, Drought, Food, Landslide, Fire and forest fire, Earthquake and Volcanoes, Tsunami. Man- made Disasters: War, Arson / Sabotage / Internal Disturbances / Riots, Nuclear Explosion /Accidents / Radioactive Leakages. Ecological disasters like Deforestation / Soil Erosion / Air / Water Pollution. CORONA,HIV / AIDS, Life Style Diseases.	4
<b>Unit No : 6</b>	Disaster Management: Components of Disaster Management, Government's Role in Disaster Management through Control of Information, Actors in Disaster Management, Organizing Relief measures at National and Local Level, psychological Issues, Carrying Out Rehabilitation Work, Government Response in Disaster	4

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Dr. Alok Satsangi	Environment Management and Disaster Management	2014	Green Leaf Publication	
2 – National	Gupta A.K., Niar S.S and Chatterjee S.	Disaster management and Risk Reduction, Role of Environmental Knowledge	2013	Narosa Publishing House, Delhi.	
3 – National	Dr.	Environmental	2019	Agrobios (India)	

	Ponmani S, Mrs. Bharathi VS, Dr. Balusamy A	Studies & Disaster Management			
4 – International	R. Rajagopalan	Environmental Studies	2015	Oxford University Press Publication	
5 – International	Majid Husain	Environment And Ecology: Biodiversity, Climate Change And Disaster Management	2016	Access Publishing	
6 – International	Thomas H. Tietenberg ,Lynne Lewis	Environmental and Natural Resource Economics	2018	Routledge Publishing	

### Online Resources:

Online Resources No	Web site address
1	<a href="http://environment-and-ecology-by-anil-kumar-d60361115.html">environment-and-ecology-by-anil-kumar-d60361115.html</a>
2	<a href="http://nammakpsc.com/wp/wp-content/uploads/2015/08/12.pdf">http://nammakpsc.com/wp/wp-content/uploads/2015/08/12.pdf</a>
3	<a href="http://ndl.iitkgp.ac.in/document/Qm92bWdMVkJ2U1J3RjNWSDhFMWkwaGplSi9ObFJpd2VZQytMbkjZGZ3RT0">http://ndl.iitkgp.ac.in/document/Qm92bWdMVkJ2U1J3RjNWSDhFMWkwaGplSi9ObFJpd2VZQytMbkjZGZ3RT0</a>
4	<a href="https://www.journals.elsevier.com/international-journal-of-disaster-risk-reduction">https://www.journals.elsevier.com/international-journal-of-disaster-risk-reduction</a>
5	<a href="https://www.omicsonline.org/environmental-journals.php">https://www.omicsonline.org/environmental-journals.php</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.edx.org/course/natural-disasters">https://www.edx.org/course/natural-disasters</a>
2	<a href="https://swayam.gov.in/">https://swayam.gov.in/</a>
3	<a href="https://www.coursera.org/">https://www.coursera.org/</a>
4	<a href="https://nptel.ac.in/">https://nptel.ac.in/</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	403	E-Business Management	
Type	Credits	Evaluation	Marks
Core	2	CES	IE = 100

### Course Objectives:

Subject / Course Objectives :		
<ol style="list-style-type: none"> <li>1. Understand the E-Commerce and E- business infrastructure and trends</li> <li>2. Analyze different types of portal technologies and deployment methodologies commonly used in the industry.</li> <li>3. Analyze the effectiveness of network computing and cloud computing policies in a multi-location organization.</li> <li>4. Analyze real business cases regarding their e-business strategies and transformation processes and choices.</li> <li>5. Integrate theoretical frameworks with business strategies.</li> </ol>		
Learning Outcomes :		
<ol style="list-style-type: none"> <li>1. After completion of this course, students will be able to understand the basic concepts and technologies used in the field of management information systems.</li> <li>2. Understand the processes of developing and implementing information Systems. Be aware of the ethical, social, and security issues of information systems.</li> <li>3. Understand the role of information systems in organizations, the strategic management processes, and the implications for the management.</li> <li>4. Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.</li> </ol>		
Units	Syllabus – E-Business Management	Hrs.
Unit No : 1	<b>Introduction to E-Business and E-Commerce:</b> - Define the e-Commerce and e-Business, Define e-Commerce Types of EC transactions. Define e-Business Models. Internet Marketing and e-Tailing. Elements of e-Business Models. Explain the benefits and limitations of e-Commerce.	10
Unit No : 2	<b>E-Marketplaces:</b> Structures, Mechanisms, Economics, & impacts:- Define e-Marketplace and Describe their Functions. Explain e-Marketplace types and their features. Describe the various types of auctions and list their characteristics. Discuss the benefits, limitations and	10

	impacts of auctions. E-Commerce in the wireless environment. Competition in the DE and impact on industry	
Unit No : 3	<b>E-Business applications, E-Procurement and E- Payment Systems:-</b> Integration and e-Business suits. ERP, e-SCM, CRM, E-Payment. E-Procurement definition, processes, methods and benefits. Discuss the categories and users of smart cards. Describe payment methods in B2B EC	10
Unit No : 4	<b>The Impact of E-Business on Different Fields and Industries:-</b> E-Tourism · Employment and Job Market Online Real Estate. Online Publishing and e-Books. Banking and Personal Finance Online. On-Demand Delivery Systems and E-Grocers. Online Delivery of Digital Products.	10
Unit No : 5	<b>E-Learning and Online Education:-</b> Define electronic learning. Discuss the benefits and drawbacks of e-Learning. The e-Learning Industry. Discuss e-Content development and tools. Describe the major technologies used in e-Learning. Discuss the different approaches for e-Learning delivery. How e-Learning can be evaluated. <b>E-Government:-</b> Definition of e-Governments · Implementation. E-Government Services. Challenges and Opportunities. E-Government Benefits, Case Study	10
Unit No : 6	<b>Launching Online Business and E-Commerce Projects:-</b> Understand the requirements for starting an online business from different perspectives. Describe the funding options available to startup businesses. Understand the processes associated with managing Web site development. Know the techniques of search engine optimization. Evaluate Web sites on design criteria.	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

<b>Reference Books</b> (Publisher)	Name of the Author	Title of the Book	Year Addition	Publisher Company
1 – National	Ravi Kalakota,	Frontiers of e-commerce		Pearson.
2 – National	Elias. M. Awad,	Electronic Commerce		Prentice-Hall of India Pvt Ltd.
3 – International	Horton and Horton,	e-Learning Tools and Technologies		Wiley Publishing
4 –	Dave	Electronic	2006	Prentice Hall

International	Chaffey	Business and Electronic Commerce Management		
5 – International	Turban, E. et al.,	Electronic Commerce: A Managerial Perspective	2008	Prentice Hall

### Online Resources:

Online Resources No	Web site address
1	<a href="https://en.wikipedia.org/wiki/Project_Management_Institute">https://en.wikipedia.org/wiki/Project_Management_Institute</a>
2	<a href="https://www.projectengineer.net/the-10-pmbok-knowledge-areas/">https://www.projectengineer.net/the-10-pmbok-knowledge-areas/</a>
3	<a href="https://en.wikipedia.org/wiki/Project_management">https://en.wikipedia.org/wiki/Project_management</a>
4	<a href="https://pmstudycircle.com/2012/03/stakeholders-inproject-management-definition-and-types/">https://pmstudycircle.com/2012/03/stakeholders-inproject-management-definition-and-types/</a>
5	<p><a href="https://www.webcreate.io/ecommerce-website-buildercomparison/?edgetrackerid=100253676826902&amp;utm_medium=cpc&amp;utm_campaign=eCommerce&amp;utm_source=google&amp;utm_term=searchpareto&amp;utm_content=text&amp;gclid=EAIaIQobChMIwffjmNX63AIVz73tCh0qGw8LEAMYAyAAEgI_aPD_BwE">https://www.webcreate.io/ecommerce-website-buildercomparison/?edgetrackerid=100253676826902&amp;utm_medium=cpc&amp;utm_campaign=eCommerce&amp;utm_source=google&amp;utm_term=searchpareto&amp;utm_content=text&amp;gclid=EAIaIQobChMIwffjmNX63AIVz73tCh0qGw8LEAMYAyAAEgI_aPD_BwE</a></p> <p>2. <a href="https://builtwith.com/ecommerce">https://builtwith.com/ecommerce</a></p> <p>3. <a href="https://www.shopify.com/blog/11863377-30-beautiful-and-creative-ecommercewebsite-designs">https://www.shopify.com/blog/11863377-30-beautiful-and-creative-ecommercewebsite-designs</a></p> <p>4. <a href="https://www.awwwards.com/websites/e-commerce/">https://www.awwwards.com/websites/e-commerce/</a></p> <p>5. <a href="https://ecommerce-platforms.com/articles/ecommerce-store-design">https://ecommerce-platforms.com/articles/ecommerce-store-design</a></p>

**MOOCs:**

Resources No	Web site address
1	Please refer these websites for MOOCS: NPTEL / Swayam
2	<a href="http://www.edx.com">www.edx.com</a>
3	<a href="http://www.coursera.com">www.coursera.com</a>

# **MBA SEM IV**

## **Open Courses**



<b>Programme: MBA (Gen) CBCS 2020 – w.e.f. - Year 2020 – 2021</b>			
<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	
IV	404	<i>Introduction to Data Science</i>	
<b>Type</b>	<b>Credits</b>	<b>Evaluation</b>	<b>Marks</b>
Open	2	CES	IE: 100

Course Objectives :
1. Understanding the Role of Data Science in business.
2. Understanding the basic concept of data management and data mining techniques
3. To understand the basic concept of machine learning
4. To understand the application of business analysis.
Learning Outcomes:
Upon the successful completion of this course, the student will be able to:
CO1. Understand the basics of business analysis and Data Science Knowledge (K2)
CO2. Understand data management and handling and Data Science Project Life Cycle
CO3. Understand the data mining concept and its techniques Applying (K4)

Unit	Contents	Sessions
1	Introduction: What is Data Science? Historical Overview of data analysis, Data Scientist vs. Data Engineer vs. Business Analyst, Career in , What is data science, Why Data Science, Applications for data science, Data Scientists Roles and Responsibility	06
2	Data: Data Collection, Data Management, Big Data Management, Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data.	08
3	Data Classification Data Science Project Life Cycle: Business Requirement, Data Acquisition, Data Preparation, Hypothesis and Modeling, Evaluation and Interpretation, Deployment.	06
4	Introduction to Data Mining, The origins of Data Mining, Data Mining Tasks, OLAP and Multidimensional data analysis, Basic concept of Association	08
5	Introduction to Machine Learning: History and Evolution, AI Evolution, Statistics Vs Data Mining Vs, Data Analytics Vs, Data Science, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Frameworks for building Machine Learning Systems.	06

6	Application of Business Analysis: Retail Analytics, Marketing Analytics, Financial Analytics, Healthcare Analytics, Supply Chain Analytics.	08
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**Reference Books:**

Sr.No.	Name of the Author	Title of the Book	Year Edition	Publisher
1 – National	Bhimasankaram Pochiraju, SridharSeshadri,	Essentials of Business Analytics: An Introduction to the methodology and		Springer
2 – National	Andreas C. Müller, Sarah Guido, O'Reilly	Introduction to Machine Learning with Python: A	1st Edition,	
3 – National	Laura Igual Santi Seguí,	Introduction to Data Science		Springer
4 – International	Pang-Ning Tan, Michael Steinbach, Vipin Kumar,	Introduction to Data Mining,		Pearson Education
5 – International	Ger Koole, Lulu.com,	An Introduction to Business Analytics	2019	

**Online Resources:**

Online	Web site address
1	
2	

**MOOC:**

Resources No	Web site address
1	www.alison.com
2	Swayam

Course : MBA (G/HR) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	405	Artificial Intelligence For Managers	
Type	Credits	Evaluation	Marks
Core	2	CES	IE = 100

### Course Objectives:

Subject / Course Objectives:		
<ul style="list-style-type: none"> <li>i. the fundamental technical terms and concepts around machine learning necessary to apply these methods to building artificial intelligence systems for business.</li> <li>ii. Identify and describe problems that are amenable to solution by AI methods.</li> <li>iii. Understand key terms and components involved in machine learning approaches</li> <li>iv. TO understand the use of AI in business</li> </ul>		
Learning Outcomes:		
<ul style="list-style-type: none"> <li>I) Understand various AI concepts</li> <li>II) Solve the problems using neural networks techniques</li> </ul>		
Units	Syllabus – Artificial Intelligence For Managers	Hrs.
Unit No: 1	Artificial Intelligence: Role of AI in engineering, AI in daily life, Intelligence and Artificial Intelligence, Different task domains of AI, Programming methods, Limitations of AI Intelligent Agent: Agent, Performance Evaluation, task environment of agent, Agent classification, Agent architecture Components of AI, History of AI, Salient Points, Knowledge and Knowledge Based Systems, AI in Future, Applications. [Reference 1]	5
Unit No: 2	Problems, problem spaces and search: Define the problem as a state space search, Production systems, Problem characteristics, Production system characteristic, Issues in design of search Program Search Techniques: DFS, BFS, Hill Climbing	6
Unit No: 3	Knowledge Representation: Need to represent knowledge, Knowledge representation with mapping scheme, Properties of good knowledge-based system, Knowledge representation issues, AND-OR graph, Types of knowledge	5
Unit No: 4	<b>Knowledge-Based Systems:</b> Structure of an Expert System, Expert Systems in different Areas, Expert System Shells, Comparison of Expert Systems, Comparative View, Ingredients of Knowledge-Based Systems, Web-based Expert Systems. [Reference 1]	9

Unit No: 5	Natural Language Processing- need of NLP, natural Language understanding, Basic NLP techniques, Natural language generation, Applications of NLP [Reference 3]	6
Unit No: 6	AI for Management an overview, what is the value of firms in AI world, Evolving role of general managers in the age of AI, role managers in new economy, AI and leadership development of the future, AI and marketing science and sustainable profit growth, how human- computer super minds develop business strategies. [ Reference 6]	5

Student has to upgrade Knowledge by using below inputs:

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 –National	R. B. Mishra	Artificial Intelligence		IEEE PHI
2 – National	Deepak Khemani	First Course in Artificial Intelligence	2013	Mc graw Hill Publication
3 – National	Anandita Das Bhattacharjee	Artificial Intelligence & Soft Computing for Beginners		SPD Shroff Publication
4 – International	S.Russel, P.Norvig	Artificial Intelligence: A Modern Approach	2002	Pearson Education
5 – International	E.Rich and K.Knight	Artificial Intelligence	2002	TMH
6 – International	Jordi Canals Franz Heukamp	The Future of Management in an AI World: Redefining Purpose and Strategy in the Fourth Industrial Revolution		IESE Business Collection

### Online Resources:

Online Resources No	Web site address
1	<a href="https://www.sas.com/en_in/insights/analytics/what-is-artificial-intelligence.html">https://www.sas.com/en_in/insights/analytics/what-is-artificial-intelligence.html</a>
2	<a href="https://www.newgenapps.com/blog/why-business-development-needs-artificial-intelligence/">https://www.newgenapps.com/blog/why-business-development-needs-artificial-intelligence/</a>

**MOOCs:**

Resources No	Web site address
1	<a href="https://nptel.ac.in/courses/106/106/106106126/">https://nptel.ac.in/courses/106/106/106106126/</a>
2	<a href="https://www.coursera.org/learn/business-implications-ai">https://www.coursera.org/learn/business-implications-ai</a>
3	<a href="https://www.edx.org/course/ai-for-leaders">https://www.edx.org/course/ai-for-leaders</a>
4	<a href="https://www.udacity.com/course/ai-for-business-leaders--nd054">https://www.udacity.com/course/ai-for-business-leaders--nd054</a>

<b>Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021</b>			
Semester	Course Code	Course Title	
<b>IV</b>	<b>406</b>	<b>Rural Entrepreneurship</b>	
Type	Credits	Evaluation	Marks
<b>OPEN</b>	<b>2</b>	<b>CES</b>	<b>IE = 100</b>
<b>Course Objectives:</b>			
i) To give an overview of the concept of entrepreneurs and entrepreneurship ii) To acquaint the students with the concept of Rural Industrialization iii) To develop an entrepreneurial mindset to generate a sustainable livelihood in rural area. iv) To help students understand the problems of Marketing of Rural Industries. v) To examine the performance of various government schemes, programs and institutional support in fostering rural entrepreneurship			
<b>Learning Outcomes :</b>			
i) Develop understanding about Entrepreneurship in Rural Context ii) Develop entrepreneurial skills in the rural youth iii) Explore and identify rural potential for a business idea iv) Address the challenges identified with rural entrepreneurship v) Engage in the management of the rural entrepreneurship			

<b>Units</b>	<b>Syllabus: Rural Entrepreneurship</b>	<b>Hours</b>
<b>1</b>	<b>Concept of Entrepreneurship:</b> <ul style="list-style-type: none"> <li>• Concept, definition, need and role of entrepreneurship.</li> <li>• Types and functions of entrepreneurs, role and importance of entrepreneurs in rural development.</li> <li>• Women Entrepreneurship Development</li> <li>• Indian entrepreneurial cultural.</li> </ul>	<b>5</b>
<b>2</b>	<b>Rural Development:</b> <ul style="list-style-type: none"> <li>• Meaning, definition and concept of Rural Development</li> <li>• Features of rural economy</li> <li>• Role of rural industrialization in uplifting village and national economy.</li> <li>• Causes of rural backwardness</li> <li>• Socio-cultural barriers in rural development and rural entrepreneurship</li> </ul>	<b>5</b>
<b>3</b>	<b>Venturing In Rural Entrepreneurship:</b> <ul style="list-style-type: none"> <li>• Concept of Rural Entrepreneur.</li> <li>• Problems and prospects of rural entrepreneur.</li> <li>• Product selection process, screening and evaluation of ideas, developing a Business Plan</li> <li>• Marketing Strategy And Information System for rural</li> </ul>	<b>5</b>

	industries	
4	Organizations: Khadi and Village Industries Commission (KVIC) National Small scale Industries Corporation (NSIC) District Industries Centre (DIC) Small Industry Development Corporation (SIDCO) Small Industries Service Institutes (SISI) Consultancy Organizations, Financial Organizations	5
5	Government Policy and Programmes for Entrepreneurship Development in Rural India: Types of micro finance and insurance schemes operative in India. Government Schemes for rural development: Trysem, IRDP, ACID (Agriculture credit intensive development scheme),DRI (Differential rate of Interest scheme of banks, Insurance schemes.	5
6	Globalization and Rural Industrial Promotion: Imports and Exports - Strategies - Policies Implications Visit to any Entrepreneurial supportive organization. Case Studies in Rural Entrepreneurship.	

#### Reference Books:

Sr. No.	Name of the Author	Title of the Book	Year Edition	Publisher Company
1.National	A.K. Sood	Evaluation of rural entrepreneurship development programs in Himachal Pradesh, Evaluation study series, no. 4	2009	NABARD HP regional office, Shimla.
2. National	N.Lalitha	Rural Development in India: Emerging Issues and Trends	2004	Dominant Publishers , Delhi,
3.National	Veerashakarappa	Institutional Finance for Rural Development,	1997	Rawat Publications, Jaipur and New Delhi
4.National	Laxmi Devi	Encyclopedia of rural Development	1996	Anmol Publications Pvt. Ltd. New Delhi.
5.National	Katar Singh	Rural Development, principles, polices and Management,	1986	Sage Publication, New Delhi.
6.International	David Holt	Entrepreneurship :New	1998	Prentice Hall

		Venture Creation		India.
7.International	Konecnik Ruzzier, Maja, Hisrich, Robert D.	Marketing for Entrepreneurs and SMEs: A Global Perspective	2013	Edward Elgar Publishing Limited
8.International	Alsos, GA, S. Carter, E. Ljunggren, and F. Welter (Ed.).	The Handbook of Research on Entrepreneurship in Agriculture & Rural Development.	2011	Edward Elgar Publishing Limited
<b>Journals:</b>				
1	R. Ahmad, Wan F. W. Yusoff, H. M. Noor, A. K. Ramin	Preliminary study on Rural entrepreneurship development program in Malaysia”	2012	Journal of Global Entrepreneurship, vol. 2(1), pp. 23-26
2	J.S. Saini J. S., Bhatia B. S	Impact of Entrepreneurship Development Programs	1996	journal of Entrepreneurship, vol. 5(1), pp. 65-80
3	Anand Bansal	“How is entrepreneurship good for economic development?”	2012	The IUP journal of entrepreneurship development, vol. 9(2), June 2012, pp. 7-22

#### Online Resources:

Resource No	Website Address
1	<a href="https://journal-jger.springeropen.com/articles/10.1186/s40497-019-0162-6">https://journal-jger.springeropen.com/articles/10.1186/s40497-019-0162-6</a>
2	<a href="https://journals.sagepub.com/home/irm">https://journals.sagepub.com/home/irm</a>
3	<a href="https://rrjournals.com/conference-proceeding/rural-entrepreneurship-in-terms-of-rural-entrepreneurial-motivations/">https://rrjournals.com/conference-proceeding/rural-entrepreneurship-in-terms-of-rural-entrepreneurial-motivations/</a>
4	<a href="https://www.sciencedirect.com/science/article/abs/pii/S0743016718304509">https://www.sciencedirect.com/science/article/abs/pii/S0743016718304509</a>
5	<a href="https://www.intechopen.com/books/entrepreneurship-trends-and-challenges/the-digitalisation-of-rural-entrepreneurship">https://www.intechopen.com/books/entrepreneurship-trends-and-challenges/the-digitalisation-of-rural-entrepreneurship</a>

#### MOOCs

Resources Name	Website Address
IIM ,Bangalore	<a href="https://www.edx.org/learn/agribusiness">https://www.edx.org/learn/agribusiness</a>



University of Florida	<a href="http://www.coursera.org">www.coursera.org</a>
University of London	<a href="http://www.cefims.as.uk">www.cefims.as.uk</a>
Alison	<a href="https://alison.com/">https://alison.com/</a>
Khan Academy - free online courses and lessons	<a href="https://www.khanacademy.org/">https://www.khanacademy.org/</a>
Swayam	<a href="http://swayam.gov.in">swayam.gov.in</a>

# **MBA SEM IV**

## **SPECIALIZATION ELECTIVES**

**Elective - Marketing Management: Course - Sales & Distribution Management & B2B**

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	MK03	Sales and Distribution Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

**Course Objectives:**

Subject / Course Objectives:		
<ul style="list-style-type: none"> <li>i) To understand the Importance of Sales Management.</li> <li>ii) To know the Emerging Trends in Sales Management.</li> <li>iii) To learn the Sales Planning and Budgeting.</li> <li>iv) To know Sales Territories and Quotas.</li> <li>v) To study Controlling of Salesforce Performance.</li> <li>vi) To learn Logistics and Supply Chain Management.</li> </ul>		
Learning Outcomes:		
<ul style="list-style-type: none"> <li>I) To know the Role and Skills of Modern Sales Managers.</li> <li>II) To set Sales Objectives and design the Sales Strategies.</li> <li>III) To learn the various Methods of Sales Forecasting.</li> <li>IV) To know the procedure of preparing Sales Budget.</li> <li>V) To learn the process for designing Sales Territories.</li> <li>VI) To learn the methods of setting Sales Quota.</li> </ul>		
Units	Syllabus – Sales & Distribution Management & B2B	Hrs.
Unit No: 1	<b>Introduction to Sales Management:</b> Nature and Importance of Sales Management, Role and Skills of Modern Sales Managers, Personal Selling Objectives, Sales Process/ Personal Selling Process, Sales/ Personal Selling Strategies, Emerging Trends in Sales Management.	5
Unit No: 2	<b>Sales Planning and Budgeting:</b> Sales Planning Process, Developing Sales Forecast, Types of Sales Forecasts. Sales Forecasting Methods, Sales Budget, Purpose of Sales Budget, Methods used for Deciding Sales Expenditure Budget, Sales Budgeting Process.	6
Unit No: 3	<b>Sales Territories and Quotas:</b> Reasons for Setting or Reviewing Sales Territories, Procedure for Designing Sales Territories, Use of IT in Sales Territory Management, Territorial Coverage, Sales Quotas or Sales Targets, Objectives of Sales Quotas, Types of Sales Quotas, Methods for Setting Sales Quotas.	6

Unit No: 4	<b>Sales Organization and Salesforce:</b> Sales Organization and its types, Specialization in Sales Organization, Staffing the Salesforce, Sales Training Process, Compensating the Salesforce, Motivating and Leading the Salesforce, Evaluating and Controlling the Performance of the Salesforce, Sales Analysis and Sales Audit, Ethical and Social Responsibilities of Sales Personnel.	6
Unit No: 5	<b>Distribution Management:</b> Need for Distribution Channels, Different Types of Distribution Channels, Factors influencing the Channel selection. Channel Conflict, Ways of Managing the Channel Conflict. <b>Retailing:</b> Meaning of Retailing, Retailer as a Salesman, Types of Retailers, Role of Retailer, Retailing in Rural India, E-Retailing. <b>Wholesaling:</b> Meaning of Wholesaler, Functions of Wholesalers, Types of Wholesalers, Key Tasks of Wholesalers.	9
Unit No: 6	<b>Logistics and Supply Chain Management:</b> Meaning of Logistics, Activities of Logistics, Meaning of Supply Chain Management, Factors influencing the Supply Chain, Difference between Logistics and Supply Chain Management.	4

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	K. Shridhar Bhat	Sales and Distribution Management	1 <sup>st</sup> Edition 2017	Himalaya Publishing House.
2 – National	Dr. S.L.Gupta	Sales and Distribution Management Text & Cases An Indian Perspective	3 <sup>rd</sup> Edition 2018	Trinity Press
3 – National	Satish S. Uplaonkar	Sales and Distribution Management	1 <sup>st</sup> Edition 2019	Book Enclave.
4 – International	Tapan K. Panda & Sunil Sahadev	Sales and Distribution Management	2 <sup>nd</sup> Edition 2012	Oxford University Press.
5 – International	Krishna Havaladar & Vasant Cavale	Sales and Distribution Management Text & Cases	3 <sup>rd</sup> Edition 2017	McGraw Hill Education
6 – International	Richard Still, Edward Cundiff, Norman Govoni &	Sales and Distribution Management	6 <sup>th</sup> Edition 2017	Pearson.

	Sandeep Puri			
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### Online Resources:

Online Resources No.	Web site address
1	<a href="http://www.marketing91.com">www.marketing91.com</a> › <a href="#">sales-management</a>
2	<a href="http://www.researchgate.net">www.researchgate.net</a> › <a href="#">journal</a> › <a href="#">0885-3134 Journal</a>
3	<a href="http://www.iaset.us">www.iaset.us</a> › <a href="#">index.php</a> › <a href="#">international-journal-of-sal.</a>
4	<a href="https://academic-accelerator.com/Impact-factor-if">https://academic-accelerator.com/Impact-factor-if</a> › <a href="#">Journal</a>
5	<a href="http://www.tandfonline.com">www.tandfonline.com</a> › <a href="#">loi</a> › <a href="#">rps20</a>

### MOOCs:

Resources No.	Web site address
1	<a href="http://www.mooc-list.com">www.mooc-list.com</a> › <a href="#">tags</a> › <a href="#">sales-management</a>
2	<a href="https://alison.com">https://alison.com</a> › <a href="#">Business</a> › <a href="#">Sales Courses</a>
3	<a href="https://alison.com/course/diploma-in-sales-management">https://alison.com/course/diploma-in-sales-management</a>
4	<a href="https://alison.com/course/introduction-to-sales-management">https://alison.com/course/introduction-to-sales-management</a>
5	<a href="http://www.edx.org">www.edx.org</a> › <a href="#">learn</a> › <a href="#">sales</a>

<b>Course: MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021</b>			
<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	
IV	MK04	Integrated Marketing Communications	
<b>Type</b>	<b>Credits</b>	<b>Evaluation</b>	<b>Marks</b>
Core Elective	3	CES	UE:IE =50:50

### Course Objectives:

Subject / Course Objectives:		
<ul style="list-style-type: none"> <li>i) To provide an in-depth understanding of integrated marketing communications concepts</li> <li>ii) To understand the importance of integrated marketing communication strategies in the contemporary market</li> </ul>		
Learning Outcomes:		
After studying this course the learner would be able to		
<ul style="list-style-type: none"> <li>i) Apply the key terms, definitions, and concepts used in integrated marketing communications.</li> <li>ii) Choose a marketing communications mix to achieve the communications and behavioural objectives of the IMC campaign.</li> <li>iii) Structure an integrated marketing communications campaign based on the application of marketing concepts, principles, and practices within an organization.</li> <li>iv) Measure and critically evaluate the communications effects and results of an IMC campaign to determine its success.</li> </ul>		
Units	Syllabus – Integrated Marketing Communications	Hrs.
Unit No: 1	Introduction to Integrated Marketing Communications (IMC): Concept, Components of Integrated Marketing Communications (IMC) - Above the Line (ATL), Below the line (BTL) and Through The line (TTL) promotion - Push and Pull strategy	08
Unit No: 2	Advertising- Meaning, Functions & Types of Advertising- Commercial	11

	advertising, corporate advertising, surrogate advertising, social advertising, Ad appeals – rational, emotional – positive emotional, negative emotional appeal, humor, musical etc. Objections on Advertising. ASCII guidelines for the advertisers and celebrity endorsers	
Unit No: 3	Media mix: Types of media- Print, broadcast – Television and Radio, Outdoor, Transit, Social Media- Facebook , Instagram, Twitter etc. Media mix planning and scheduling	08
Unit No: 4	Sales Promotion- Objectives of sales promotion, Trade promotion - Consumer promotion- coupons, Premiums, contests, Sweepstakes, refund and Rebate, Sampling	04
Unit No: 5	Public relation(PR), Types of PR- Publicity -Corporate Reputation, image building, crisis management, Event Sponsorship, word of mouth (WOM) Marketing, Direct Marketing	07
Unit No: 6	Integrated Marketing Communications (IMC) Promotional Tools: Product placement and Branding in films, Product placement on television, Film Based Merchandising, Sponsorships for Reality Shows & TV serials, Ambush marketing	07

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Chunawalla & Sethia	Foundations of Advertising	2008	Himalaya Publications
2 – National	George E. Belch, Michael A. Belch and Keyur Purani	Advertising and Promotions	2013 9 <sup>th</sup> Edition	McGraw Hill Education (India)
4 – International	Lawrence Ang	Principles of Integrated Marketing Communications	2014	Cambridge University Press

#### Online Resources:

Online Resources No.	Web site address
1	<a href="https://onlinelibrary.wiley.com/journal/14791838">https://onlinelibrary.wiley.com/journal/14791838</a>
2	<a href="https://www.tandfonline.com/doi/ful">https://www.tandfonline.com/doi/ful</a>
3	<a href="http://www.mheducation.com/hoghered/category.10366">www.mheducation.com/hoghered/category.10366</a>

**MOOCs:**

Resources No.	Web site address
1	<a href="http://www.Swayam.org">www. Swayam.org</a>
2	<a href="http://www.Coursera.com">www. Coursera.com</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	FM03	Corporate Finance	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ol style="list-style-type: none"> <li>I. To orient the students regarding application of Corporate Finance</li> <li>II. To orient the students to understand basic concepts of Financial Planning and Liquidity Management</li> <li>III. To orient the students to understand the concept of Corporate Restructuring &amp; forms of Business combination</li> <li>IV. To orient the concept of International Business Combination Forms and structure.</li> </ol>		
Learning Outcomes :		
<ol style="list-style-type: none"> <li>I. To acquire the concept of Corporate Finance and Financial decision in terms of Planning and Liquidity Management</li> <li>II. To gain the knowledge of Business combination structure and various forms of corporate restructuring in Indian and International Context</li> <li>III. Students can able to apply common frameworks and tools related to mergers and acquisitions.</li> <li>IV. To acquire the knowledge of Restructuring decision while working for M&amp;A process in organization with the help on various interaction of Cases in the Indian and International contexts.</li> </ol>		
UNITS	Syllabus – Corporate Finance	Hrs.
1	<b>Corporate Finance</b> Meaning, Nature and Scope of Corporate Finance, Changing role of Corporate Finance in global economic environment, Corporate Governance.	5
2	<b>Financial Planning</b> Meaning, Objectives, Characteristics of sound Financial Planning , Steps /Process involved preparation of sound Financial Plan, Factors affecting financial planning,  <b>Capitalization:</b> Meaning, Over-Capitalization and Under capitalization-Meaning, Causes and Remedial Measures.	6

3	<p><b>Liquidity Management:</b> Inventory Control Management-inventory control system , Factors determining level of Inventory, Techniques of Inventory control.</p> <p><b>Receivable Management</b></p>	7
4	<p><b>Corporate Restructuring</b> Meaning , different forms , Motives and applications of corporate restructuring, forms of restructuring</p> <p><b>Joint venture</b> – sell off and spin off , divestitures, meaning of LBO, MBO, governance and mode of Purchased in LBO, Key motives behind MBO, Structure of MBO.</p> <p><b>Demerger-</b> Meaning of Demerger, Characteristics of demerger, Structure of Demerger, and Tax implication of demergers.</p>	12
5	<p><b>Mergers and Acquisition:</b> Meaning ,Types of Mergers, motives behind the M &amp; A, advantages and disadvantages of M &amp; A, Process of merger integration,</p> <p><b>Methods of financing mergers,</b> calculation and Significance of P/E Ratios and EPS Analysis , Market Capitalization, Analysis of Mergers &amp; Acquisitions.</p> <p>The Legal and Regulatory framework of Mergers and Acquisition Company Act 1956 &amp; 2013.</p> <p><b>Accounting for Mergers &amp; Acquisitions</b> Accounting methods for Mergers &amp; Acquisition - Purchase Method and Pooling of Interest Method, Tax aspects on Mergers and Acquisitions.</p> <p>Prominent Cases of Mergers and Acquisitions - examples of M &amp; A in the Indian and International contexts.</p>	12
6	<p><b>International M &amp; A</b> –Introduction of international M &amp; A activity, the opportunities and threats, role of M &amp; A in international trade growth.</p> <p>Impact of government policies and political and economic stability on international M&amp;A decisions, recommendation for effective cross-border M &amp; A.</p>	8

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	I.M. Pandey	Financial Management	2015	Vikas Publishing House Pvt Limited
2 – National	R.P. Rustagi, Galgotia	Financial Management - Theory, Concepts and Problems	January 2018	Taxmann's
3 – National	<u>Richard A. Brealey</u>	Principles of Corporate Finance	2007	Tata McGraw-Hill Education
4- National	Kamal Ghose Ray	Mergers, Acquisitions, Strategy and Integration	2010	Kindle Edition
5- National	Prasad Godbole	Mergers, Acquisitions and Corporate Restructuring	January 2013	Vikas Publication
6-International	A.P.Dash	Mergers & Acquisitions	Feb-2020	Dreamtech press-Wiley
7-International	William R Snow	Mergers & Acquisitions for Dummies –A willey brand	2008	John Willey&sons Inc

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://onlinelibrary.wiley.com/">https://onlinelibrary.wiley.com/</a> - Mergers and Acquisitions: A Step-by-Step Legal and Practical Guide, Second Edition

2	<a href="https://www.ebooks.com/Mergers, Acquisitions and Corporate Restructuring">https://www.ebooks.com/ Mergers, Acquisitions and Corporate Restructuring</a>
3	<a href="https://www.questia.com/library/economics-and-business/business/corporations/corporate-mergers-acquisitions">https://www.questia.com/library/economics-and- business/business/corporations/corporate-mergers-acquisitions</a>

### MOOCs:

Resources No	Web site address
1	<a href="http://ugcmoocs.inflibnet.ac.in">http://ugcmoocs.inflibnet.ac.in</a>
2	<a href="https://nptel.ac.in">https://nptel.ac.in</a>
3	<a href="https://swayam.gov.in">https://swayam.gov.in</a>
4	<a href="https://coursera">https://coursera.</a>

### Experts for framing Syllabus (Corporate and other University)

Sr.No	Name of the Experts & Designation	Contact No
1	Mr.Gaurav Kothawale Financial Analyst – BNY Mellon ,Pune	91+9225857077
2	Dr. Suyog Amrutrao Professor – Dr.Babasaheb Ambedkar Marthwada University ,Sub Campus (Osmanabad )	91+ 9766350127
3.	Dr.Nanda Bhattad (Director -Disha Acadamay –FCA)	91+8805127099

### Faculty from BVDU (Centers)

Sr.No	Name of the Experts & Designation
1	Dr.Sonali Dharmadhikar (Associate Professor-IMED,Pune)
2	Dr.Rodrigues (YMIM, Karad Centre)
3	Dr.Anuradha Yesgunde (IMED,Pune)
4.	Prof.CA. S.R.Hiremath (BVAKIMSS),Solapur

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	FM04	International Financial Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To understand the core concepts of International Finance and Domestic Finance.</li> <li>ii) To study the International Flow of Funds and International Monetary System.</li> <li>iii) To analyze the nature and functioning of foreign exchange markets, determination of exchange rates and study the techniques of Foreign Exchange Risk Management.</li> <li>iv) The course also aims to provide students with a thorough understanding of international investment, taxation and financing decisions.</li> <li>v) To gain the conceptual clarity of the theoretical aspects of international trade and finance.</li> <li>vi) To identify the processes, risks and instruments used in the financing of international trade.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i) Gain understanding of core concepts of International Finance and Domestic Finance.</li> <li>ii) Knowledge of International Flow of Funds and International Monetary System.</li> <li>iii) Analyze and understand the nature and functioning of foreign exchange markets and develop the ability to manage the foreign exchange risk.</li> <li>iv) Understanding of International Capital Budgeting and International Taxation.</li> <li>v) Knowledge of details of International Trade Settlement.</li> <li>vi) Familiarize with the mechanism of International Trade Finance.</li> </ul>		
Units	Syllabus – International Financial Management	Hrs.
Unit No : 1	<b>Introduction:</b> Overview, Scope and Objective of International Finance. Distinction between Domestic Finance and International Finance. Importance and Challenges of International Financial Management. Foreign Direct Investment: Concept, Cost and Benefits of Foreign Direct Investment, Concept of International Portfolio Management.	06
Unit No : 2	<b>International Flow of Funds and International Monetary System:</b> Concept, principles and components of Balance of Payments. International Monetary System: Evolution, Gold Standard, Bretton Woods System, The Flexible	07

	Exchange Rate regime, The Current Exchange Rate arrangement.	
Unit No : 3	<b>Foreign Exchange Market and Foreign Exchange Risk Management:</b> Functions and structure of Foreign Exchange Market. Major participants. Types of transactions. Foreign Exchange Exposure. Various tools and techniques of Foreign Exchange Risk Management. Foreign Exchange Rate Determination: An overview, Factors influencing Exchange Rates, Foreign Exchange Quotations, International Arbitrage, Interest Rates Parity, Purchasing Power Parity, Relationship between Inflation, Interest Rates and Exchange Rates.	11
Unit No : 4	<b>International Capital Budgeting and International Taxation:</b> Introduction of international capital budgeting, adjusted present value model, capital budgeting from parent firm's perspective and expecting the future expected exchange rate analysis. International tax system, double taxation, double taxation avoidance agreement (DTAA), tax havens and transfer pricing.	10
Unit No : 5	<b>International Trade Settlement:</b> Concept, objectives and importance of International Trade, Risks involved in International Trade, Factors influencing International Trade, Settlement methods of International Trade viz. Open Account, Advance Payment, Documentary Credit, Documentary Collection, Consignment Trading.	7
Unit No : 6	<b>International Trade Finance:</b> Pre shipment finance, Post shipment finance, Supplier's credit, Buyer's credit, Factoring, Forfeiting, Offshore banking documentary credit mechanism, Steps involved in Letter of Credit (L.C.) mechanism along with role played by the parties to L.C.	7

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	P.G.Apte.	International Financial Management	2014	Tata Mcgraw Hill
2 – National	Vyuptakesh Sharan	International Financial Management	2012	Prentice Hall of India Pvt Ltd
3 – National	MadhuVij	International Financial Management	2006	Excel Books
4 – International	Eiteman David, I. Stonehill Arthur, et al.	Multinational Business Finance	2017	Pearson

5 – International	Alan C. Shapiro	International Financial Management	2016	Wiley
6 – International	Cheol S. Eun, Bruce G. Resnick	International Financial Management	2017	Tata McGraw-Hill

### Online Resources:

Online Resources No	Web site address
1	<a href="https://www.investopedia.com/">https://www.investopedia.com/</a>
2	<a href="http://www.icmai.in">www.icmai.in</a>
3	<a href="https://www.yourarticlelibrary.com">https://www.yourarticlelibrary.com</a>
4	<a href="http://www.youtube.com">www.youtube.com</a>
5	<a href="https://www.freebookcentre.net/">https://www.freebookcentre.net/</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/learn/global-financial-markets-instruments">https://www.coursera.org/learn/global-financial-markets-instruments</a>
2	<a href="https://www.coursera.org/specializations/global-challenges-business">https://www.coursera.org/specializations/global-challenges-business</a>
3	<a href="https://nptel.ac.in/courses/110/105/110105057/">https://nptel.ac.in/courses/110/105/110105057/</a>
4	<a href="https://nptel.ac.in/courses/110/105/110105031/">https://nptel.ac.in/courses/110/105/110105031/</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	HR03	Compensation and benefits management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To understand the concept of compensation</li> <li>ii) To explain the components of labour cost.</li> <li>iii) To define executive compensation with various plans.</li> <li>iv) To discuss wage policies and concepts related to labour market</li> <li>v) To elaborate issues related to reward management and global compensation</li> <li>vi) To understand the rules for taxation and concept of tax friendly package.</li> </ul>		
Learning Outcomes : After completion of course, student will able to		
<ul style="list-style-type: none"> <li>i) Explain concepts related to compensation</li> <li>ii) Explain components of labour cost.</li> <li>iii) Contribute in designing executive compensation</li> <li>iv) Describe issues related to wage policies and labour market.</li> <li>v) Handle the issues related to reward management and global compensation</li> </ul> <p>Explain rules of taxation and design tax friendly package</p>		
Units	Syllabus – <i>Compensation and benefits management</i>	Hrs.
Unit No : 1	Introduction: Concept, scope and importance of Compensation and Benefits Management; Factors affecting Compensation and Benefits decisions; Roles and responsibilities of Compensation and Benefit Managers	8
Unit No : 2	Labour Cost: Components of Compensation package; Bonus: Method of Determining Bonus; Fringe Benefits: concept and types; Wage Incentives: Concept, different kinds of wage incentives plans and their application; Labour Turnover: causes, implications and costs.	8
Unit No : 3	Executive Compensation: Compensation and organization Structure; Aligning compensation to organization culture; Stock Options and Stock	7



	Purchase plans; Economic value added (EVA) as an alternative to Stock based compensation; Pay for performance; Competency based pay.	
Unit No : 4	Company Wage Policy: National Wage Policy: Objectives, Concepts; Labour Market: Concept, broad types; Wage Determination; Pay Grades, Economic Principles; External Equity: Wage Surveys.	8
Unit No : 5	Reward and Global Compensation - Total reward management process- Assessment, Design, Execution and Evaluation, Global compensation - strategies, Best practices in global compensation.	5
Unit No : 6	Taxation Aspect: Current rules of taxation of salaries; Exemption in income tax-and the rationale; Fringe benefit tax and its implication for the employers and employees; Taxation of stock options; Designing a tax friendly package. Note: Simple problems on Income Tax Calculation to be taught.	09

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
National	R.C.sharma, Sulabh Sharma	Compensation Management	2019	Sage Publishing	
National	A.P. Rao	Labour Cost Accounting and Compensation Management	2000	Everest Publishing House.	
National	B.D.Singh	Compensation & Reward Management	2007	Excel Books	
International	Michele Dennis and Thomas Roth	Effective executive compensation	2008	American management Association	

#### Online Resources:

Online Resources No	Web site address

1	<a href="https://www.iedunote.com/compensation-management">https://www.iedunote.com/compensation-management</a>
2	<a href="https://execcomp.org/Basics/Basic/What-Is-Executive-Compensation">https://execcomp.org/Basics/Basic/What-Is-Executive-Compensation</a>
3	<a href="https://theinvestorsbook.com/labour-turnover.html">https://theinvestorsbook.com/labour-turnover.html</a>
4	<a href="https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/totalrewardsstrategies.aspx">https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/totalrewardsstrategies.aspx</a>
5	<a href="https://www.worldatwork.org/workspan/articles/global-compensation-considerations">https://www.worldatwork.org/workspan/articles/global-compensation-considerations</a>
6	<a href="https://www.incometaxindia.gov.in/pages/tax-laws-rules.aspx">https://www.incometaxindia.gov.in/pages/tax-laws-rules.aspx</a>

### MOOCs:

Resources No	Web site address
1	<a href="https://www.coursera.org/learn/compensation-management">https://www.coursera.org/learn/compensation-management</a>
2	<a href="https://alison.com/courses/diploma-in-modern-human-resource-management/content/scorm/5730/module-6-compensation-and-benefits">https://alison.com/courses/diploma-in-modern-human-resource-management/content/scorm/5730/module-6-compensation-and-benefits</a>
3	<a href="https://www.classcentral.com/course/managing-employee-compensation-5510">https://www.classcentral.com/course/managing-employee-compensation-5510</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	HRO4	Competency Mapping and Performance Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

**Course Objectives:**

- To understand managerial competencies in changing business environment and the resultant challenges.
- To establish links between managerial competencies for effective work performance.
- To introduce the concept of performance management and its importance in organizations.
- To enable students, knowledge of managing performances for greater success.
- To provide information about the latest development and trends in the practices of performance management.

**Learning Outcomes :**

- Applied skills and knowledge that enable people to successfully perform in professional, educational, and other life contexts.
- Understand the different types of Performance Planning strategies and develop various development plans for the employees.
- Gain a practical understanding as how Performance Management plan is beneficial for the organization and also the employees.
- Recognize how Competency Mapping works and affects at different levels of the organizations.
- Appreciate the Performance Appraisal Process and gain knowledge for avoiding various rating errors.
- Identify job ready competencies and how to detect them in a probable candidate.
- Design and develop Competency Models for a particular job-role.

Units	Syllabus – Competency Mapping and Performance Management	Hrs.
Unit No : 1	<b>Concept of Competencies:</b> Meaning and significance of Managerial competencies for effective work performance, competency identification and its role in performance development, managerial competency in a dynamic business national and global workplace, environment, PJ Job fit Theory, PE fit Theory, Holland Theory.	10

Unit No : 2	<b>Competency Mapping for effective HRM Development: Concept of</b> Competency Mapping - and its scopes, significance of competency mapping for effective HRM, techniques for competency mapping, career planning, role of competency mapping in career planning and development.	10
Unit No : 3	<b>Introduction to Performance Management:</b> Definition and Importance of Performance Management, contribution of competency mapping in effective performance development. Linkage of Performance Management to Other HR Processes; Aims, Purposes and Principles of Performance Management.	08
Unit No : 4	<b>Performance Management Planning and Development:</b> Introduction: Performance Management Planning, the Planning Process, Performance Management Documentation, Manager's Responsibility in Performance Planning Mechanics and Documentation, Employee's Responsibility in Performance Planning Mechanics and Documentation, Creation of PM Document	12
Unit No : 5	<b>Competency Appraisal and Performance Management:</b> Need and benefits of effective appraisal system in Performance management. Traditional and Modern methods of Appraisal. Identifying training needs, develop suitable training programs for competency management.	12
Unit No : 6	<b>Management Competencies and Performance Development in Organizations:</b> Developing a model for competency mapping and management for effective HR development for a chosen firm. Ethics and Challenges in Performance Management.	08

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Radha Sharma	360 degree Feedback, Competency Mapping and Assessment Center			
2 – National					
3 – National					
4 – International	Spencer and Spencer	Competency at Work	-	Wiley Publication	
5 – International	<a href="#">David D. Dubois</a> , <a href="#">Deborah</a>	Competency –Based			

	<a href="#">Jo King Stern, Linda K. Kemp</a>	Human Resource Management			
6 – International	Michael Armstrong & Angela Baron	Performance Management		Jaico Publication	

### Online Resources:

Online Resources No	Web site address
1	<a href="mailto:aictefreecourses@gmail.com">aictefreecourses@gmail.com</a>
2	<a href="https://www.emerald.com/insight/content/doi/10.1108/09685220610648373/full/html?journalCode=i">https://www.emerald.com/insight/content/doi/10.1108/09685220610648373/full/html?journalCode=i</a>
3	<a href="https://bdigital.ufp.pt/handle/10284/357">https://bdigital.ufp.pt/handle/10284/357</a>

### MOOCs:

Resources No	Web site address
1	Coursera -Managing Employee Performance, <a href="http://www.coursera.org">www.coursera.org</a>
2	Alission- Performance Management and strategic planning

Course : MBA (Gen) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	IB03	International Marketing	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i. Apply the key terms, definitions, and concepts used in marketing with an international perspective.</li> <li>ii. Compare the value of developing global awareness vs. a local perspective in marketing.</li> <li>iii. Evaluate different cultural, political, and legal environments influencing international trade.</li> <li>iv. Distinguish the advantages and disadvantages Canadian products and services possess in international marketing in both emerging markets and mature markets.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i. Explain the impact of global and regional influences on products and services for consumers and businesses.</li> <li>ii. Apply basic internationally oriented marketing strategies (total product concept, pricing, place, and promotion).</li> <li>iii. Develop creative international market entry strategies.</li> <li>iv. Understand the importance of the Internet for global business.</li> <li>v. Explain the differences in negotiating with marketing partners from different countries and the implications for the marketing strategies (4Ps).</li> </ul>		
Units	<i>Syllabus: International Marketing</i>	
Unit No : 1	International Marketing- Concept, Importance, International Marketing Research and Information System,	
Unit No : 2	Market Analysis and Foreign Market Entry Strategies, Future of International Marketing, India's Presence in International Marketing	
Unit No : 3	Internationalization of Retailing and Evolution of International Retailing, Motives of International Retailing, International Retail Environment – Socio-Cultural, Economic, Political, Legal, Technological	
Unit No : 4	Selection of Retail Market, Study and Analysis of Retailing in Global Setting, Methods of International Retailing, Forms of Entry-Joint Ventures, Franchising, Acquisition	
Unit No : 5	Competing in Foreign Market, Multi-country competition and Global Competition, Competitive Advantages in Foreign Market, Cross Market subsidization, Retail Structure, Global Structure.	
Unit No :	Case Studies in International Retailing Management	

6		
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Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Swapana Pradhan- Retailing Management 2. Dravid Gilbert- Retail Marketing 3. George H, Lucas Jr., Robert P. Bush, Larry G Greshan- Retailing 4. A. J. Lamba- The Art of Retailing 5. Barry Berman, Joel R Evans- Retail Management; A Strategic Approach

<b>Reference Books (Publisher)</b>	<b>Name of the Author</b>	<b>Title of the Book</b>	<b>Year Edition</b>	<b>Publisher Company</b>	
1 – National	Swapana Pradhan-	- Retailing Management			
2 – National	A. J. Lamba-	The Art of Retailing			
4 – International	Dravid Gilbert	- Retail Marketing			
5 – International	. George H, Lucas Jr., Robert P. Bush, Larry G Greshan-	Retailing			
6 – International	Barry Berman, Joel R Evans- Retail Management	A Strategic Approach			

Course : MBA (Gen) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	IB04	Global Business Strategies	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) Knowledge: Basic and broad knowledge in international business environment, strategies and management. Ability to apply concepts, principles and theories to simple business situations.</li> <li>ii) Global Perspective: Awareness of the different thinking and viewpoints of diverse cultures.</li> <li>iii) Awareness of the global business environment and its impacts on businesses.</li> <li>iv) . Practical Application: Use of excel tools in real world scenarios.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i) Explain the concepts in international business with respect to foreign trade/international business</li> <li>ii) Apply the current business phenomenon and to evaluate the global business environment in terms of economic, social and legal aspects</li> <li>iii) Analyse the principle of international business and strategies adopted by firms to expand globally</li> <li>iv) . Integrate concept in international business concepts with functioning of global trade</li> </ul>		
Units : -	Syllabus – <i>Global Business Strategies</i>	
Unit No : 1	Export – Import – Strategies, Third Party Intermediaries, Cause of Ethical dilemma ‘Is demand always Export’ Technology impact on Export Strategy	
Unit No : 2	Global Manufacturing Strategies, Global Supply Chain Management, Ethical Dilemma –supplier relations approach that yields best result	
Unit No : 3	Control Strategies – Introduction, Planning, Organizational Structure, Location of Decision making, Control in process of Internationalization, Control Strategy Mechanisms Corporate Culture & Co-ordinating Methods, Control in special situations Acquisitions, Shared ownership	
Unit No : 4	Role of legal structure in Control Strategies – Control or No control Constant Balancing Act	
Unit No : 5	Collaborative Strategies – Motives for collaborative arrangements, Considerations in collaborative arrangements, Licensing/ Franchising / Contracts/ Joint Ventures/ Equity Alliances	



Unit No : 6	Problems of Collaborative Arrangements, Collaborative Importance, Differing Objectives, Control Problems, Cultural Difference, Compatible Partners, Steps to know how Innovation breeds collaboration	
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Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	T.K Das & Bing- Sheng Teng	A resource Based theory of Strategic Alliance		Journal of management 26, no.1 [2000:31- 61]	
2 – National	Jeffery Reur	Collaborative Strategy J		The logic of Alliances – Financial Times Oct- 4 1999- Page 12-13 3.	
3 – National	Chakrawarthy B and Permutter H (1995)	Strategic Planning for Global Business			
4 – International	M Porter (1990)	Competitive Advantage of Nation		)New York Free Press	
5 – International	Engelwood Cliffs,	. The Strategy Process		M J Prentice Hall	
6 – International		The Dynamics of International Strategy		Strategy London – International Thompson Press	

**Online Resources:**

Online	Web site address
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Resources No	
1	<a href="https://www.global-strategy.net/what-is-global-strategy/">https://www.global-strategy.net/what-is-global-strategy/</a>
2	<a href="https://www.researchgate.net/publication/322789850_International_Business_Strategy">https://www.researchgate.net/publication/322789850_International_Business_Strategy</a>

**MOOCs:**

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	PM03	Logistics & Supply Chain Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To gain the in depth knowledge, and importance of the subject of Supply Chain Management (SCM).</li> <li>ii) To acquire the working knowledge.</li> <li>iii) To understand the JIT and SCM concepts and applicability to industrial examples.</li> <li>iv) To know the concept of 5R in achieving Customer satisfaction/ delight.</li> </ul>		
Learning Outcomes : After completion of this course, students will		
<ul style="list-style-type: none"> <li>I) Develop a sound understanding of the important role of supply chain management in today's business environment.</li> <li>II) Become familiar with current supply chain management trends.</li> <li>III) learn logistics concepts and basic activities.</li> <li>IV) Know the types of transportation systems.</li> <li>V) Know the third, fourth party logistics.</li> </ul>		
Units	Syllabus – Logistics & Supply Chain Management	Hrs.
Unit No : 1	Introduction to Logistics and SCM: Meaning, objectives, importance of various terms and concepts of SCM in relation to competitive global business. EOQ models, Customer Relationship Management and Supply Chain	10
Unit No : 2	Planning and SCM: Planning Demand & Supply chain, types of distribution network, concept of 5R in achieving Customer satisfaction/ delight. Role of agent, Distributor, Ware house, Retailer, and various types of distribution level.	10
Unit No : 3	Materials Management and Logistics: Meaning of logistics in reference to materials management, broader sense including transport selection, long term contracts for information flow & material flow to reach the	10

	supply with 5R.Sourcing and pricing of logistics.	
Unit No : 4	Transportation Systems: Types of transportation systems & their merits/ demerits, , selection of suitable type, complexities in trans shipment, and exporting the goods, role of forwarding and clearing agents and documentation requirements	10
Unit No : 5	Integration of Logistics functions: Developments in outsourcing of Logistics-stores functions-bar coding, layout, material handling, and suitable equipments for it, overall integration of various functions of material management, stores, procurement, distribution network tuned to information flow from customers to get the effectiveness .	10
Unit No : 6	Current Trends in Logistics and SCM: Current developments/ practices-MRP, MRPII. 3PL,4PL, use of IT.	10

Student has to upgrade Knowledge by using below inputs:

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	Satish C. Ailawadi&Rakesh Singh	Logistics Management	2005	Prentice-Hall Of India Pvt. Limited
2 – National	D K Agrawal	Logistics and Supply Chain Management	2003	Macmillan Publishers India Limited,
3 – National	Janat Shah	Supply Chain Management-Text and Cases	2009	Pearson Education
4 – International	<u>Douglas Long</u>	International Logistics: Global Supply Chain Management	2003	<u>Springer US</u>
5 – International	Donald J. Bowersox& David J. Closs	Logistical Management	1996	McGraw-Hill Companies
6 – International	Donald Waters	Logistics- An Introduction to Supply Chain Management	2003	<u>Palgrave Macmillan</u>

**Online Resources:**

Online Resources No	Web site address
1	<a href="http://www.poms.org">www.poms.org</a>
2	<a href="http://www.searchmanufacturingerp.techtarget.com">www.searchmanufacturingerp.techtarget.com</a>
3	<a href="http://www.inderscience.com">www.inderscience.com</a>
4	<a href="http://www.logisticsmgmt.com">www.logisticsmgmt.com</a>
5	<a href="http://www.ionlogistics.eu">www.ionlogistics.eu</a>

**MOOCs:**

Resources No	Web site address
1	<a href="http://mooc.org">mooc.org</a>
2	<a href="http://www.Coursera.org">www.Coursera.org</a>
3	<a href="http://www.Udemy.com">www.Udemy.com</a>
4	<a href="http://Swayam.gov.in">Swayam.gov.in</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	PM04	World Class Manufacturing Practices	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) To gain in depth knowledge of World Class Manufacturing(WCM) systems in globally Leading Manufacturers.</li> <li>ii) To gain concept of Strategic Decisions for business, JIT, Total Employee involvement.</li> <li>iii) To get acquainted with the use of IT, ERP and MRP systems</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>I) Demonstrate the relevance and basics of World Class Manufacturing.</li> <li>II) Understand the concepts of Business excellence, competitiveness and customization of product for manufacturing.</li> <li>III) Implementation of new technology concepts of world class manufacturing, dynamics of material flow, and Lean manufacturing.</li> <li>IV) Understand recent trends in manufacturing to meet the current and future business challenges.</li> <li>V) Compare the existing industries with WCM industries.</li> </ul>		
Units	Syllabus – World Class Manufacturing Practices	Hrs.
Unit No : 1	<b>Introduction to World Class Manufacturing (WCM):</b> World Class manufacturing; Concept, Imperatives for success – Technology, systems approach and change in the mindset	10
Unit No : 2	<b>Planning for Manufacturing System:</b> Strategic decisions in manufacturing management; choice of technology; capacity; Layout; Aggregate Planning and Master production scheduling.	10
Unit No : 3	<b>Materials Planning:</b> Resources planning - Materials Requirement planning (MRP). Manufacturing Resources planning (MRP-II) Enterprise Resources Planning (ERP).	10
Unit No : 4	<b>Just in Time (JIT):</b> Just-In-Time (JIT) - Concept, Advantages, Techniques of JIT, JIT Layout, Kanban system, JIT Purchasing.	10
Unit No :	<b>World Class Manufacturing development Tools:</b> Total employee	10

5	Involvement and small group activities 5-S Concept, Total Productive Maintenance, Automation in design and manufacturing, Automated Material Handling equipment's, Product and Process Design Tools, Bar Code Systems.	
Unit No : 6	<b>Recent Trends in World Class Manufacturing:</b> Role of IT in World Class Manufacturing, Flexible Manufacturing Systems (FMS), Group Technology, Six Sigma.	10

Student has to upgrade Knowledge by using below inputs:

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – National	B S Sahay K B C Saxena, Ashish Kumar	WORLD-CLASS MANUFACTURING- A STRATEGIC PERSPECTIVE	2018	Infinity press
2 – National	L.C. Jhamb	Production Operations Management	2014	Everest publishing House
3 – National	S.A. Chunawalla, D.R. Patel	Production and Operations Management Systems	2018	Himalaya Publishing House
4 – International	Richard J.Schonberger,	World Class Manufacturing	1986	Schonberger & Associates
5 – International	Carlo Baroncelli&NoelaBallario (eds.)	WCOM (World Class Operations Management) : Why You Need More Than Lean	2016	Springer International Publishing
6 – International	Devistsiotis Kostas N,	Operations Management	1981	McGraw Hill

### Online Resources:

Online Resources No	Web site address

1	<a href="https://www.wcm.fcagroup.com/">https://www.wcm.fcagroup.com/</a>
2	<a href="http://www.iso.org">www.iso.org</a>

**MOOCs:**

Resources No	Web site address
1	<a href="http://www.coursera.org">www.coursera.org</a>
2	<a href="http://www.edx.org">www.edx.org</a>
3	<a href="http://www.openlearning.com">www.openlearning.com</a>
4	<a href="http://www.alison.com">www.alison.com</a>



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	IT03	RDBMS with Oracle	
Type	Credits	Evaluation	Marks
Core	3	CES	UE:IE = 50:50

**Course Objectives :**

- vii) To understand and learn how to work with an Oracle database.
- viii) To understand the Structured Query Language and be able to use it in conjunction with Oracle database.
- ix) To understand Procedural Language SQL (PL/SQL) and be able to use it in conjunction with an Oracle database.

**Learning Outcomes :**

At the end of this course, student should be able to:

- i) Simple Query using sample datasets
- ii) Complex queries using SQL.
- iii) Writing PL/SQL blocks

Units	Syllabus – RDBMS with Oracle	Hrs.
Unit No : 1	<b>Introduction to oracle RDBMS:</b> DBMS VS RDBMS, CODD's Rules, Introduction to Oracle: History, Features, Versions of oracle, introduction to oracle RDBMS, Tools of Oracle: SQL, SQL *Plus, SQL Form, SQL Reports.	04
Unit No : 2	<b>SQL and Components of SQL</b> Defining a database in SQL, Components of SQL: DDL, DML, DCL, DQL, SQL query Rules, Data types, Keywords, Delimiters, Literals. DDL Commands – Defining a database in SQL, Creating table, changing table definition, removing table. Truncating Table. DML Commands- Inserting, updating, deleting data, DQL Commands: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. Data Constraints: Primary key, Foreign Key, NOT NULL, UNIQUE, CHECK constraint	09

Unit No : 3	<b>Operators, Functions and Joins</b> Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN & NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect. Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join, Sub queries, Aggregate Functions , Numeric Functions, String Functions, Conversion functions, Date conversion functions, Date functions.	08
Unit No : 4	<b>Database Objects</b> Index: Creating index, simple index, composite index, unique index, dropping indexes, multiple indexes on table, using rowid to delete duplicate rows from a table, Sequence: Creating sequence, altering sequence, dropping sequence. Views: Defining, modifying, deleting views.	06
Unit No : 5	<b>Introduction to PL/SQL programming</b> Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement.	9
Unit No : 6	<b>Advanced Programming Techniques of PL/SQL</b> <b>Cursors:</b> Introduction, Types of Cursors: Implicit Cursor, Explicit Cursors, Parameterized cursors, Programs on cursors, <b>Triggers:</b> Introduction, Use of triggers, Types of Triggers, Creating triggers, Examples on Triggers	9

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	P.S.Deshpande	SQL for oracle 9i	3 <sup>rd</sup> Edition	Dreamtech Press	
2 –International	Ivan Bayross	PL/SQL The Programming Language of Oracle 3rd Revised Edition	3 <sup>rd</sup> Edition	BPB Publication	

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.w3schools.com/sql/">https://www.w3schools.com/sql/</a>
2	<a href="https://www.tutorialspoint.com/sql/index.htm">https://www.tutorialspoint.com/sql/index.htm</a>
3	<a href="https://www.javatpoint.com/sql-tutorial">https://www.javatpoint.com/sql-tutorial</a>

**MOOCs:**

Resources No	Web site address
1	<a href="https://www.coursera.org/learn/intro-sql">https://www.coursera.org/learn/intro-sql</a>
2	<a href="https://www.coursera.org/projects/introduction-to-relational-database-and-sql">https://www.coursera.org/projects/introduction-to-relational-database-and-sql</a>
3	<a href="https://www.coursera.org/projects/intermediate-rdb-sql">https://www.coursera.org/projects/intermediate-rdb-sql</a>

<b>Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021</b>			
<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>	
IV	IT04	<i>Enterprise Business Applications</i>	
<b>Type</b>	<b>Credits</b>	<b>Evaluation</b>	<b>Marks</b>
Core Elective	03	CES	UE:IE = 50:50

**Course Objectives:**

**Subject / Course Objectives: .**

1. To make student able to build an understanding of the fundamental concepts of ERP systems, their architecture, and working of different modules in ERP.
2. Students will also able to develop and design the modules used in ERP systems, and can customize the existing modules of ERP systems.
3. Identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship management .
4. Describe basic concepts of erp systems for manufacturing or service companies
5. To study and understand the ERP life cycle.
6. 6. To learn the different tools used in ERP.

**Learning Outcomes :**

1. Understand the basic concepts of ERP.
2. Identify different technologies used in ERP.
3. Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules.
4. Discuss the benefits of ERP
5. Understand and implement the ERP life cycle.

6. Apply different tools used in ERP.		
Units	Syllabus – <i>Enterprise Business Applications</i>	Hrs.
Unit No : 1	<b>Introduction (Enterprise Resource Planning)</b> : Evolution of ERP-MRP and MRP II. Introduction to ERP. Basic ERP concepts. Benefits of ERP.	10
Unit No : 2	<b>ERP and Related Technologies</b> : Business Intelligence, E-commerce & e-Business, Business Process Reengineering, Data Warehousing & Data Mining, On Line Analytical Processing(OLAP), Product Life cycle Management, Supply Chain Management, Customer Relationship Management	10
Unit No : 3	<b>ERP Implementation:</b> ERP Implementation Life Cycle, Pre-implementation tasks, Requirements Definition, Implementation Methodologies, Process Definition, Dealing with Employee Resistance, Training & Education, Data Migration, Project Implementation & Monitoring, Post Implementation Activities, Success & Failure Factors of an ERP Implementation.	10
Unit No : 4	<b>Business Modules of an ERP Package: Finance, Manufacturing (Production) , Human Resources, Plant Maintenance,</b>	10
Unit No : 5	<b>Materials Management, Quality Management, Marketing , Sales , Distribution and Service.</b>	10
Unit No : 6	ERP Market: (Company and Product Features) SAP AG, Oracle Corporation, PeopleSoft, JD Edwards, SSA Global, Lawson Software.  Enterprise Application Integration, ERP and Total Quality Management, Future Directions and Trends in ERP.	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Addition	Publisher Company	
1 – National	Alexis neon	ERP Demystified		Mcgrawhill	

2 – National	V.K. Garg &N.K. Venkita Krishnan 3.	ERP Ware: ERP Implementation Framework			
3 – National	V.K. Garg &N.K. Venkita Krishnan	ERP Concepts & Planning			
4 – International	P.T.Joseph,	E-Commerce A Managerial Perspective		Prentice Hall of India	
5 – International	Kalakota and Whinston	Frontiers of Electronic Commerce		Pearson Education	
6 – International	<a href="https://www.kvimis.co.in/sites/...co.../Gary%20P.Schneider%20Electronic%20Commerce.pdf">https://www.kvimis.co.in/sites/...co.../Gary%20P.Schneider%20Electronic%20Commerce.pdf</a>				

### Online Resources:

Online Resources No	Web site address
1	<a href="http://index-of.co.uk/IT/Wiley%20-%20Enterprise%20Resource%20Planning.pdf">http://index-of.co.uk/IT/Wiley%20-%20Enterprise%20Resource%20Planning.pdf</a>
2	<a href="https://mrcet.com/downloads/digital_notes/ME/III%20year/ERP%20Complete%20Digital%20notes.pdf">https://mrcet.com/downloads/digital_notes/ME/III%20year/ERP%20Complete%20Digital%20notes.pdf</a>
3	<a href="https://www.analyticom.de/docs/erp/Booklet_EN_ERP.pdf">https://www.analyticom.de/docs/erp/Booklet_EN_ERP.pdf</a>
4	<a href="http://sim.edu.in/wp-content/uploads/2018/11/B.Com-CA-II-Semester.pdf">http://sim.edu.in/wp-content/uploads/2018/11/B.Com-CA-II-Semester.pdf</a>

### MOOCs:

Resources No	Web site address
1	

	<a href="https://onlinecourses.swayam2.ac.in/cec20_mg25/preview">https://onlinecourses.swayam2.ac.in/cec20_mg25/preview</a>
2	<a href="https://www.coursera.org/courses?query=e-commerce">https://www.coursera.org/courses?query=e-commerce</a>
3	<a href="https://www.udemy.com/courses/business/e-commerce">https://www.udemy.com/courses/business/e-commerce</a>
4	<a href="https://www.edx.org/learn/ecommerce">https://www.edx.org/learn/ecommerce</a>
5	<a href="https://www.classcentral.com/subject/ecommerce">https://www.classcentral.com/subject/ecommerce</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	IB04	Global Business Strategies	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
v) Knowledge: Basic and broad knowledge in international business environment, strategies and management. Ability to apply concepts, principles and theories to simple business situations. vi) Global Perspective: Awareness of the different thinking and viewpoints of diverse cultures. vii) Awareness of the global business environment and its impacts on businesses. viii) . Practical Application: Use of excel tools in real world scenarios.		
Learning Outcomes :		
v) Explain the concepts in international business with respect to foreign trade/international business vi) Apply the current business phenomenon and to evaluate the global business environment in terms of economic, social and legal aspects vii) Analyse the principle of international business and strategies adopted by firms to expand globally viii) . Integrate concept in international business concepts with functioning of global trade		
Units	Syllabus – Global Business Strategies	Hrs.
Unit No : 1	Export – Import – Strategies, Third Party Intermediaries, Cause of Ethical dilemma ‘Is demand always Export’ Technology impact on Export Strategy	10
Unit No : 2	Global Manufacturing Strategies, Global Supply Chain Management, Ethical Dilemma –supplier relations approach that yields best result	10
Unit No : 3	Control Strategies – Introduction, Planning, Organizational Structure, Location of Decision making, Control in process of Internationalization, Control Strategy Mechanisms Corporate Culture & Co-ordinating Methods, Control in special situations Acquisitions, Shared ownership	10
Unit No : 4	Role of legal structure in Control Strategies – Control or No control Constant Balancing Act	10
Unit No :	Collaborative Strategies – Motives for collaborative arrangements,	10



5	Considerations in collaborative arrangements, Licensing/ Franchising / Contracts/ Joint Ventures/ Equity Alliances	
Unit No : 6	Problems of Collaborative Arrangements, Collaborative Importance, Differing Objectives, Control Problems, Cultural Difference, Compatible Partners, Steps to know how Innovation breeds collaboration	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	T.K Das & Bing- Sheng Teng	A resource Based theory of Strategic Alliance		Journal of management 26, no.1 [2000:31- 61]	
2 – National	Jeffery Reur	Collaborative Strategy J		The logic of Alliances – Financial Times Oct- 4 1999- Page 12-13 3.	
3 – National	Chakrawarthy B and Permutter H (1995)	Strategic Planning for Global Business			
4 – International	M Porter (1990)	Competitive Advantage of Nation		)New York Free Press	
5 – International	Engelwood Cliffs,	. The Strategy Process		M J Prentice Hall	
6 – International		The Dynamics of International Strategy		Strategy London – International Thompson Press	

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.global-strategy.net/what-is-global-strategy/">https://www.global-strategy.net/what-is-global-strategy/</a>
2	<a href="https://www.researchgate.net/publication/322789850_International_Business_Strategy">https://www.researchgate.net/publication/322789850_International_Business_Strategy</a>

**MOOCs:**

Resources No	Web site address
1	<a href="http://mooc.org">mooc.org</a>
2	<a href="http://www.Coursera.org">www.Coursera.org</a>
3	<a href="http://www.Udemy.com">www.Udemy.com</a>
4	<a href="http://Swayam.gov.in">Swayam.gov.in</a>

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	AM03	Use of Information Technology in Agribusiness Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>• Gain a solid understanding of core concepts of ICT in agriculture, with a focus on used cases and potential impact.</li> <li>• Learn about digital tools enhancing on-farm productivity.</li> <li>• Understand how to empower smallholder farmers through ICT/Digital Tools in market access and financial services.</li> <li>• Gain awareness of the forward-looking technologies and their scope in agriculture – artificial intelligence, remote sensing, crowdsourcing, and big data analytics.</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i) Data analysis in Agribusiness</li> <li>ii) ICT in Agriculture</li> <li>iii) GIS and Remote Sensing application in Agriculture</li> <li>iv) Monitoring and Evaluation in Agriculture</li> </ul>		
Units	<i>Syllabus: Use of Information Technology in Agribusiness Management</i>	Hrs.
Unit No : 1	Introduction to Computers: Types of Computer systems, Basic Computer operations, Networks: Internet, Intranet and Extranet Applications, Functional units of Computers, Practical data processing application in business, and Computer applications in various areas of business.	10
Unit No : 2	The Software: Software types, Systems Software, Classification of Operating System, Application Software, Introduction to Programming Language, Types of Programming Languages. Introduction to Microsoft Office, working with MS Word, MS Excel, MS Power point, Data Base, Data Base Management System	10
Unit No : 3	Internet, Security and E-Commerce: Introduction, History and Core features of the Internet, Internet Applications, Internet and World Wide Web, Extranet and E-mail, Mobile Computing, Electronic Commerce, Types of E-Commerce and their utilities	10
Unit No : 4	Management Information Systems: Introduction to MIS, Principles of MIS, Characteristics, functions, structure & Classification of MIS, information for decisions; strategic importance of MIS, MIS in	10

	Manufacturing, Marketing, Finance Human Resource Management, Materials & Project Management; ERP: CRM	
Unit No : 5	Managing Knowledge: Introduction to Knowledge Management, Organizational Learning and Memory, knowledge management activities, Approaches to Knowledge management, Information Technology in Knowledge Management, knowledge Management Systems implementation, Roles of people in knowledge management, Managerial Issues in Knowledge Management.	10
Unit No : 6	Corporate Performance Management and Business Intelligence: A framework of Business Intelligence: Concepts and Benefits, Business Analytics: Online analytical processing reporting and querying, Data Text Web mining and Predictive Analytics, Data Visualization, Geographical Information Systems and virtual reality, Real time business intelligence and competitive Intelligence, Business Performance Management Scorecards and Dashboards.	10

Student has to upgrade Knowledge by using below inputs:

#### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Turban, McLean, Wetherbe 2003	Information technology for Management,		John Wiley & Son	
2 – National	S. Sudalaimuthu, S. Anthony Raj. 2008, — ll,	Computer Application in Business		Himalaya Publishing House	
3 – National	Jaiswal & Mittal, (2010),	. Management Information Systems,		5Oxford University Press	
4 – International	. O'Brien, J.A. (2004	Management Information Systems: Managing IT in the Business Enterprise		).. (6th edition) Prentice Hall	
5 – International	. Lucas, H. C. Jr. (2004).	4Information Technology For		New Delhi: TMH	

		Management. (7th ed			
6 – International					

### Online Resources:

Online Resources No	Web site address
1	<a href="http://ecoursesonline.iasri.res.in/mod/page/view.php?id=123663">http://ecoursesonline.iasri.res.in/mod/page/view.php?id=123663</a>
2	<a href="https://knowledge4food.net/event/training-course-on-agribusiness-development-and-management/">https://knowledge4food.net/event/training-course-on-agribusiness-development-and-management/</a>
3	<a href="https://cgspace.cgiar.org/bitstream/handle/10568/90119/1931_PDF.pdf">https://cgspace.cgiar.org/bitstream/handle/10568/90119/1931_PDF.pdf</a>
4	<a href="https://en.wikipedia.org/wiki/Information_and_communications_technology_in_agriculture">https://en.wikipedia.org/wiki/Information_and_communications_technology_in_agriculture</a>

### MOOCs:

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	AM04	Cooperatives Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ol style="list-style-type: none"> <li>1. The objective of the course is to provide the conceptual and practical understanding of cooperative management.</li> <li>2. The course will be helpful to provide the knowledge of functions, rules &amp; regulations and the benefits of the cooperative management</li> </ol>		
Learning Outcomes :		
<ol style="list-style-type: none"> <li>i) Communicate Concept and Characteristics of Cooperatives, •</li> <li>ii) Explain Functional and Management aspects of Cooperatives •</li> <li>iii) Organize a cooperative institution based upon grassroots level after analyzing market condition</li> </ol>		
Units : -	Syllabus – <i>Cooperatives Management</i>	Hrs.
Unit No : 1	Cooperation ideology-origin growth and development Principles of Agriculture Cooperation. Raifeisen and schulze concept of Agricultural Cooperatives Cooperation and other forms of Enterprise Cooperative Management- Nature and Function. Professionalized Management for Cooperatives.	10
Unit No : 2	Theory and practice of Agricultural Cooperative credit system critical study of organization and financial structure, operation and Management of selected cooperative credit institutions-Central Cooperative Banks. State Cooperative Banks. Land Dev. Banks and NABARD	10
Unit No : 3	Formation and Management in Agriculture Cooperative Societies; Re-organization of Agricultural Credit Societies, Multipurpose cooperative Societies; Large-Sized Cooperative Societies, Service Cooperatives. Cooperative farming in India	10
Unit No : 4	Cooperative Processing; Management of Cooperative Sugar Factories; Cooperative Agricultural marketing; Growth and Development Problems and challenges. Cooperative Education and Training Management in India; Role of State in the progress Indian Cooperative Movement.	10
Unit No : 5	Dairy Cooperatives, Growth and Development, Problems, Measures to overcome these problems	10
Unit No : 6	Indian Cooperatives in this era of Globalisation	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	B.S. Mathur	Cooperation in India		Sahitya Bhawan, Agra	
2 – National	Kamat	, G.S. Cooperative Management,		HPH	
3 – National	. Bedi R.D.	Theory, History and Practical of Cooperation			
4 – International	. Fay, C.R.	Cooperation in India and Abroad			
5 – International	Raj Krutia	Cooperative Farming some Critical Reflection			
6 – International	Rais Ahmad	Cooperative Development and Management Text and Cases,		Mittal Pub. House	

**Online Resources:**

Online Resources No	Web site address
1	<a href="http://unaab.edu.ng/wp-content/uploads/2009/12/451_AEM%20511.pdf">http://unaab.edu.ng/wp-content/uploads/2009/12/451_AEM%20511.pdf</a>
2	<a href="https://en.wikipedia.org/wiki/Cooperative_learning">https://en.wikipedia.org/wiki/Cooperative_learning</a>
3	
4	
5	

**MOOCs:**

Resources No	Web site address

1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in



Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	R03	<i>Merchandising , Display &amp; Advertising</i>	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ol style="list-style-type: none"> <li>I. To familiarize the students with evolution and growth of Retailing, expectations of customers and to study the importance of retailing in present business scenario.</li> <li>II. Present and coordinate merchandise so that related goods are shown in a unique, desirable, and saleable manner.</li> <li>III. Use both written and oral English that emphasizes good organization, clarity, correct grammar which is appropriate for communication purposes in the business environment.</li> <li>IV. Understand the fundamentals of basic financial problems, and use good reason in financial decision making.</li> </ol>		
Learning Outcomes :		
<ol style="list-style-type: none"> <li>I. Understand the basic functions of retail store operations including store location and layout, shopping centre analysis, retail market segmentation and strategies, and the merchandising mix.</li> <li>II. Prepare and execute displays for exhibitions and promotional events using the visual dynamics of light as a design element.</li> <li>III. Prepare illustrative matter and layout for posters and advertising using graphic design principles including perspective, lettering, and logo design.</li> <li>IV. Understand basic personnel functions such as interviewing techniques, basic supervisory skills, motivation, and written and non verbal communication.</li> </ol>		
Units	<i>Syllabus: Merchandising , Display &amp; Advertising</i>	Hrs.
Unit No : 1	Introduction: stages of merchandise, management process, Developing merchandise plan (a) Decision related to buying organization and its process, (b) Factors to be considered in the process of devising merchandise plan	10
Unit No : 2	Elements of Merchandise Management: Introduction, issues of merchandise management (a) Sales forecasting, (b) Inventory planning, (c) Logistic.	10
Unit No : 3	Implementing Merchandise Plan: Steps involved in implementing the plan, (a) Logistic – performance goal, order processing & fulfillment, transportation & warehousing, customer transaction and customer service. (b) Inventory Management – Meaning, Retailer task, inventory levels,	10

	Merchandise security, Reverse logistic, Inventory analysis.	
Unit No : 4	Fundamentals of Merchandising: (a) Product - Merchandise strategy, Planning, Sourcing, Arranging & display, space management. (b) Pricing – objectives, pricing for markets, pricing calculations, pricing policies, pricing strategies.	10
Unit No : 5	Promoting the Store: Elements of promotion, communicating the image, selection of promotion mix, advertising and sales promotion, publicity, personal selling and relationship marketing.	10
Unit No : 6	Display Advertisement: Types of promotion, promotion in the channel, promotional objectives, steps in planning and retail advertising campaign, Management of sales promotion & publicity.	10

Student has to upgrade Knowledge by using below inputs:

### Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	David Gilbert	Retail Marketing Management		, Pearson Education	
2 – National	Agarwal, Bansal, Yadav & Kumar	Retail Management,		Pragati Prakashan, W.K. Road, Merut.	
3 – National	Meenal Dhotre	, Channel management & Retail Marketing,		Himalaya Publishing House, Mumbai.	
4 – International	Andrew J. Newman & Peter Cullen,	Retailing Environment & operations		Change learning	
5 – International	Barry Berman & Joel R. Evans	Retail Management – A Strategic Approach		Pearson Education	
6 – International	Barry Barman & Joel R. Evans	Retail management,		Prentice Hall of India Pvt. Ltd.	

### Online Resources:

Online Resources No	Web site address
1	<a href="https://reflektion.com/resource/merchandising-types-and-examples">https://reflektion.com/resource/merchandising-types-and-examples</a>
2	<a href="https://www.yotpo.com/blog/online-merchandising/">https://www.yotpo.com/blog/online-merchandising/</a>
3	<a href="https://www.smartinsights.com/ecommerce/merchandising/online-merchandising/">https://www.smartinsights.com/ecommerce/merchandising/online-merchandising/</a>
4	<a href="https://www.tickto.com/digital-displays-retail-store-tomorrow/">https://www.tickto.com/digital-displays-retail-store-tomorrow/</a>

### MOOCs:

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Course : MBA (General) CBCS 2020 – w.e.f. - Year 2020 – 2021			
Semester	Course Code	Course Title	
IV	R04	Supply Chain Management in Retailing	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE = 50:50

### Course Objectives:

Subject / Course Objectives :		
<ul style="list-style-type: none"> <li>i) Familiarize the students with organized retail and, the value it creates.</li> <li>ii) The strategic and operational decision-making processes in the organized retail.</li> <li>iii) Relate the supply chain activities which create the value in the organized retail industry</li> </ul>		
Learning Outcomes :		
<ul style="list-style-type: none"> <li>i) Understand the functions of retail business and various retail formats and retail channels.</li> <li>ii) Understand the difference between Retail and Manufacturing Supply Chain</li> <li>iii) Understand, key drivers of retail supply chain and how to select a retail store location?</li> <li>iv) Analyze Retail Market and Financial Strategy including product pricing.</li> <li>v) Integrate the various Supply Chain partners and how to collaborate with them?</li> </ul>		
Units	Syllabus : <i>Supply Chain Management in Retailing</i>	Hrs.
Unit No : 1	Introduction to Supply Chain Management: Meaning, Objectives and Importance, Decision phases, Process View, Competitive and supply chain strategies, Achieving strategic fit, Supply chain drivers.	10
Unit No : 2	Planning Demand and Supply in Supply Chain: Supply Chain integration, Demand Forecasting in a supply chain, Managing Demand and supply in supply chain, Role of IT in forecasting.	10
Unit No : 3	Designing the Supply Chain Network: Designing the Distribution Network, Role of Distribution, Factors influencing distribution, Design options, Modeling for supply chain, Network design in Supply Chain.	10
Unit No : 4	Logistics in Supply Chain Management: Introduction, Elements, Logistics interfaces with other areas, Approach to analyze Logistics System, Logistics System Analysis-Techniques, Factors affecting the cost and Importance of logistics.	10
Unit No : 5	Sourcing and Pricing in Logistics: I. Sourcing- In-house or outsource, Supplier scoring and assessment, Procurement process, Sourcing- Planning and Analysis II. Pricing- Pricing and Revenue management for multiple customers, Perishable products, Seasonal demand, Bulk and spot contracts.	10
Unit No : 6	Information Technology in supply Chain Management: Role of IT in Supply Chain management, Customer Relationship Management, Internal Supply Chain management, EBusiness and Supply Chain Management, Building strategic partnerships and trust within a supply chain	10

Student has to upgrade Knowledge by using below inputs:

**Reference Books:**

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company	
1 – National	Sunil Chopra, Peter Meindal, D.V.Kalra,	Supply Chain Management-Strategy, Planning and Operation,		Pearson Education.	
2 – National	Braj Mohan Chaturvedi,	Supply Chain Management,		ICFAI University Press	
3 – National	Rahul V.Altekar,	Supply Chain Management, Concepts and Cases,		Prentice Hall India, New Delhi.	
4 – International	John Mentzer,	Supply Chain Management, Response Books,		Sage Publication, New Delhi	

**Online Resources:**

Online Resources No	Web site address
1	<a href="https://www.vinculumgroup.com/the-role-of-scm-in-retail-scenario-of-today/">https://www.vinculumgroup.com/the-role-of-scm-in-retail-scenario-of-today/</a>
2	<a href="https://www.vendhq.com/blog/supply-chain-management/">https://www.vendhq.com/blog/supply-chain-management/</a>
3	<a href="https://www.slideshare.net/RahulJha6/retail-supply-chain-management">https://www.slideshare.net/RahulJha6/retail-supply-chain-management</a>

**MOOCs:**

Resources No	Web site address
1	mooc.org
2	www.Coursera.org
3	www.Udemy.com
4	Swayam.gov.in

Elective - Project Management: Course – Advance Project Management

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2021– 2022			
Semester	Course Code	Course Title	
IV	PR03	Advance Project Management	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p>Subject / Course Objectives:</p> <ul style="list-style-type: none"> <li>i) To understand the overall aspects of project management</li> <li>ii) To view at the project from a holistic view</li> <li>iii) To identify costs and control them while implementing project</li> <li>iv) To understand quality aspects in project</li> </ul>		
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> <li>i) To know the details of project budgeting and costing</li> <li>ii) To learn various aspects of project monitoring and implementation</li> <li>iii) To understand how to manage project quality and project audit</li> <li>iv) To understand the aspects related to Human resource in Project Management</li> </ul>		
Name	Syllabus – Advance Project Management	Hrs.
Unit No: 1	<p><b>Baseline Cost Structure</b> Introduction to cost structure, Inputs for project costing, Project cost estimation, categories of costs such as Labor cost, Equipment cost, Cost of supplies, Travel cost, Training cost, Overhead cost, etc. <b>Project Procurement process:</b> Plan procurement , Conduct procurement, Control procurement and Close.</p>	8
Unit No: 2	<p><b>Project budgeting &amp; activity costing</b> Techniques to estimate project costs - Analogous Estimating, Parametric estimating, Bottom-up estimating, Project Budget planning, Identifying activities and Activity cost estimates, generation of Cost performance baseline, Project funding requirements, Project documents</p>	11
Unit No: 3	<p><b>Project Monitoring</b> General aspects of project monitoring, Importance of project monitoring and control, Monitoring and control method, Project monitoring activities, Project monitoring process, Project Monitoring Steps, Monitoring and control techniques, control with Gantt Chart, Earned Value Analysis</p>	5
Unit No: 4	<p><b>Project Quality Management</b> Project Quality Management Plan , identifying quality metrics and standard measures for project processes, regulatory compliance requirements, product functionality, documentation, etc., Development of Quality management plan, Process improvement plan, Quality metrics, Quality checklists, Project documents</p>	4
Unit No: 5	<p><b>Project Audit</b></p>	10

	Quality Assurance - analyzing project quality, improve project quality, checking whether the quality standards are met, Quality control measurements, Work performance information, checking Project management plan, Project documents updates, Organizational process assets updates	
Unit No: 6	<p><b>Project Human Resource Management</b></p> <p>Develop human resource plan with the help of Activity resource requirements, Enterprise environmental factors, Organizational processes</p> <p>Acquire project team - Project staff assignments, Resource calendars, Develop project team - improving the team efficiency, team member interaction and enhancing overall team and project performance</p> <p>Manage project team - tracking team member performance, resolving issues, providing feedback and managing a team to optimize project performance.</p> <p><b>Communication Management:</b> Organizing for Communication, Feedback communication. Reporting system.</p>	07

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – International	Kenneth Rose	Project Quality Management Why, What and How	2nd Edition	J. Ross Publishing
2 – International	Kim H. Pries, Jon M. Quigley	Total Quality Management for Project Management	1st Edition	Taylor & Francis
3 – International	Sunil Luthra, Dixit Garg, Ashish Agarwal, Sachin K. Mangla	Total Quality Management (TQM) Principles, Methods, and Applications	1st Edition, 2021	CRC Press
4 –	Martina Huemann	Human Resource Management in the	1st Edition,	Taylor & Francis

International		Project-Oriented Organization Towards a Viable System for Project Personnel	2016	
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Online Resources:

Online Resources No.	Web site address
1	<a href="https://www.guru99.com/learn-financial-planning-project-management.html">https://www.guru99.com/learn-financial-planning-project-management.html</a>
2	<a href="https://www.ispatguru.com/project-monitoring/">https://www.ispatguru.com/project-monitoring/</a>
3	<a href="https://memory.ai/timely-blog/project-monitoring-what-it-is-and-how-to-do-it-well">https://memory.ai/timely-blog/project-monitoring-what-it-is-and-how-to-do-it-well</a>
4	<a href="https://www.greycampus.com/blog/project-management/top-4-project-monitoring-steps">https://www.greycampus.com/blog/project-management/top-4-project-monitoring-steps</a>
5	<a href="https://www.projectmanagementqualification.com/blog/2019/10/21/project-monitoring-control/">https://www.projectmanagementqualification.com/blog/2019/10/21/project-monitoring-control/</a>
6	<a href="https://www.projectmanager.com/project-management">https://www.projectmanager.com/project-management</a>
7	<a href="https://www.pmi.org/learning/library/earned-value-management-systems-analysis-8026">https://www.pmi.org/learning/library/earned-value-management-systems-analysis-8026</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://www.mooc-list.com/course/preparing-manage-human-resources-coursera#.YC84K56SNGg.whatsapp">https://www.mooc-list.com/course/preparing-manage-human-resources-coursera#.YC84K56SNGg.whatsapp</a>
2	<a href="https://www.my-mooc.com/en/categorie/project-management">https://www.my-mooc.com/en/categorie/project-management</a>
3	<a href="https://www.coursera.org/learn/uva-darden-project-management">https://www.coursera.org/learn/uva-darden-project-management</a>



Elective - Project Management: Course – Scanning Business Environment for Project

Course: MBA (General) CBCS 2020 – w.e.f. - Year 2021– 2022			
Semester	Course Code	Course Title	
IV	PR04	Scanning Business Environment for Project	
Type	Credits	Evaluation	Marks
Core Elective	3	CES	UE:IE =50:50

Course Objectives:

<p>Subject / Course Objectives:</p> <ul style="list-style-type: none"> <li>i) To understand the business environment impacts project management</li> <li>ii) To understand how to scan internal business environment and to work on strengths and weaknesses</li> <li>iii) To understand how to scan external business environment to identify opportunities and threats</li> <li>iv) To understand the intricacies for preparing for unforeseen events.</li> </ul>		
<p>Learning Outcomes:</p> <ul style="list-style-type: none"> <li>i) To know how to scan business environment</li> <li>ii) To understand the impact of changes in business environment</li> <li>iii) To identify, evaluate and deliver project benefits and value in the complex business environment</li> <li>iv) To understand the impact of project on Organization culture through organizational change.</li> </ul>		
Name	Syllabus – Scanning Business Environment for Project	Hrs.
Unit No: 1	<p><b>Environmental Scanning for Implementing project</b>                      Importance of environmental scanning for project management, internal and external environment, global environment, SWOT analysis for readiness for project, preparation for unforeseen changes</p>	8
Unit No: 2	<p><b>Evaluating Internal Business Environment</b>                      Corporate mission, corporate culture, and leadership style, Organizational structure and suitability to project, Financial condition of organization, Skill sets of employees</p>	11
Unit No: 3	<p><b>Evaluating External business environment</b>                      Monitoring external business environmental changes ((e.g., regulations, technology, geopolitical, market), Assessing and prioritizing impact on project scope/backlog based on changes in external business environment, Identify options for scope/backlog changes</p>	5
Unit No: 4	<p><b>Plan and manage project compliance</b>                      Project compliance requirements (e.g., security, health and safety, regulatory compliance), Analysing potential threats to compliance, Use methods to support compliance, Conditions of non-compliance, consequences of noncompliance, Approach and Action to address compliance needs (e.g., risk, legal), Measure the extent to which the</p>	4

	project is in compliance	
Unit No: 5	<b>Evaluate and deliver project benefits and value</b> Identifying Project Benefits, Creating agreement on ownership for ongoing benefit realization, Establishing measurement system to track benefits, Evaluation of delivery options to demonstrate value, Appraise stakeholders of value gain progress	10
Unit No: 6	<b>Support organizational change</b> Assess organizational culture, Evaluating impact of organizational change to project, Impact of project on the organization culture	07

Reference Books:

Reference Books (Publisher)	Name of the Author	Title of the Book	Year Edition	Publisher Company
1 – International	Worthington, Ian, Britton, Chris, Thompson, Edward	The Business Environment: A Global Perspective	2018	Pearson Education Limited
2 – International	Avraham Shtub and Shlomo Globerson and Jonathan F Bard	Project Management: Processes, Methodologies, And Economics	2nd Edition	Pearson
3 – International	Robert J. Graham	Creating an Environment for Successful Projects: The Quest to Manage Project Management	1st Edition	Jossey-Bass

Online Resources:

Online Resources No.	Web site address
1	<a href="https://twproject.com/blog/internal-external-corporate-environmental-factors-project-environment/">https://twproject.com/blog/internal-external-corporate-environmental-factors-project-environment/</a>

2	<a href="https://www.itmplatform.com/en/blog/corporate-environmental-factors-that-affect-project-management/">https://www.itmplatform.com/en/blog/corporate-environmental-factors-that-affect-project-management/</a>
3	<a href="https://www.tefen.com/insights/services/operation_Organization/project_management_global_projects">https://www.tefen.com/insights/services/operation_Organization/project_management_global_projects</a>
4	<a href="https://www.knowledgehut.com/blog/project-management/projects-in-business-environments">https://www.knowledgehut.com/blog/project-management/projects-in-business-environments</a>
5	<a href="http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf">http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf</a>

MOOCs:

Resources No.	Web site address
1	<a href="https://www.mooc-list.com/course/global-business-environment-evolution-and-dynamics-futurelearn">https://www.mooc-list.com/course/global-business-environment-evolution-and-dynamics-futurelearn</a>
2	<a href="https://www.udemy.com/course/project-management-course-udemy/">https://www.udemy.com/course/project-management-course-udemy/</a>
3	<a href="https://www.coursera.org/learn/global-business-environment">https://www.coursera.org/learn/global-business-environment</a>

**BHARATI VIDYAPEETH**  
**DEEMED TO BE UNIVERSITY**  
**PUNE, INDIA**

**FACULTY OF MANAGEMENT STUDIES**

**Board of Studies in Computer Applications**

**Master of Computer Applications Programme**

**(Under Choice Based Credit System)**

**To be effective from 2018-19**

**BHARATI VIDYAPEETH**  
**DEEMED TO BE UNIVERSITY**  
**PUNE, INDIA**  
**FACULTY OF MANAGEMENT STUDIES**  
**Board of Studies in Computer Applications**  
**Master of Computer Applications Programme**  
**(Under Choice Based Credit System)**  
**To be effective from 2018-19 at Part I**

**1. INTRODUCTION**

The MCA Program is a full time 150 Credits programme offered by Bharati Vidyapeeth Deemed to be University, Pune and conducted at its management institutes in Pune, Karad, Kolhapur, Sangli, and Solapur. All the five institutes have excellent faculties, Laboratories, Library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade (3rd cycle). The expectations and requirements of the software industry, immediately and in the near future, are visualized while designing the MCA programme. This effort is reflected in the Vision and Mission statements of the MCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed to be University which is to usher in “Social Transformation through Dynamic Education.”

**2. VISION STATEMENT OF MCA PROGRAMME**

To create high caliber solution architects and innovators for software development.

**3. MISSION STATEMENT OF MCA PROGRAMME**

To teach 'things, not just words', 'how to think', and 'how to self-learn'.

**4. OBJECTIVES OF THE MCA PROGRAMME**

The main objectives of MCA Programme are to prepare the youth to take up positions as system analysts, system engineers, software engineers, programmers and of course as versatile teachers in any area of computer applications. Accordingly the course curriculum aims at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skills to apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments', 'four minor projects and 'one

semester full-time internship project'. In addition, 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

## **5. LEARNING OUTCOMES FROM THE MCA PROGRAMME:**

At the end of the course the student should be able to:

- (a) Analyze problems and design effective and efficient software solutions.
- (b) Develop software under latest Application Development Environments.
- (c) Learn new technologies with ease and be productive at all times.
- (d) Read, write, and contribute to technical literature.
- (e) Work in teams.
- (f) Be a good citizen in all respects.

## **6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:**

Admission to the programme is open to any candidate (Graduate) of any recognized University satisfying the following conditions.

1. The candidate should have secured at least 50% (45% for SC/ST).
2. Mathematics as one of the subject at 12<sup>th</sup> or graduation.

### **▪ DURATION OF THE PROGRAMME**

The duration of this programme is three years divided in to six semesters or a minimum of 150 credits whichever is later. The medium of instruction and examination will be only English.

### **▪ SCHEME OF EXAMINATION:**

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways, three or four times,

during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

- **STANDARD OF PASSING:**

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA. A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table:

<b>Range of Marks (%)</b>	<b>Grade</b>	<b>Grade Point</b>
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

- **Award of Honours:**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade

only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA below 5.0	F	Fail	Marks below 40

**RULES OF ATKT:**

- 1.A student is allowed to carry backlog of any number of subjects upto Semester IV.
- 2.A student must pass Part I (Semester I and II) to appear for Semester V.



**SEMESTER WISE COURSE STRUCTURE FOR MCA**  
(To be effective from July 2018)

**SEMESTER I**

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
101	C Programming	4	3	1	-	40	60
102	Computer Organization And Architecture	4	3	1	-	40	60
103	Database Management Systems	4	3	1	-	40	60
104	Discrete Structures	3	2	1	-	40	60
105	Management Functions	3	2	1	-	40	60
106	Web Supporting Technologies	4	2	-	4	40	60
107	C Lab	2	0	-	4	40	60
108	Soft Skills	2	2	-	-	50	0
109	Self learning-1 (Societal Related Topic)	2	0	-	-	50	0
Total		28	17	5	8	380	420

**SEMESTER II**

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
201	Data structure and Algorithms	4	3	1	-	40	60
202	Operating Systems	4	3	1	-	40	60
203	Software Engineering	4	3	1	-	40	60
204	Statistical Techniques	3	2	1	-	40	60
205	Financial Accounting	3	2	1	-	40	60
206	Database Management Systems Lab	4	2	-	4	40	60
207	Data Structures Lab	2	0	-	4	40	60
208	Project-I	2	2	-	-	0	100
209	Self-learning-2 (Societal Related Topic)	2	0	-	-	50	0
Total		28	17	5	8	330	520

### SEMESTER III

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
301	Artificial Intelligence	4	3	1	-	40	60
302	Computer Networks	4	3	1	-	40	60
303	Object Oriented Analysis And Design	4	3	1	-	40	60
304	Probability and Graph theory	3	2	1	-	40	60
305	Organizational Behaviour	3	2	1	-	40	60
306	Object Oriented Programming	4	3	1	0	40	60
307	Object Oriented Programming Lab	2	0	-	4	40	60
308	Project-II	2	2	-	-	0	100
309	Self learning-3 (Societal Related Topic)	2	0	-	-	50	0
Total		28	18	6	4	330	520

### SEMESTER IV

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
401	Data Warehousing and Data Mining	4	3	1	-	40	60
402	Information Security	4	3	1	-	40	60
403	Design Patterns	4	3	1	-	40	60
404	Elective-I	3	2	1	-	100	-
405	Elective-II	3	2	1	-	100	-
406	Lab Elective-I	4	2	-	4	40	60
407	Linux Lab	2	0	-	4	40	60
408	Project-III	2	2	-	-	0	100
409	Self learning-4 (Computer Related Topic)	2	0	-	-	50	-
Total		28	17	5	8	450	400

### SEMESTER V

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
501	Data Science	4	3	1	-	40	60
502	Optimization Techniques	4	3	1	-	40	60
503	Software Project Management	4	3	1	-	40	60
504	Elective-III	3	2	1	-	100	-
505	Elective-IV	3	2	1	-	100	-
506	Lab Elective-II	4	2	-	4	40	60
507	Lab on Current Trends	2	0	-	4	40	60
508	Project-IV	2	2	-	-	0	100
509	Self learning-5 (Computer Related Topic)	2	0	-	-	50	0
Total		28	17	5	8	450	400

#### List of Elective Groups:

These are the broad Elective groups and a student can select only one group for his specialization. Each group will have 4 subjects, of which a student will study first 2 in Semester IV and other 2 in Semester V.

Elective Group
Cloud Computing
Data Analytics
Linux
Open Source Technologies
Mobile Computing
Dot Net Technologies
Net Centric Technologies
Information Systems
IOT
Big Data
Cyber Security

<b>Elective No.</b>	<b>Elective Group</b>	<b>Course No</b>	<b>Course Name</b>
01	Cloud Computing	404-01-A	Virtualization
		405-01-B	Cloud Computing Concepts
		504-01-C	Cloud Solutions
		505-01-D	Cloud Computing
02	Data Analytics	404-02-A	Algorithms for Advanced Analytics
		405-02-B	Machine Learning Techniques
		504-02-C	Weka
		505-02-D	Statistical Computing
03	Linux	404-03-A	Linux Desktop Environment and Shell Programming
		405-03-B	Linux System Administration
		504-03-C	Linux Network Administration
		505-03-D	Linux Internals and Network
04	Open Source Technologies	404-04-A	Python
		405-04-B	Perl Scripting
		504-04-C	PHP
		505-04-D	Ruby
05	Mobile Computing	404-05-A	HTML 5
		405-05-B	Java Script Programming
		504-05-C	Android
		505-05-D	Hybrid Application Development
06	Dot Net Technologies	404-06-A	C# Programming
		405-06-B	ASP .NET with C#
		504-06-C	C# Windows Programming
		505-06-D	MVC
07	Net Centric Technologies	404-07-A	HTML 5
		405-07-B	Java Script Programming
		504-07-C	Ajax Programming
		505-07-D	Web Services

08	Information Systems	404-08-A	Enterprise Resource Planning
		405-08-B	E Commerce
		504-08-C	Recommender System
		505-08-D	Knowledge Management
09	IOT	404-09-A	IoT Architecture And Protocols
		405-09-B	Sensors and Fundamentals with Hands-on lab Node.js/Raspberry PI/Python
		504-09-C	Internet Of Things: Sensing And Actuator Devices
		505-09-D	Smart city use case, MQTT, Integrating on Cloud
10	Big Data	404-10-A	Business Intelligence Applications
		405-10-B	Business Intelligence Tools
		504-10-C	Introduction to Big Data
		505-10-D	Hadoop
11	Cyber Security	404-11-A	Cyber Security
		405-11-B	Information Security Concepts
		504-11-C	Information Security Threats
		505-11-D	Information Security Administration

## SEMESTER VI

Course Number	Course Title	Credits	Hours/Week			IA Marks	EoTE Marks
			L	T	P		
601	Internship Project	10	-	-	-		100

### **Practical Examinations:**

For course Nos. 106,107,206,207,307,406,407,506 and 507 there will be practical examination.

For course No 507 Lab on Current Trends, Every center can decide the Programming Language to be taught depending upon the current industry demand and students interest.

### **Project Viva:**

For course Nos. 208,308,408,508 there will be University Project Dissertation Viva carrying 100 marks.

### **Self Learning:**

For Self Learning- 1 (109), Self Learning- 2 (209), Self Learning- 3 (309), Self Learning- 4 (409), Self Learning- 5 (509), students should select any one recent/upcoming topic related to Societal Concerns (SEM I to SEM III) and on computer science (SEM IV and V) , study it thoroughly and submit a project report at the end of the semester.

# **SEMESTER I**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
101	C Programming	3 L + 1 T +0P = 4 C	2018-19
<p><b>Course Objective :</b></p> <p>This is a first course in programming. The objective of this paper is to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving.</p>			
<p><b>Expected Outcome :</b></p> <p>At the end of the course a student should be able:</p> <ul style="list-style-type: none"> <li>• To solve a given problem using C Program C</li> <li>• Understand and use C libraries,</li> <li>• Trace the given C program manually</li> <li>• Effectively use of Arrays and functions</li> <li>• Write C program for simple applications of real life using structures and Unions.</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ol style="list-style-type: none"> <li>1. Let us C - Y.Kanetkar, BPB Publications</li> <li>4. Yashawant Kanetkar, let Us C, BPB Publication</li> <li>2. Programming in C - Gottfried B.S., TMH</li> <li>3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI</li> <li>4. Programming in ANSI C - Balaguruswami, TMH</li> <li>5. C- The Complete Reference - H.Sohildt, TMH</li> <li>6. A Structured Programming Approach using C – B.A. Forouzan&amp; R.F. Gillberg, THOMSON Indian Edition</li> <li>7. Computer fundamentals and programming in C – PradipDey&amp; ManasGhosh, OXFORD</li> </ol>			
<p><b>Suggested MOOC :</b></p> <p>Please refer these websites for MOOCS:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			

Course Plan	
Unit	Contents
1	<p><b>Basics to learn a Programming Language:</b></p> <p>Evolution of programming languages, structured programming, the compilation process, object code, source code, executable code, operating systems, interpreters, linkers, loaders, compilers, fundamentals of algorithms, flow charts. Concepts of a Program and subprogram, Procedures and functions, Syntactic, Semantic, and Logical Errors in a program; Program Correctness- Verification and Validation, Concept of Test Data</p>
2	<p><b>C Language Fundamentals:</b></p> <p>Origins of C, Characters and Character Set of C, Variables and Identifiers, Built-in Data Types, Variable Definition, Constants and Literals, Simple Assignment Statement, Operators and operands, Unary and</p>



	Binary Operators, Concept of Expression, Arithmetic Expressions, Relational Expressions, Assignment Expressions. Evaluation of Expressions, Concepts of Precedence and Associativity, Table of Precedence and Associativity. Basic Input/Output Statement, The function main()
3	<b>Control Statements:</b> Control Structures, Decision Making within a Program, Conditions, Relational Operators, Logical Connectives, Decision Making and Branching: If Statement, If-Else Statement, Switch Statement Decision Making & Looping: While Loop, Do While, For Loop. Nested Loops, Infinite Loops, Structured Programming
4	<b>Arrays:</b> One Dimensional Arrays: Array Manipulation; Searching, Linear Search, Binary Search; Finding The Largest/Smallest Element in an Array; Two Dimensional Arrays: Addition/Multiplication of Two Matrices, Transpose of a Square Matrix; Strings as Array of Characters
5	<b>Functions:</b> User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, Storage Classes. Strings in C and String manipulation functions, Input, output of string statements
6	<b>Pointers:</b> Address Operators, Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Passing parameters by reference, pointer to pointer, linked list, pointers to functions, Arrays and Pointers, Pointer Arrays, Dynamic memory allocation
7	<b>Structures, Unions:</b> Declaration of structures, declaration of unions, pointer to structure & unions. <b>Additional Features in C:</b> Command line arguments, bit wise operators, enumerated data types, type casting, macros, the C preprocessor, more about library function

Course Number	Course Name	L-T-P- Credits	Year of Introduction
102	Computer Organization and Architecture	3 L+1 T+0 P=4 C	2018-19
<p><b>Course Objectives :</b> Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components</p>			
<p><b>Expected Outcome :</b> At the end of this course, student should be able to understand</p> <ul style="list-style-type: none"> <li>• Simple machine architecture and the reduced instruction set computers.</li> <li>• Memory control, direct memory access, interrupts, and memory organization</li> <li>• Basic data flow through the CPU (interfacing, bus control logic, and internal communications).</li> <li>• Number systems, instruction sets, addressing modes, and data/instruction formats.</li> </ul>			
<p><b>References (Books, Websites etc) :</b> 1. M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication 2. Anita Goel : Computer Fundamentals Pearson Publications</p>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction To Computer Hardware &amp; Computer security:</b> Computer: Block diagram, Generations, types, Applications, Interconnecting the units of computer, performance of computer. Computer Security: threats and security attack, Malicious software, Hacking, Security services, Firewall.</p>		
2	<p><b>Introduction To Digital Computer –</b> Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits</p>		
3	<p><b>Introduction To Digital Components And Micro Operations</b> ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.</p>		

4	<p><b>Computer organization And Programming –</b></p> <p>Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler - Program Loops – Programming Arithmetic And Logic Operations – Subroutines – I/O Programming.</p>
5	<p><b>Memory Organization And CPU –</b></p> <p>Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware – CPU: General Register Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC</p>
6	<p><b>Input – Output Organization</b> Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication</p>
7	<p><b>Pipeline And Vector Processing</b> – Parallel processing – Pipelining - Arithmetic pipeline - Instruction pipeline - RISC pipeline, - Vector processing - Array processor</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
103	Database Management Systems	3L + 1T + 0P = 4C	2018-19
<p><b>Course Objective:</b>  The goal of this course is to teach the fundamentals of the database systems at a master level. A variety of topics will be covered that are important for modern databases in order to prepare the students for real life applications of databases. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.</p>			
<p><b>Expected Outcome :</b>  After going through this course a student should be able to:</p> <ul style="list-style-type: none"> <li>• Understand the concept of database and techniques for its management.</li> <li>• Design different data models at conceptual and logical level and translate ER Diagrams to Relational Data Model.</li> <li>• Normalize the database.</li> <li>• Write queries using Relational Algebra.</li> <li>• Describe the file organization schemes for DBMS.</li> <li>• Describe and use features for Concurrency and Recovery.</li> <li>• Understand data security standards and methods.</li> <li>• Understand the fundamentals of Distributed Database Systems.</li> </ul>			
<p><b>References :</b>  <b>Books:</b></p> <ol style="list-style-type: none"> <li>1. "Fundamentals of Database Systems" Global Edition By <u>RamezElmasri</u>, <u>Shamkant B. Navathe</u></li> <li>2. "Database System and Concepts" A Silberschatz, H Korth, S Sudarshan, McGraw-Hill.</li> </ol>			
<p><b>Suggested MOOC :</b>  Please refer these websites for MOOCS:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction to DBMS:</b>  Difference between Data, Information, Data Processing &amp; Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.</p>		
2	<p><b>Data Modeling in Database :</b>  Data Models, Logical Data Modeling: Hierarchical Data Model, Network Data Model, Relational Data Model. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Relationship set, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set. The extended entity relationship (EER) model,</p>		

	<p>Subclass, Superclass, generalization, specialization, Attribute Inheritance. <b>Relational Data Model</b> Codd's Rules for RDBMS, Translating ER Diagram to Relational Database.</p>
3	<p><b>Normalization and Relational Algebra:</b> Normalization Vs De-Normalization, Decomposition, Lossy and Lossless Decomposition, Functional Dependencies, Normal forms 1NF, 2NF, 3NF, BCNF, Case Studies on Normalization. <b>Relational Algebra:</b> Keys: Composite, Candidate, Primary, Secondary, Foreign, Relational Relational Algebra Operators: Select, Project, Divide, Rename. Set Operations: Union, Intersect, Difference, And Product, Joins: Outer Joins, Inner Joins with example.</p>
4	<p><b>File Structures and Data Administration:</b> File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing.</p>
5	<p><b>Concurrency Control And Recovery Techniques:</b> <b>Concurrency Control:</b> Single User and Multiuser systems, Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, Need for Concurrency control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs, Starvation <b>Recovery Techniques:</b> Database Recovery, Types of Failures, Storage Structure: Volatile, Non Volatile and stable storage, Data access. Recovery and atomicity, Recovery Techniques / Algorithms: Log Based Recovery, Check points, Shadow Paging</p>
6	<p><b>Data Administration And Security:</b> Data administration, Role and Responsibility of DBA, Creating/Deleting/Updating table space, Database Monitoring, User Management, Basic data security principles – user privileges, data masking, encryption and decryption. Data Security Implementation, revalidation of user, role, privileges. Data Quality Management, Basic quality principles, data quality audit, data quality improvement</p>
7.	<p><b>Introduction to Advance Databases:</b> <b>Distributed Database:</b> Heterogeneous and Homogeneous Databases, Distributed database features and needs, Advantages and Disadvantages, Distributed Database Architecture. Levels of distribution, transparency, replication. Fragmentation. <b>Data Warehouse:</b> Data Warehouse defined, Need for Data Warehouse, Characteristics of Data Warehouse, Multidimensional Data Model, OLTP vs. OLAP, A three tier Data Warehouse Architecture, Data Mart Vs. Data Warehouse.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
104	Discrete Structures	2L + 1T + 0P = 3C	2018-19
<b>Course Objective:</b> 1.To learn basic mathematical course ,eg. Sets, Functions, Graph. 2. To be familiar with formal mathematical reasoning eg. Logic proofs. 3.To improve problem solving skills. 4. To see the connections between Discrete structure Computer Science			
<b>Expected Outcome :</b> a)Apply standard Mathematical methods. b)Write code to implement solution procedures. c)Search for information in tacking advanced problems. d)Formulate AI problems mathematically.			
<b>Reference Books:</b> <b>Kenneth H.Rosen,Discrete Mathematics and its Applications Edition 6 th Tata McGraw Hil</b> <b>Schaum’s outlines Discrete Mathematics</b> <b>Discrete Mathematics N CH S N Lyneger and K.A. Venkatesh</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www. edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Propositional logic:</b> Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction , normal forms(conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.		
2	<b>Set and Relation</b> <b>Set Theory:</b> Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), Partition of set , proofs of some general identities on sets, Fuzzy set ,Fuzzy set operation, rough set concept <b>Relation:</b> Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation ,Equivalence Relation, Relation Matrices		
3	<b>Function:</b> Definition and types of function (one to one, onto, Inverse ) composition of functions, Graph of Functions, Some Functions in Computer Science, Growth of Functions recursively functions.		
4	<b>Algorithm, the Integers and Matrices:</b> Algorithm, growth of function, Complexity of algorithm, Primes and Greatest Common Divisors, Integers algorithm		

5	<p><b>Partial Order and Structure: Partially Ordered,</b>  Sets ,Lexico graphics Order, Hasse Diagram, Maximal and Minimal elements of a Poset, Concept of Lattice, Boolean Functions, Logic Gates, Minimization of Combinational circuit</p>
6	<p><b>Combinatorics :</b>  Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)</p>
7	<p><b>Modelling Computation:</b>  Language and Grammar, Finite State Machine with output, , Finite State Machine with no output, Language Recognition</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
105	Management Functions	2L + 1T + 0P = 3C	2018-19
<b>Course Objective:</b> 1. To orient the students to principles of management 2.To make them comprehend the process of management 3.To internalize the principles through rigorous assignments where they shall observe, analyze and infer the presence of principles transformed into practice.			
<b>Expected Outcome :</b> At the end of the course, the students shall acquire 1. Understanding of functions of management 2. Understand the principle of management woven in to the process of management 3. Understand how they are modified in to practice to suit the requirements 4. How IT influences the process of management			
<b>References :</b> <b>Books:</b> 1.H.Welrcih, Mark Cannice, H. Koontz, Management , A Global and Entrepreneurial Perspective , McGraw-Hill Companies, 12th edition. 2.P.C.Tripathi, P.N.Reddy, Principles and Practice of Management , Tata Mcgraw Hill , Third Edition 3. L.M. Prasad, Principles and Practice of Management, Seventh Edition 4. Stephan Robbins, Mary Coutler, Management			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Course Plan</b>			
Unit	Contents		
1	The need of Management Study , Process of Management , Characteristics of Professional Management , Brief Review of Management Thought Social Responsibility of Management		
2	Decision Making Process , Planning and Steps in Planning , Types of Plan Making Planning Effective , Case Study on Planning, MBO		
3	Organization, Meaning and Process , Departmentalization,, Organization Structure , Authority and Delegation , Centralization verses Decentralization , Team Work , Case Study		
4	Co-ordination – meaning and need , Techniques of establishing Co-ordination Difficulties in establishing co-ordination , Case Study		
5	Formal and Informal Organization, Manpower Planning , Recruitment and Performance Appraisal, Compensation and Incentives , issues related to Retention Case study		
6	An overview of Communication, Supervision and Direction , Leadership Styles , Control – need and types and control techniques . In addition there shall be tutorials of written examination type, field study and presentation.		
7.	<b>Case Studies</b>		



Course Number	Course Name	L-T-P- Credits	Year of Introduction
106	Web Supporting Technologies	2L-0T-2P = 4C	2018-19
<b>Course Objectives :</b> <ul style="list-style-type: none"> <li>▪ To understand the basic concepts of the World Wide Web</li> <li>▪ To understand and practice HTML as markup language</li> <li>▪ To understand and practice embedded dynamic scripting on client side Internet Programming</li> <li>▪ To understand and practice web development techniques on client-side</li> <li>▪ To understand and practice server-side scripting</li> </ul>			
<b>Syllabus Outline:</b> <ul style="list-style-type: none"> <li>▪ Understanding of internet and intranet- working of WWW, types Protocols and working of HTTP and types of servers</li> <li>▪ UI Design - Markup Language: Introduction to HTML5 - Cascading Style Sheet: Introduction to CSS3.</li> <li>▪ Client Side Scripting using JAVASCRIPT - Introduction to JavaScript - Document Object Model -Event Handling - Controlling Windows &amp; Frames and Documents - Browser Management and Media Management - Object-Oriented Techniques in JavaScript - JQuery.</li> <li>▪ Server Side Scripting using PHP - Introduction to PHP - Programming basics - Reading Data in WebPages - Embedding PHP within HTML - Establishing connectivity with MySQL database.</li> </ul>			
<b>Expected Outcome :</b> Upon successfully completing this course the student will be able to <ul style="list-style-type: none"> <li>- Understand concept of internet and how it functions</li> <li>- Use HTML tag to format contents of web page</li> <li>- Use Cascading Style Sheets (CSS) to apply user defined look and feel</li> <li>- Apply Java Script to validate form data and generate dynamic contents</li> <li>- Make use of PHP to generate server side response using MYSQL as database</li> </ul>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>1. Thomas Powell, Web Design The complete Reference, Tata McGrawHill</li> <li>2. Thomas Powell, HTML and XHTML The complete Reference, Tata McGrawHill</li> <li>3. Thomas Powell and Fritz Schneider JavaScript 2.0 : The Complete Reference, Second Edition</li> <li>4. PHP : The Complete Reference By Steven Holzner, Tata McGrawHil</li> <li>5. Ivan Bayross (2006) Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, BPB Publications.</li> <li>6. Luke Welling, PHP and MySQL Web Development, Pearson Education; Fifth edition</li> </ol>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			

### Syllabus/Course Outline

Unit	Contents
1	Understanding internet and intranet, Introduction to WWW, WWW Architecture, Concept of protocol and its types: SMTP, POP3, File Transfer, Overview of HTTP, HTTP request and response. Various web server, using Apache as web server, Installation of Apache, Apache Directory Structure, apache configuration, creating application folder,

	storing and accessing files from server
2	Types of Markup Language and HTML as markup language, basic structure of HTML, Head Section and elements of head section, Meta tags and external link tags HTML body content tags: header tags, Paragraph, span and pre tags, text formatting tags, Ordered and unordered list tag, Table tag, div tag, Frames and framesets, Anchor Links and named anchors, image tag and using image mapping for hotspot, working with forms: Form tag, POST and GET methods, working with Text input, Text Area, Checkbox and radio and other form elements;
3	Introducing CSS, Types of style sheets: inline, embedded and external style sheets, working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, various types of CSS selectors: universal, class, ID, child, descendent, adjacent sibling, attribute and query.
4	Client Side Scripting: Introduction to JavaScript, data types, Operators, conditional and iterative Statements, Introduction to arrays, arrays with methods, Math, String and Date objects, working with DOM: Window, Navigator, History, Location, Link, Anchor and form elements, functions and objects, methods, handling events and form validations
5	Advanced JavaScript: Browser Management and Media Management – Classes – Constructors – Object-Oriented Techniques in JavaScript – Object constructor and Prototyping - Sub classes and Super classes – JSON - JQuery and AJAX.
6	Why PHP and MySQL?, Server-side web scripting, Installing PHP, Adding PHP to HTML Syntax and Variables, PHP control structures and loop, Passing information between pages, Strings, Arrays and Array, Functions, Numbers, working with String and Regular Expressions
7	Concept of Cookies and sessions, when and how to use cookies and sessions, Using MySQL to create database and tables, using queries to inset and update data, using PHP to interact with MySQL, Displaying data from tables in tables, using form data to insert, update database, deleting data from table by getting criterion through forms, working with E-Mail

Course Number	Course Name	L-T-P- Credits	Year of Introduction
107	C Lab	0L +0T + 4P= 2C	2018-19
<b>Course Objective :</b>			
This is companion course of C Programming			
<b>Syllabus Broad Units:</b>			
This Companion course of C programming; Practical aspects of C programming towards problem solving is covered.			
<b>Expected Outcome :</b>			
The students will develop adequate programming skills with respect to following			
<ol style="list-style-type: none"> <li>1. Implement a real world problem using basic constructs of C language.</li> <li>2. Develop an application using Decision making and looping</li> <li>3. Make use of proper operators to solve problem.</li> <li>4. Make use of Arrays and pointers efficiently and handling strings.</li> <li>5. Comprehend the dynamic memory allocation and pointers in C.</li> <li>6. Able to define new data types using enum, structures and typedef.</li> </ol>			
<b>References (Books, Websites etc) :</b>			
<ol style="list-style-type: none"> <li>1. Let us C - Y.Kanetkar, BPB Publications</li> <li>2. Programming in C - Gottfried B.S., TMH</li> <li>3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI</li> <li>4. Programming in ANSI C - Balaguruswami, TMH</li> <li>5. C- The Complete Reference - H.Sohildt, TMH</li> <li>6. A Structured Programming Approach using C – B.A. Forouzan&amp; R.F. Gillberg, THOMSON Indian Edition</li> <li>7. Computer fundamentals and programming in C – PradipDey&amp; ManasGhosh, OXFORD</li> </ol>			

### C Lab Outline

Sr. No	Programming Exercises
1	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E Note : <i>Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented.</i> <i>gcc or an equivalent compiler is assumed.</i>
2	Program to demonstrate the following <ul style="list-style-type: none"> <li>- Branching</li> <li>- Nested Branching</li> <li>- Looping</li> <li>- Selection</li> </ul>

3	<p>Working with functions</p> <ul style="list-style-type: none"> <li>- Writing function prototype and definition</li> <li>- Using functions to solve problems (Calling a function )</li> <li>- Using recursion</li> <li>- Storage classes - Using register, extern and static</li> </ul>
4	<p>Using debugger and Creating Libraries</p> <p>Important Commands - break, run, next, print, display, help</p> <p>Functions</p> <p>Creating Header file for Function Prototype</p> <p>Compiling and storing Function Definition in Library (archive) file</p>
5	<p>Arrays</p> <p>1D - Linear Search, Sort</p> <p>2D - Matrix operations</p> <p>Strings, Structure, Union</p>
6	<p>Pointers, Dynamic Memory Allocation</p> <p>Structure Pointer</p> <p>Array of Pointers, Ragged Arrays, Function pointer</p>
7	<p>Structures</p> <p>Making use of structures to define new types(user defined types)</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
108	Soft Skills	2L+0T+0P=2C	2018-19
<b>Course Objective :</b> <ol style="list-style-type: none"> <li>To provide Confidence building and soft skills development.</li> <li>To develop decision making and analytical skills.</li> <li>To let students make a transition from the academic mode to the corporate and entrepreneurial mode</li> </ol>			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>This course would be handy for those who are attending interviews at the company premises, even if it is arranged by the institute. You need to differentiate yourself as a better candidate than others, which is the key to get a job.</li> <li>This will go a long way in improving your career prospects by developing skills required by a practicing manager. Thus, you will be able to handle challenging corporate assignments. Being a fresher, you will be closely monitored by your superior. This course will give you confidence to impress them with your professional attitude.</li> <li>Industry expects to spot out people for better positions, with the qualities of leadership. This is where this program will help you acquire some of the qualities of leadership.</li> </ul>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Course Plan</b>			
<b>Sr. No</b>			
<b>1</b>	<b>Business Communication Skills – Email correspondence:</b> E-mail etiquette and Writing Skills, Features of Business Correspondence, Tips for writing Business E-mails, Do's and Don'ts of Business Communication, Examples and Exercises		
<b>2</b>	<b>The Art of Effective Communication:</b> Communication skills: the importance of removing barriers, Source, Encoding, Channel, Decoding, Receiver, Feedback, Johari's Window, Public Speaking and Presentation tips, Body Language Tips, Listening skills, Common Grammatical mistakes in Written and spoken communication, Negotiation		
<b>3</b>	<b>Time Management:</b> Importance of setting Tasks, Applying basic principles of Time management; identify productivity cycles, and set goals and priorities, Create a time management plan and a daily plan, Effectively utilize time by using technology and reducing time wastage. Manage interruptions, increase meeting productivity, overcome personal time wasters, and prevent personal work overloads, Screen and organize information to reduce information overload		
<b>4</b>	<b>How to create a winning CV:</b> Designing an Impressive CV, Defining the objective, Customizing the CV for each job, Identifying and Highlighting the right set of strengths, Presentation of academic and		

	professional achievements, Formatting Styles, Do's and Don'ts and common mistakes, Examples and Exercises
<b>5</b>	<p><b>How to prepare for Interview:</b></p> <p>Introspection: Knowing yourself, your comfortable areas or subjects, Companies, sectors, functions, Employer Research, Skill set and competency mapping, Attire and Etiquette : Greetings, posture, handshakes, manners and actions, Common Interview blunders, Frequently asked questions for Freshers and Experienced professionals, Simulated Interview Situations, Do's and Don'ts before an Interview, Common formats of Company Interview assessments, What to speak?, Latest developments about the specific sector for last 5 years, Study of regulators for sectors.</p>
<b>6</b>	<p><b>Preparing for Group discussion and aptitude test:</b></p> <p>Structure and Format of a GD, Difference between a Discussion &amp; an Argument, Observing, Reflecting and designing responses within a group, The art of being assertive and persuasive, Defending your turf, Defining the correct Body Language and posture, Deconstructing Topics, Common Do's and Don'ts, Practice and Exercise</p>
<b>7</b>	<p><b>Fear Factor: Removing Stage Fear</b></p> <p>Presentation Skills, Public Speaking skills, Importance of Eye Contact, Audience engagement, Forms of speech, Content Preparation, Debating, Extempore, Do's and Don'ts, Sample Exercises</p>

# **SEMESTER II**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
201	Data Structures and Algorithms	3L + 1T+ 0P= 4C	2018-19
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>To make familiar with linear &amp; non linear data structures</li> <li>To develop skills to analyze the problem given and to design &amp; develop an efficient solution to given problem</li> <li>To develop capability to choose appropriate data structures for given problems</li> <li>To imbibe programming skills &amp; thereby making industry ready</li> </ul>			
Syllabus Broad Units :			
<b>Expected Outcome :</b> After undergoing this course, student will <ol style="list-style-type: none"> <li>Have thorough knowledge about data structures</li> <li>Ability to design&amp; develop program using linear data structures&amp; non linear data structures for solving problems</li> <li>Ability to choose appropriate data structures for problem solving</li> <li>Ability to use combination of these data structures for problem solving.</li> </ol>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, <b>Computer Science A Structured Programming Approach Using C</b></li> <li>Basavraj S Anami, ShanmukhappaAngadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.</li> <li>Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse &amp; Bruce Leung, Data Structures &amp; Program Design in C, Pearson Education,</li> </ol>			
<b>Pre-requisites</b> Any programming language			
<b>Suggested MOOC :</b> Data structures and Algorithms, Prof. SudarshanIyengar, IITRopar, 8 weeks, Rerun Feb 05, 2018 <a href="https://onlinecourses.nptel.ac.in/noc16_cs06">https://onlinecourses.nptel.ac.in/noc16_cs06</a> at NEPTEL			

Course Plan	
Unit	Contents
1	<b>Elementary Data Structures</b> - Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.
2	<b>Linear Data Structures</b> ( Representation in Memory and operations like insertion, deletion and traversal) – one and multidimensional array, Sparse Matrics, Pointer arrays, single link list, circular link list, double link list, applications of Linked list,: Sparse Matrix Manipulation,



	Polynomial Representation, Dynamic storage Management
3	<b>Particular Linear Data Structures</b> ( Representation in Memory and operations like insertion, deletion and traversal) - Stacks: Applications: Evaluation of Arithmetic Expression, implementation of recursion, factorial calculation, Quick Sort, Tower of Hanoi Problem, queues, circular queue, dequeues; Application of queues abstract data types; Array and linked list implementations of stacks, queues, and dequeues;
4	File Handling: Creation, reading writing in a file. Pattern Matching and Extraction of data from a file. Reading and writing from files.
5	<b>Hierarchical data structures</b> - General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms. Applications of Trees. B Trees : B Tree indexing, Operations on a B Tree, SETS: Representation of Sets, Operations on Sets, Applications of Sets
6	<b>The problem of search</b> – linear and binary search algorithms and their efficiency; binary search trees and operations on binary search trees; Improving the efficiency of search through Balanced trees – AVL trees and Red-black trees, concepts of rotation. Hash tables and related concepts in detail.
7	<b>The problem of sorting</b> – The standard sort algorithms and their efficiencies; Merge sort and quick sort algorithms and their efficiencies. The binary heaps, their array implementation; Operations on heaps and heap sort algorithm.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
202	Operating Systems	3+1+0 = 4C	2018-19
<b>Course Objective:</b> The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as the structure and key functions of the operating system. Case studies will be used to illustrate and reinforce fundamental concepts.			
Syllabus Broad Units : 7			
<b>Expected Outcome :</b> At the end of this course, student should be able to <ul style="list-style-type: none"> <li>• Explain the concepts of process, address space, and file</li> <li>• Compare and contrast various CPU scheduling algorithms</li> <li>• Understand the differences between segmented and paged memories, and be able to describe the advantages and disadvantages of each</li> <li>• Compare and contrast polled, interrupt-driven and DMA-based access to I/O devices</li> <li>• Understand functioning and working of Windows as well as Unix operating system.</li> </ul>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>1. Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull</li> <li>2. Operating systems concept and design by Milan Milenkovic</li> </ol>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a> <a href="http://www.alison.com">www.alison.com</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Unit1: Introduction to Operating system:</b> Definition, Importance and functions of operating systems, Types: Batch, Timesharing, Multitasking, multiprogramming, multiprocessing, Online operating system, Real time, distributed operating systems. Various Views: Command language users view, system call users view. Operating system concept: Processes, Files, The shell. Structures: Monolithic system, layered system, Virtual Machine, Client server model.		
2	<b>Processes:</b> Process concept, Implicit and explicit tasking, process relationship (cooperation and competitions). Operating systems view of processes OS services for process management. Scheduling and types of Schedulers, Scheduling algorithms: First come first served, shortest remaining time next, Time slice scheduling, Priority based preemptive scheduling, multiple level queues, multiple level queues with feedback, Guaranteed scheduling, Lottery scheduling. Performance Evolution.		

3	<p><b>Memory Management:</b>  Basic Memory Management, monoprogramming without paging or swapping, multiprogramming with fixed partitions. Swapping: Memory Management with bit maps, and linked list. Virtual Memory, Page replacement algorithms: Optimal Page replacement algorithm, Not recently Page replacement algorithm, First in first out Page replacement algorithms, second chance Page replacement algorithms, clock Page replacement algorithms, least recently Page replacement algorithms, simulating LRU in software. Design issues for paging. Segmentation: Implementation of pure segmentation, segmentation with paging with example.</p>
4	<p><b>Interprocess communication and Synchronization:</b>  Need, Mutual Exclusion, Semaphore definition, Busy- wait implementation, characteristics of Semaphore. Queuing implementation of semaphore, Producer consumer problem. Critical region and conditional critical region, what are monitors? Need of it, format of monitor with example. Messages: Basics, issues in message implementation, naming, copying, Synchronous vs asynchronous message exchange, message length, ICS with messages, interrupt signaling via messages.</p>
5	<p><b>Deadlocks:</b>  Conditions to occurs the deadlock, Reusable and consumable resources, deadlock prevention, Deadlock Avoidance, resource request, resource release, detection and recovery,</p>
6	<p><b>File systems:</b>  Files- naming, structure, types, access, attributes, operation. Directories- system, path and operations. Implementing file and directories, disk space management, file system reliability and performance. Environment, Security flaws, Security attacks, principles for Security, user authentication. Protection domains, access control lists, capabilities.</p>
7	<p><b>Input/ output:</b>  Principles of I/O hardware: I/O devices, device controller, DMA, Principles of I/O software : goals, interrupt handler, device drivers, Device independent I/O software. RAM Disk Hardware and software, DISK Hardware and software.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
203	Software Engineering	3L + 1T +0P= 4C	2018-19
<b>Course Objective:</b> To introduce the current methodologies involved in the design and development of Software over its entire life cycle.			
<b>Expected Outcome :</b> At the end of this course, student should be able to: <ul style="list-style-type: none"> <li>• Understand life cycle models, Requirement elicitation techniques, understand the concept of Analysis and Design of software.</li> <li>• Implement software engineering concepts in software development to develop quality software which can work on any real machine.</li> </ul>			
<b>References (Books, Websites etc):</b> <ul style="list-style-type: none"> <li>• SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition.</li> <li>• Software Engineering by Sommerville, Pearson Education, 7th edition</li> <li>• Software Engineering by K.K. Aggarwal&amp;Yogesh Singh, New Age International Publishers.</li> </ul>			
<b>Course Plan</b>			
Unit	Contents		
1.	<b>Introduction to Software Engineering</b> Software, software characteristics, Difference between software engineering and software programming, Members involved in software development. Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis. General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, Spiral and Rapid Application Development model). Agile Software Development methodologies.		
2.	<b>Requirement Engineering Concepts and Methods</b> What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process. Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable Case study on DFD and ERD mechanism.		
3.	<b>Design Concept and Methods</b> Software Design and software Engineering. Software Design process and principles, Design concepts: Abstraction, Refinement, Modularity, Architecture, Control hierarchy, Structural partitioning, Data structure, Procedure and Data hiding  Modular design: Functional independence, Cohesion and Coupling concepts Architectural design process: Transform flow and Transaction flow User Interface design: - Elements of good design, design issues, Features of modern GUI, Guidelines for interface design Procedural design: - Structured Programming, Program Design Language Report Design		

4.	<p><b>Software Quality Assurance</b>  Quality concept: (quality, quality control, quality assurance, cost of quality), SQA activities, SQA plan.  Formal Technical review: Review meeting, review reporting and review guidelines  Software Configuration Management: - What is configuration management, Baseline, Software Configuration items.  SCM process- Identification of objects, Version control and Change control</p>
5	<p><b>Software Testing and Testing Strategies</b>  Software Testing Fundamentals:-Testing Objectives and Testing Principles.  White Box Testing, Black Box Testing: - Graph Based Testing Methods, Equivalence Partitioning, Boundary Value Analysis.  Testing Strategies for Conventional Software: - Unit Testing, Integration Testing (Top-down and Bottom-up Integration)  Validation Testing: - Validation Test Criteria, Configuration Review, Alpha and Beta Testing  System Testing: - Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing  The Art of Debugging – The Debugging Process.</p>
6	<p><b>Maintenance and Reengineering</b>  Software maintenance: - Importance and types of maintenance, Concept of Re-engineering, Software reengineering process model Reverse engineering: - to understand process, data and user interfaces  Restructuring: Code and Data restructuring  Forward engineering: - for client server architecture and user interfaces</p>
7	<p><b>Computer Aided Software Engineering</b>  What is CASE? Importance of CASE tools  Various Tools: -  1) Information engineering  2) Project planning tools  3) Risk analysis tools  4) Project management and testing tools  5) Tools for Quality assurance  6) Software Configuration Management  7) Analysis and design  8) Database management  9) Interface design and programming tools</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
204	Statistical Techniques	2+1+0 = 3C	2018-19
<b>Course Objective:</b> The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.			
Syllabus Broad Units :			
<b>Expected Outcome :</b> (i) To compute various measures of central tendency, dispersion, skewness and kurtosis. (ii) To analyze data pertaining to attributes and to interpret the results. (iii) To compute the correlation coefficient for bivariate data and interpret it. (iv) To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables. (v) To fit linear regression model to the bivariate data (vi) They are able to construct predicate model.			
<b>Reference Books:</b> <b>Fundamentals of Statistics , S.C.Gupta, Seventh Edition ,Himalaya Publishing House</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Statistics:</b> Meaning of Statistics as a Science, Importance of Statistics Scope of Statistics, Statistical organizations in India and their functions: CSO, ISI, NSS, IIPS (Devnar,Mumbai), Bureau of Economics and statistics, Types of data: Primary data, Secondary data , Cross-sectional data, time series data, directional data, Classification: Raw data and its classification, ungrouped frequency distribution,, grouped frequency distribution, cumulative frequency distribution, and relative frequency distribution.		
2	<b>Measures of Central Tendency</b> Concept of central tendency of statistical data, Statistical averages, characteristics of a good statistical average. Arithmetic Mean (A.M.): Definition, effect of change of origin and scale, combined mean of a number of groups, merits and demerits, trimmed arithmetic mean. Mode and Median: Definition, formulae (for ungrouped and grouped data), merits and demerits, Quartiles, Deciles and Percentiles (for ungrouped and grouped data), Geometric Mean (G.M.): Definition, formula, merits and demerits. Harmonic Mean (H.M.): Definition. Formula, merits and demerits. mean Weighted Mean: weighted A.M., G.M. and H.M. Measures of Dispersion :Concept of dispersion, characteristics of good measure of dispersion. Range, Quartile deviation Mean deviation: Definition, merits and demerits, Variance and standard deviation		
3	<b>Moments, Skewness and Kurtosis</b> Raw moments ( $m'_r$ ) for ungrouped and grouped data. , Central moments ( $m_r$ ) for ungrouped and grouped data, Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Karl Pearson's coefficient		

	of skewness, Measures of skewness based on moments ( $\beta_1, \gamma_1$ ) Concepts of kurtosis, Measures of kurtosis based on moments ( $\beta_2, \gamma_2$ ).
4	<p><b>Theory of Attributes</b></p> <p>Attributes: Concept of a Likert scale, classification, notion of manifold classification, dichotomy, class- frequency, order of a class, positive class frequency, negative class frequency, ultimate class frequency, relationship among different class frequencies (up to three attributes), and dot operator to find the relation between frequencies, fundamental set of class frequencies. Consistency of data upto 2 attributes. Concepts of independence and association of two attributes. Yule's coefficient of association (Q),</p>
5	<p><b>Correlation:</b></p> <p>Bivariate data, Scatter diagram and interpretation., Concept of correlation between two variables, positive correlation, negative correlation, no correlation. variance between two variables , Karl Pearson's coefficient of correlation (r) , Spearman's rank correlation coefficient, compute Karl Pearson's correlation coefficient between ranks</p>
6	<p><b>Regression:</b> Meaning of regression, difference between correlation and regression, Concept of error in regression, error modeled as a continuous random variable. Simple linear regression model Estimation of a, b by the method of least squares. Interpretation of parameters.</p>
7	<p><b>Times Series</b></p> <p>Introduction, Component of a time series, Analysis of time series, Mathematical models for time series, Measurement of Seasonal Variations, Measurement of Cyclical Variations ,Measurement of Irregular Variations.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
205	Financial Accounting	2L+1T+0P=3C	2018-19
<b>Course Objective :</b> <ol style="list-style-type: none"> <li>To impart basic accounting knowledge</li> <li>To enable the students to understand basic accounting principles, practice and its applications in modern business.</li> </ol>			
<b>Prerequisite :</b> Students should know the basic principles of accounts and concepts .			
<b>Expected Outcome :</b> <ol style="list-style-type: none"> <li>The knowledge of accounting and its principles at basic level.</li> <li>Practical's in Tally and Excel for Financial Accounting assignments</li> </ol>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>Anil Chowdhry , Fundamentals of Accounting &amp; Financial Analysis (Pearson Education)</li> <li>M.E.ThukaramRao, Accounting for Managers.( New Age International Publishers)</li> <li>M.G.Patkar, Book-Keeping &amp;Accountancy.Std XI( FYJC) Commerce</li> <li>Dr. S. N. Maheshwari , Financial Accounting For Management: (Vikas Publishing House)</li> <li>Robert Anthony, David Hawkins , Business Accounting. (Tata McGraw –Hill)</li> </ol>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	<b>Unit 1: Introduction:</b> Need for Accounting, Financial Accounting-definition, Scope and objectives. Accounting v/s Book Keeping. Limitations of Financial Accounting, End users of financial statements. Accounting Concepts and Conventions, Branches of accounting. Accounting Standard-Scope and Functions.		
2	<b>Unit 2: Journal and Ledger:</b> Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, posting and balancing of account, Trial Balance- meaning and purpose, preparation of a trial balance.		
3	<b>Unit 3: Preparation final accounts:</b> Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.		
4	<b>Unit 4: Depreciation:</b> Meaning, need & importance of depreciation, methods of charging depreciation.(WDV & SLM)		
5	<b>Unit 5: Introduction to International Accounting Standards:</b> Need for International Financial Reporting Standards (IFRS), Disclosure of Accounting Policies, reporting needs of emerging economies, IFRS for Small and Medium Enterprises(SMEs).		
6	<b>Unit 6:Computerized Accounting:</b> Computers and Financial application, Accounting Software packages. (Orientation level)		



7	<b>Unit-7: Practical Applications</b> on Tally package for accounting and its Implementation . Accounting formulas in Excel and its implementation for practical assignments
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
206	Database Management Systems Lab	2L+0T+2P=4C	2018-19
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>The main objective is to teach the concepts related to database its techniques and Operations.</li> <li>SQL (Structured Query Language) is introduced in this subject.</li> <li>This helps to create strong foundation for application of database design.</li> </ul>			
<b>Pre-requisites:</b> <ul style="list-style-type: none"> <li>Concept of Database Management Systems,</li> <li>Familiarity with data processing concepts and applications.</li> </ul>			
<b>Expected Outcome :</b> At the end of this course, students should be able to: <ul style="list-style-type: none"> <li>Understand the theoretical and physical aspect of a relational database.</li> <li>Implementation of RDBMS concepts through Oracle.</li> <li>Construct Simple and complex queries on sample datasets</li> <li>Writing PL/SQL blocks</li> </ul>			
References (Books, Websites etc.):1. IvanBayross SQL,PL/SQLTheProgramming LanguageofOracle 3rd Revised Edition BPB Publications.			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Oracle and SQL:</b> History, Features, Versions of Oracle, Database Structure: Logical Structure and Physical Structure, Oracle Architecture: System Global Area Processes: Server Processes, Background Processes, Tools of Oracle: SQL * Plus, PL/SQL, Forms, Reports, Pre Compilers:SQL Loader, Import, Export. <b>Introduction to SQL:</b> Keywords, Delimiters, Literals, Data Types, Components of SQL: <b>DDL Commands</b> – Defining a database in SQL, Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check. Altering Constraints. <b>DML Commands</b> - Inserting, updating, deleting data, <b>DQL Commands:</b> Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table, Creating table from a table, Inserting data from other table, Table alias, and Column alias. <b>DCL commands</b> - Granting and Revoking Permissions		
2	<b>Operators and Functions:</b> <b>Operators:</b>		

	<p>Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN &amp; NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect, Grouping data.</p> <p><b>Functions:</b> Aggregate Functions, Numeric Functions, String Functions , Date Functions, Conversion Functions, Miscellaneous Sub queries</p>
3	<p><b>Joins:</b> Relating data through join concept. Simple join, equi join, non equi join, Self join, Outer join</p>
4	<p><b>Database Objects:</b> <b>Views:</b> Introduction, Creating a View, Selecting data from a view, Updateable views, Views on multiple tables, Destroying a View.</p> <p><b>Sequences:</b> Introduction, Creating a Sequence, Altering a Sequence, Referencing a Sequence, Dropping a Sequence.</p> <p><b>Index:</b> Introduction, Creating Index, Simple Index, Unique Index, Reverse Key Index, Dropping Index.</p>
5	<p><b>Introduction To PL/SQL:</b> Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, PL/SQL Block: Attributes %type, %rowtype, Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement, Commit, Rollback, Savepoint</p>
6.	<p><b>Cursor Management and Triggers:</b> <b>Cursor:</b> Explicit &amp; Implicit Cursor, Declaring Cursor Variables, Constrained &amp; Unconstrained Cursor Variables, Opening Cursor, Fetching Cursor into Variables, Closing Cursor, Cursor For Loops, Parametric Cursors.</p> <p><b>Triggers:</b> Definition, Syntax, Parts of triggers: statement, body, restricted, Types of triggers: Enabling &amp; disabling triggers.</p>
7	<p><b>Stored Procedures / Functions and Exception Handling:</b> Introduction, How oracle executes procedures/ functions, Advantages, How to create Procedures &amp; Functions, Examples.</p> <p><b>Error Handling in PL/SQL:</b> Exception Handling &amp; Oracle Engine, Oracles Named Exception Handlers, User Named Exception Handlers.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
207	Data Structures Lab	0L+0T+4P =2C	2018-19

**Course Objective :**

This is companion course of Data Structures and Algorithm

**Syllabus Broad Units:**

This Companion course of Data Structure and algorithm. Algorithms to use different data structures are covered in theory. Students will implement C Programs for these data structures.

**Expected Outcome :**

The students will develop adequate programming skills with respect to following

1. Implement a real world problem using appropriate data structure.
2. Implement data structures like array, stack, queue, linklist and applications of these data structures.
3. Use files for reading, writing and manipulation.
4. Make use of appropriate searching and sorting techniques appropriately.

**References (Books, Websites etc) :**

1. Data Structures using C - Y.Kanetkar, BPB Publications
2. Yashawant Kanetkar, BPB Publication
3. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C
4. Basavraj S Anami, Shanmukhappa Angadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.
5. Andrew Tenenbaum, Thomson, 2005, Data Structures with C. Robert Kruse & Bruce Leung, Data Structures & Program Design in C, Pearson Education,

**Suggested MOOC :**

Please refer these websites for MOOCS:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

## DS Lab Outline

Sr. No	Programming Exercises
<b>1</b>	<p>Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.</p> <p>Use Linux environment to execute C Programme.            Note :<i>Algorithm of every program should be written. Properly document the programs using comments. Author name and date, purpose of each variable and constructs like loop and functions should be indicated/ documented. gcc or an equivalent compiler is assumed.</i></p>
<b>2</b>	<p>Program to demonstrate the following:</p> <ul style="list-style-type: none"> <li>- insertion, deletion and traversal in one and multidimensional array, single link list, circular link list, double link list,</li> </ul> <p>Addition of Polynomial using array/ link list</p>
<b>3</b>	<p>insertion, deletion and traversal in Stacks, queues, circular queue, deque, :</p> <p>Programs to demonstrate:</p> <ul style="list-style-type: none"> <li>- Evaluation of Arithmetic Expression,</li> <li>- implementation of recursion like factorial calculation, Quick Sort, Tower of Hanoi Problem</li> <li>- linked list implementations of stacks, queues, and deque;</li> </ul>
<b>4</b>	<p>Programs to demonstrate:</p> <ul style="list-style-type: none"> <li>- Creation, reading writing in a file.</li> <li>- Pattern Matching and Extraction of data from a file.</li> <li>- Reading and writing from files.</li> </ul>
<b>5</b>	<p>Programs to demonstrate:</p> <ul style="list-style-type: none"> <li>- binary tree traversal</li> <li>- depth first and breadth first traversal of trees</li> </ul>
<b>6</b>	<p>Programs to demonstrate:</p> <ul style="list-style-type: none"> <li>- linear and binary search algorithms and their efficiency;</li> <li>- The standard sort algorithms (bubble,selection,insertion) and their efficiencies;</li> <li>- Merge sort and quick sort algorithms and their efficiencies.</li> </ul>

# **SEMESTER III**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
301	Artificial Intelligence	3L+1T+0P = 4C	2018
<p><b>Course Objective :</b>  Students After completion of the course will get the knowledge of area like machine learning, robotics, natural language processing, and multi-agent systems.  Students should be able to:</p> <ul style="list-style-type: none"> <li>• Representation an AI problem or domain model, and construct domain models in that representation</li> <li>• Choose the appropriate algorithm for reasoning within an AI problem domain</li> <li>• Implement and debug core AI algorithms in a clean and structured manner</li> <li>• Design and analyze the performance of an AI system or component</li> <li>• Describe AI algorithms and representations and explain their performance, in writing and orally</li> </ul>			
<p><b>Expected Outcome :</b>  At the end of the course a student should be able:</p> <ul style="list-style-type: none"> <li>• Understand various search methods</li> <li>• Use various knowledge representation methods.</li> <li>• Understand various Game Playing techniques</li> <li>• Use Prolog Programming language using predicate logic</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>• “Artificial Intelligence” -By Elaine Rich And Kevin Knight (2nd Edition) Tata McGraw-Hill</li> <li>• Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI</li> <li>• Introduction to Prolog Programming By Carl Townsend.</li> <li>• “PROLOG Programming For Artificial Intelligence” -By Ivan Bratko( Addison-Wesley)</li> <li>• “Programming with PROLOG” –By Klocksins and Mellish.</li> </ul>			
<p><b>Suggested MOOC:</b>  Please refer these websites for MOOC’s:  NPTEL / Swayam  www.edx.com  <a href="http://www.coursera.com">www.coursera.com</a></p>			

### Syllabus:

Unit	Contents
1	<p><b>Introduction:</b>  What is AI? ,The AI Problems, Background/history, What Is An AI Techniques, The Level Of The Model, Criteria For Success, Some General References, High-level overview of field, State of the art.</p>
2	<p><b>Introduction and historical perspective, Hard and Soft AI –</b>  disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the prepare- deliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI.  Problems, State Space Search &amp; Heuristic Search Techniques:Defining The Problems As</p>

	A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate – And-Test, Hill Climbing, Best-First Search, ProblemReduction, ConstraintSatisfaction, Means-Ends Analysis.
3	<b>Knowledge Representation Issues:</b> Representations And Mappings, Approaches To Knowledge Representation.Using Predicate Logic: Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Representing knowledge Using Rules: Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning
4	<b>Symbolic Reasoning under Uncertainty:</b> Introduction To Non-monotonic Reasoning, Logics For Non monotonic Reasoning.Statistical Reasoning: Probability And Bays' Theorem, Certainty Factors And Rule-Base Systems, Bayesian Networks, Dumpster-Shafer Theory, Fuzzy Logic.Weak Slot – and-Filler Structure. Semantic Nets, Frames. Strong Slot and Filler Structures : Conceptual Dependency, Scripts, CYC
5	<b>Game Playing:</b> Overview, And Example Domain: Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques.Understanding: What is understanding? , What makes it hard?, As constraint satisfaction
6	<b>Natural Language Processing:</b> Introduction, Syntactic Processing, Semantic Analysis, Semantic Analysis, DiscourseAnd Pragmatic Processing, Spell Checking. Connectionist Models: Introduction: Hopfield Network, Learning In Neural Network, Application Of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI AndSymbolic AI.
7	<b>Introduction to Prolog :</b> Introduction To Prolog: Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and LocalVariables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AI Programming Languages



Course Number	Course Name	L-T-P- Credits	Year of Introduction
302	Computer Networks	3L+1T+ 0P = 4C	2018
<p><b>Course Objective:</b> The key objective is to acquire a foundational understanding of computer network and communication technologies. Networking concepts will be illustrated using TCP/IP networks.</p>			
<p><b>Expected Outcome :</b> At the end of the course a student should be able:</p> <ul style="list-style-type: none"> <li>• Students will acquire a good knowledge of the computer network, its architecture and operation.</li> <li>• Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters).</li> <li>• Students will be able to follow trends of computer networks. So, students will get exposed to advanced network technologies like MANET, WSN, and 7G, IoT.</li> </ul>			
<p><b>References (Books, Websites etc) :</b> <b>Text Books:</b></p> <ul style="list-style-type: none"> <li>• A.S. Tanenbaum, <b>Computer Networks</b> (4<sup>th</sup> ed.), Prentice-Hall of India, Latest Edition</li> <li>• W.Behrouz Forouzan and S.C. Fegan, <b>Data Communication and Networking</b>, McGraw Hill, Latest Edition</li> </ul> <p><b>Reference Books:</b></p> <ul style="list-style-type: none"> <li>• Network Essential Notes GSW MCSE Study Notes</li> <li>• Internetworking Technology Handbook CISCO System</li> <li>• Introduction to Networking and Data Communications Eugene Blanchard</li> <li>• Computer Networks and Internets with Internet Applications Douglas E. Comer</li> </ul>			
<p><b>Suggested MOOC :</b> NPTEL: <a href="http://www.nptel.ac.in/courses/106106091/">http://www.nptel.ac.in/courses/106106091/</a></p>			

### Syllabus:

Unit	Contents
1	<p><b>Introduction to Computer Network:</b> What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, Network software: Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, Network Models: The OSI Reference Model, The TCP/IP Reference Model</p>
2	<p><b>Basics of Data Transmission / Physical Layer:</b> Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum Transmission Media&amp; its Characteristics: Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching, Mobile Telephone Systems: 1G to 7G</p>
3	<p><b>Network Layer: Network Layer Design Issues; Routing Algorithms:</b> Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State</p>

	Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, <b>Congestion Control Algorithms:</b> General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control,
4	<b>IP Addressing:</b> IP-Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6- packet format, addressing scheme, security, applications and limitations of IPv6. IPv4 Vs IPv6
5	<b>Domain Network Services (DNS) :</b> Domain Names, Authoritative Hosts, Delegating Authority, Resource Records, SOA records, DNS protocol, DHCP & Scope Resolution
6	<b>Transport and Application Support Protocols:</b> Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, Application Layer: Hyper Text Transfer Protocol (HTTP) HTTP request, Request Headers, Responses, MIME–Multipurpose Internet Mail Extensions, SMTP–Simple Mail Transfer Protocol, POP – Post Office Protocol, IMAP – Internet Message Access Protocol, FTP – File Transfer Protocol, Telnet – Remote Communication Protocol
7	<b>Advance Networks:</b> Concept of 7G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, Mobile Ad-hoc Networks: Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, Wireless Sensor Networks: Sensor networks overview: Introduction, applications, design issues, requirements. Introduction to IOT

Course Number	Course Name	L-T-P- Credits	Year of Introduction
303	Object Oriented Analysis And Design	3L + 1T + 0P= 4C	2018
<p><b>Course Objective :</b> The course aims at developing skills to analyze and design a software system using Object Oriented Analysis and Design (OOAD) and UML. And use these skills in Unified Process (UP) environment.</p>			
<p><b>Expected Outcome : At the end of the course a student should be able:</b></p> <ul style="list-style-type: none"> <li>• Understand and describe the Object Oriented concepts</li> <li>• Describe Object Oriented Analysis and Design(OOAD) concepts and apply them to solve problems</li> <li>• Prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language</li> <li>• Describe the activity carried out in each and every phase of Rational Unified Process(RUP)</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>• Martin Fowler (2003), UML Distilled, 3rd Edition, Pearson Education.</li> <li>• Applying UML and Patterns</li> <li>• Roger Pressman(2009), Software Engineering: A Practitioner's Approach, Roger Pressman, ; 7th edition, McGraw-Hill</li> <li>• Brett D. McLaughlin (2006), Head First Object-Oriented Analysis and Design , 1 edition, O'Reilly</li> </ul>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com</p>			

### Syllabus:

Unit	Contents
1	<p><b>Introduction To Object Orientation:</b>  <b>Overview:</b> Review of SDLC, waterfall, spiral, iterative and incremental models, Iterative development and Rational Unified Process(RUP),  <b>Object Orientation :</b> Introduction to Object Orientation, Principles of Object, Orientation: Abstraction, Encapsulation, Modularity, hierarchy, OO Concepts, Object Oriented Analysis (OOA) and Object Oriented Design(OOD)  <b>Concept of Modeling:</b> Importance of Modeling, principles of Modeling, object oriented Modeling, object Modeling techniques.</p>
2	<p><b>Introduction To UML:</b>  Basics of UML: What is UML? History of UML, Goals of UML,  Building Blocks of UML: Elements- structural, behavioral, grouping, annotation, relationships- links, dependency, association, aggregation, generalization, realization, Use Case modeling, conceptual modeling, behavioral modeling.</p>

3	<p><b>Use Case Model (Requirement Modeling):</b>  Understanding requirements, requirements types, goal and scope of use cases, levels of use cases, identifying use cases, identifying actors, naming use cases, elementary business processes, actors and actor types ,  Use Case Diagrams, examples, Use case relationships (include, extend and generalize);  Concrete, Abstract, Base, and Addition Use Cases</p>
4	<p><b>Activity Diagram:</b>  Decomposing an action, partitions, signals, tokens, flow and edges, pins and transformations, expansion regions, flow final, join specification decision, fork, join, swimlanes.</p>
5	<p><b>Domain Modeling:</b>  Introduction to Domain Models, Domain modeling guidelines, conceptual class identification , strategies to identify conceptual classes,  Adding Associations: Introduction to association, Finding and adding association, Common Associations List, Association Guidelines, Association Roles, Naming Associations, finding attribute and its types, UML Attribute Notation, attributes and foreign Keys, Multiplicity</p> <p><b>Class Diagram :</b>  Design Class Diagrams(DCD):When to create Class Diagrams, how to Design Class Diagrams, identify classes, class notations, stereotypes for classes, attribute and operation scope, types of classes, class relations, multiplicities, roles, class diagrams.</p>
6	<p><b>System Sequence Diagram :</b>  moving from inception to elaboration, system behavior, introduction to system sequence diagrams, Example of system sequence diagrams, Inter- System Sequence Diagram, system sequence diagrams and Use Cases,  System Events and the System Boundary, Example of System Sequence Diagrams.</p> <p><b>State Chart Diagram:</b>  Modeling behavior in state chart diagram, events, states, and transitions in state chart Diagrams.</p>
7	<p>Illustration of Collaboration diagram, component diagram, Deployment diagram with suitable examples.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
304	Probability and Graph Theory	2L + 1T +0P = 3C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>• Learn and become comfortable with a body of results and definitions,</li> <li>• Practice creative problem solving and improve skills in this area,</li> <li>• Practice and improve writing skills.</li> <li>• Understand some applications of graph theory to practical problems and other branches of mathematics.</li> <li>• Learn about how graph theory developed via a creative organic historical process.</li> <li>• See that the simplicity of graph theory (a) makes them ubiquitous, and (b) makes it easier to be creative in these fields than in others.</li> </ul>			
<b>Expected Outcome :</b> At the end of the course a student should be able: <ul style="list-style-type: none"> <li>• To perform Simple random experiment.</li> <li>• Analysis the data from Simulation experiments using appropriate Statistical Methods.</li> <li>• Aware of some important applications of probability and statistics in the analysis of information systems.</li> </ul>			
<b>Text/Reference Books:</b> <ul style="list-style-type: none"> <li>• Kenneth H. Rosen, “Discrete Mathematics and its Applications”, Mc.Graw Hill, 2002.</li> <li>• S.C.Gupta ,” Fundamentals of Statistics seven Revised Editions”</li> <li>• Desgin and Analysis of Algorithms, Prentice –Hall of India private Limited New Delhi -2008</li> <li>• Discrete Mathematics Schaum’s outlines</li> <li>• Discrete Mathematics and its Applications VII Edition Kenneth Rosen</li> <li>• Discrete Mathematics N Ch SN Iyengar</li> <li>• Narsing Deo- Graph Theory with Applications to Computer Science and Engineering ; Prentice Hall, India</li> <li>• Ron Clark and Derek Holton- Graph Theory, Narosa</li> </ul>			
<b>Suggested MOOC :</b> NPTEL: <a href="http://www.nptel.ac.in/courses/106106091/">http://www.nptel.ac.in/courses/106106091/</a>			

### Syllabus:

Course Plan	
Unit	Contents
1	<b>Theory of Probability:</b> Introduction, Permutation and Combination concept, types of probability, Mutually Exclusive and Mutually Exhaustive concept ,Independent event, Conditional probability ,Addition theorem of Probability, Multiplication Theorem, Bayes’s Theorem.
2	<b>Random Variable ,Probability distribution and Mathematical Expectation:</b> Random Variable, probability distribution of a Discrete Random variable, Probability distribution of a continuous random variable, Distribution function or cumulative probability function moments, Mathematical Expectation, Theorem on Expectation.

3	<p><b>Theoretical Distributions:</b>  Introduction, Binomial Distribution, probability functions of Binomial distribution, constant of Binomial distribution, mode of binomial distribution, Fitting of Binomial distribution. Poisson distribution, utilities or Importance, constant of Poisson distributions, mode, fitting of Poisson's distribution. Normal distribution, equation, curve, properties, importance, relation between binomial and normal distribution, relation between Poisson and Normal distribution.</p>
4	<p><b>Sampling Theory :</b>  Introduction, Population, Sampling, principles, Limitations, Types of Sampling, Simple random Sampling, Stratified random Sampling System sampling, Cluster sampling, Multistage sampling, Quota sampling.</p>
5	<p><b>Testing of Hypothesis:</b>  Introduction, Student's t distribution, properties, critical values of t, application of t – distribution, Fisher's transformation, critical values of F – distribution, Applications of F-distribution, chi square test.</p>
6	<p><b>Basic Concept of Graph:</b>  Introduction, Graphs and Multi graphs, sub graphs, Isomorphic Graphs, Homomorphism Graphs, Paths, Connectivity ,labeled Graphs, Weighted Graphs ,Complete graphs, Planer Graphs,  Introduction, Directed Graphs, Rooted Trees, Represented of Directed Graphs, Incidence and Adjacency Matrices, Eulerian and Hamiltonian Graphs, Tree Traversing, Prims Algorithm ,Hufmann Algorithm</p>
7	<p><b>Graph Applications and Algorithm:</b>  Bridges of Konigsberge, Travelling Salesmen Problem, Seating Arrangement problem ,Crossing of river problem, Sheep cabbage problem, Utilities problem  Shortest Algorithms: Warshall's Algorithm, Dijkstra's Algorithm, Travelling Salesman problem, Depth First search, Breadth First Search</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
305	Organizational Behavior	2L+1T+ 0P = 3C	2018
<b>Course Objective :</b>			
To understand the dynamics of individual and group behaviour in organisational setting to achieve optimum utilization of human resources.			
<b>Expected Outcome:</b>			
At the end of the course, a learner should be able to			
<ul style="list-style-type: none"> <li>• To understand the implications of different models of Organizational Behavior</li> <li>• To learn the effect of attitudes, values, group dynamics in organization</li> <li>• To utilize motivation and leadership theories for delivering best results for organization.</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ul style="list-style-type: none"> <li>• Stephen Robbins, Organizational Behaviour</li> <li>• Ashwathappa, Organizational Behaviour</li> <li>• Uma Sekaran, Organizational Behaviour</li> <li>• Ricky W. Griffin, Gregory Moorhead, OB, Cengage Publication</li> </ul>			

### Syllabus:

Unit	Contents
<b>1</b>	<b>Introduction to OB:</b> Definition, importance & scope of Organization Behaviour, Multi-disciplinary approach to OB, Models of OB-Autocratic, Custodial, Supportive, Collegial, SOBC, Recent developments and challenges in OB
<b>2</b>	<b>Individual Behaviour in Organizations:</b> Attitude - Definition, Components, Sources, Job satisfaction, Perception – Definition, Process, Implications for Management, Perceptual Errors, Values – Definition and meaning, Types of value, Personality – Determinants, Traits theory, BIG FIVE, MBTI
<b>3</b>	<b>Foundation of Group Behaviour:</b> Group- Definition, Stages of Group Development, Classification of Groups, Advantages of Group Decision Making, Team – Difference between Group and Team, Creating Effective Team
<b>4</b>	<b>Conflict and Stress Management:</b> Conflict – Definition, Conflict Process, Types – Constructive and Destructive Conflicts, Levels of Conflicts and conflict Management, Stress – Definition, Causes or Sources of stress, Symptoms of stress, Management of Stress, Quality of Work-Life
<b>5</b>	<b>Motivation and Leadership:</b> Motivation – Definition, Process, Theories – Maslow Hierarchy Theory of Needs, Herzberg's Two Factor Theory, Equity Theory, Vroom's Expectancy Theory
<b>6</b>	<b>Leadership:</b> Leadership- Definition, Traits of good leader, Difference between Leader & Manger, Types of Leadership Style, Likert's 4-M management styles, Managerial Grid and its application
<b>7</b>	<b>Organization Change Management:</b> Need for Change, Reasons for Resistance of Change, Building Support for Change, Role

	of Change Agent, Process of Change Implementation, Learning organization – characteristics, Creating Learning Organization
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
306	Object Oriented Programming	3L+1T+0P= 4C	2018
<b>Course Objectives :</b> <ul style="list-style-type: none"> <li>To understand the concepts of object-oriented programming paradigms and develop skills in these paradigms using Java.</li> <li>To provide an overview of characteristics of Java and make them familiarize to use JDK and Java API for concurrent programming, input/output, Java Collections</li> </ul>			
<b>Syllabus Outline:</b> Introduction to Object Oriented concepts - Java Basics - Arrays and Strings -Inheritance – Polymorphism – Interface – Packages - Exception Handling –Multithreaded Programming – Streams and collections			
<b>Expected Outcome :</b> At the end of this course, student should be able to <ul style="list-style-type: none"> <li>Design interfaces, abstract and concrete classes needed, given a problem specification</li> <li>Implement classes designed using object oriented programming language</li> <li>Learn how to test, verify, and debug object-oriented programs and create programs using</li> <li>Make them comfort to muse Java API for Input/output and Java Collections and utility classes</li> <li>Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007</li> <li>Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008</li> <li>Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition</li> </ul>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCs: NPTEL/Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			

### Syllabus/Course Outline

Unit	Contents
1	<b>Introduction to Java:</b> Introduction: Need for OOP paradigm, Procedural approach vs. Object-Oriented approach. Object Oriented concepts Java Basics: Features of Java, History of Java, Java features, data types, variables, operators, expressions, control statements, type conversion and casting, Java compiler, JVM, Garbage collection, Data types, concept of class and object, java naming conventions

	wrapper classes, control structures in java,
2	<p><b>Class and Object Concepts:</b>          Defining a class, creating objects from class, adding attributes and methods to the class, using constructors,          Passing values to the functions – pass by value, pass by reference, Function overloading.          Modifiers – public, private, protected, default, static, final</p>
3	<p><b>Arrays and Strings:</b>          One dimensional arrays, Multidimensional arrays, exploring String class and methods, String Buffer class. Packages - creating and accessing a package, importing, packages, creating user defined packages, Concept of package, Introduction to Exception Handling.</p>
4	<p><b>Inheritance and Polymorphism:</b>          Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Throws keyword and method overriding.          Using abstract and final keywords with class declaration, Concept of interface, Compression of Interface and class.          Access modifiers and data accessibility in derived classes, method access modifier and method overriding.</p>
5	<p><b>Concurrent Programming</b>          Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Thread synchronization, inter thread communication – wait(), notify(), notifyAll() methods</p>
6	<p><b>Java Input/Output</b>          Concept of streams, types of streams – byte streams, character streams, The Console: System.out, System.in, and System.err          InputStream class, OutputStream class, File class, FileInputStreams, FileOutputStream, Reader class, Writer class, FileReader, FileWriter.          Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter.          Object Streams, issue of ‘Serialization’</p>
7	<p><b>Java Collections and Utility Classes</b>          Collection Basics- A Collection Hierarchy, Using ArrayList and Vector, LinkedList, Using a Iterator, Set: HashSet, LinkedHashSet, TreeSet , Comparable and Comparator interfaces, Map, Hashmap, HashTable, TreeMap, LinkedHashMap          Generics – Basics, class parameters, bounded types, erasures.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
307	Object Oriented Programming Lab	0L+0T+4P = 2C	2018
<b>Course Objective :</b>			
This is companion course of Object Oriented Programming			
<b>Syllabus Broad Units:</b>			
This Companion course of OO programming, Practical aspects of OOP towards problem solving is covered.			
<b>Expected Outcome :</b>			
The students will develop adequate programming skills with respect to following			
<ul style="list-style-type: none"> <li>• Write simple programs to use basic programming language constructs</li> <li>• Design interfaces, abstract and concrete classes needed, given a problem specification</li> <li>• Implement classes designed using object oriented programming language</li> <li>• Learn how to test, verify, and debug object-oriented programs and create programs using</li> <li>• Make them comfort to muse Java API for Input/output and Java Collections and utility classes</li> <li>• Able to achieve object persistence using object serialization and write modules to take advantages of concurrent programming</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ul style="list-style-type: none"> <li>• Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007</li> <li>• Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008</li> <li>• Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition</li> </ul>			

### OOP Lab Outline

Sr. No	Programming Exercises
1	<b>Writing, compiling and Executing Java programs using basic language constructs as bellow :</b> <ul style="list-style-type: none"> <li>- Using Operators : arithmetic, relational, logical and bitwise</li> <li>- Control structures (if, if-else, switch)</li> <li>- Iterative statements (while, do-while, for)</li> </ul>
2	<b>Programming with Classes :</b> Wring a class, creating objects and using it Using constructors to initialize object Programs to demonstrate parameter passing Making use of access modifiers

3	<b>Working with Arrays and Strings:</b> <ul style="list-style-type: none"> <li>- Programs to work with single dimensional and multidimensional arrays</li> <li>- Searching and sorting</li> <li>- Programming with string and operations on it</li> <li>- Programs to understand and study string literal pool</li> </ul>
4	<b>Inheritance and Polymorphism:</b> <ul style="list-style-type: none"> <li>- Defining classes as generic types ; using it to write new class/classes</li> <li>- Need and example of method overriding</li> <li>- Writing abstract class and interface</li> <li>- Using abstract classes to write concrete classes</li> <li>- Using interface as base type to write new interface and implementing it to write new concrete class/classes</li> <li>- Anonymous and inner classes</li> </ul>
5	<b>Concurrent Programming :</b> <ul style="list-style-type: none"> <li>- Designing and using Thread class and Runnable interface</li> <li>- Thread synchronization</li> <li>- Program to demonstrate Thread priorities, thread join and making use of yield</li> <li>- Programs with classes making use of thread and inter communication between them.</li> </ul>
6	<b>Java Input/Output :</b> <ul style="list-style-type: none"> <li>- Programs to make using InputStream and OutputStream classes.</li> <li>- Reading and Writing data into files</li> <li>- Making use to console to read data.</li> <li>- Using readers and writers to write data into Files</li> <li>- Making use of Buffered Streams and reader and writer</li> <li>- Programs to take advantages of serialization</li> </ul>
7	<b>Java Collections and Utility Classes:</b> <ul style="list-style-type: none"> <li>- Programs to make use collections (ArrayList, Vector, Set and Maps)</li> <li>- Writing user defined data generic types</li> <li>- Programs to illustrate bounded types and erasures</li> </ul>

# **SEMESTER IV**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
401	Data Warehousing and Data Mining	3L+1T+0P=4C	2018
<p><b>Course Objective:</b>  This course will enable to expose the students to Study various design and implementation issues and techniques in data warehousing and data mining including, Basic concepts on knowledge discovery in databases process and tasks, Concepts, model development, schema design for a data warehouse, Data extraction, transformation, loading techniques for data warehousing, Concept description: input characterization and output analysis for data mining, Core data mining algorithms, implementation and applications, Data mining tools and validation techniques.</p>			
<p><b>Pre-requisites:</b>  Thorough understanding of: Relational database normalization techniques , Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of: Software engineering principles and techniques, Probability and statistics – Bayesian theory, regression, hypothesis testing</p>			
<p><b>Expected Outcome :</b> After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> <li>• The Fundamentals concepts of Data warehouse and Data Mining</li> <li>• Differences between a data warehouses OLAP and operational databases OLTP</li> <li>• Multidimensional data model design and development</li> <li>• Techniques for data extraction, transformation, and loading</li> <li>• Learning schemes in data mining</li> <li>• Mining association rules (Apriori)</li> <li>• Classification and prediction (Statistical based: Naïve Bayes, regression trees and model trees; Distance based: KNN, Decision tree based: 1R, ID3, CART; Covering algorithm: Prism)</li> <li>• Cluster analysis (Hierarchical algorithms: single link, average link, and complete link; Partitional algorithms: MST, K-means; Probability based algorithm: EM)</li> <li>• Use of data mining tools: C5, Cubist, Weka</li> </ul>			
<p><b>References (Books, Websites etc.):</b></p> <ul style="list-style-type: none"> <li>• Bing Liu, “ Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)”, Springer; 2nd Edition 2009</li> <li>• 2.. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP, McGrawHill, 2004</li> <li>• D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011</li> <li>• Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Harcourt India Pvt., 2011.</li> </ul>			
<p><b>Suggested MOOC :</b>  Please refer these websites for MOOC’s:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			
<b>Syllabus</b>			
<b>Unit</b>	<b>Contents</b>		

1	<p><b>Data Warehousing:</b> Introduction, Definition, data transformation, ETL (Extract, Transform, Load) processes, OLAP operations, Differences between Operational Database Systems and Data Warehouses; Difference between OLTP &amp; OLAP, Overview of Multi-dimensional Data Model, and the basic differentiation between “Fact” and “Dimension”; Multi-dimensional Cube, Concept Hierarchies of “Dimensions” Parameters: Examples and the advantages, Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases, Measures: Their Categorization and Computation, Pre-computation of Cubes, Constraint on Storage Space, Possible Solutions, OLAP Operations in Multi-dimensional Data Model: Roll-up, Drill-down, Slice &amp; Dice, Pivot (Rotate), Indexing OLAP Data; Efficient Processing of OLAP Queries, Type of OLAP Servers: ROLAP versus MOLAP versus HOLAP.</p>
2	<p><b>Data Warehouse Architecture:</b> Steps for Design &amp; Construction of A Data Warehouse, A 3-Tier Data Warehouse Architecture, Data warehouse implementation</p> <p><b>Data Pre-processing overview:</b> The need for Pre-processing, Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process, Data Integration &amp; Transformation, Data Cube Aggregation; Attribute Subset Selection, Dimensionality Reduction: Basic Concepts only, Numerosity Reduction: Regression &amp; Log-linear Models, Histograms, Clustering, Sampling, Data Discretization &amp; Concept Hierarchy Generation, For Numerical Data, For Categorical Data</p>
3	<p><b>Introduction Data Mining :</b> Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.</p>
4	<p><b>Mining Association Rules :</b> Basic Concepts, Market Basket Analysis, Mining Multi-Level and single , Association Rules From Transaction Mining Multi-Dimensional Association Rules From Relational Databases &amp; Data Warehouses, From Association Mining To Correlation Analysis, Constraint Based Association Mining, Association Rules: Apriori Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.</p>
5	<p><b>Classification &amp; Prediction:</b> Introduction to Classification and Prediction; Basics of Supervised &amp; Unsupervised Learning; Preparing the Data for Classification and Prediction; Comparing Classification and Prediction Methods, Classification by Decision Tree Induction, Attribute Selection Measures; Tree Pruning; <math>\alpha</math> -<math>\beta</math> pruning Scalability and Decision Tree Induction, Rule-based Classification: Using IF-THEN Rules for Classification; Rule Extraction from a Decision Trees; Rule Induction Using a Sequential Covering Algorithm, Bayesian Classification: Bayes’ Theorem, Naïve Bayesian Classification; Bayesian Belief Networks.</p>
6	<p><b>Cluster Analysis:</b> Introduction to Cluster Analysis; Types of Data in Cluster Analysis; A Categorization of major. Unsupervised Learning - K-means Clustering -Hierarchical Clustering –Partially Supervised Learning. <b>Applications of Cluster Analysis-</b>Clustering analysis in market research, pattern recognition, data analysis, and image processing.</p>

	<p><b>Requirements of Clustering in Data Mining:</b>  Scalability, Ability to deal with different kinds of attributes, Discovery of clusters with attribute shape, High dimensionality, Ability to deal with noisy data, Interpretability.</p> <p><b>Clustering Methods:</b>  Classification of clustering methods-Partitioning Method, Hierarchical Method, Density-based Method, Grid-Based Method, Model-Based Method, Constraint-based Method</p>
7	<p><b>Web Structure Mining:</b>  Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based, Similarity Search -Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers Evaluation- Crawler Ethics and Conflicts - New Developments</p> <p><b>Web Usage Mining:</b>  Web Usage Mining – sources of data- Applications -Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing- Cleaning and Filtering- Data Modeling for Web Usage Mining – Issues- Discovery and Analysis of Web Usage Patterns – Used tools in Web Usage mining.</p>



Course Number	Course Name	L-T-P- Credits	Year of Introduction
402	Information Security	3L+1T+0P=4C	2018

**Course Objectives :-**

To Create awareness about important issue of Information Security, understand the concept of Information Security in Business Organizations, security measures and procedures at different levels within your IT environment. Procedure to manage the security issues in systematic and scientific way.

**Expected Out Come :**

- The expected outcome of this course is to understand security policy, Information security management at all functional levels of organization. The basic background of Security and its implementation is required to undertake this course.
- The course will provide the student with an understanding of the principles of information security for IT Industry and management of important resources of the organization. Students will come to know interrelationship between the various elements of information security and its role in protecting organizations information at all level.

**Reference Book(s) :**

- Information Security Management Handbook, Sixth Edition, Volume 5-2012 Amazon Books Edited by - Micki Krause Nozaki, Harold F. Tipton.
- Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives Nina Godbole and Sunit Belpure, Publication Wiley.
- Information Security: Principles and Practice 1st , Kindle Edition -2005 Amazon Books Author - Mark Stamp
- “Cryptography and information Security” V.K. Pachghare, PHI Learning Private Limited, Delhi India.
- Analyzing Computer Security by Charles P. Pfleeger, Shari Lawerance Pfleeger, Pearson Education India,
- Practical Information Security Management: A Complete Guide to Planning and Implementation-Dec-2016 Amazon Books . Tony Campbell
- Managing Risk and Information Security :- Protect to Enable A-Press Open Access Book (Free) at <http://www.freotechbooks.com/managing-risk-and-information-security-protect-to-enable-t1150.html>

**Suggested MOOC :**

Please refer these websites for MOOC’s:

NPTEL / Swayam  
[www.edx.com](http://www.edx.com)  
[www.coursera.com](http://www.coursera.com)

Unit	Contents
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1	<p><b>Introduction and Background:</b>  Information, Information Characteristics, sources of Information, Types of Information, and Generating Information in Organizations. Business Application of Information and Information System, What is Information security? Need for Information Security , Types of Organization , Functions of Business organization , Levels of Organization , How Organizations manage the information , flow of information , IT Policy for Information protecting.</p>
2	<p><b>Basics of Networking for Security Purpose –</b>  Network Installations , Types of Networks and their security issues , Types of Network of OS. Functions of Information security officer. Different measures to safe guard the important information in the organization . Network policy for protecting important resources of the Network. Basic concept of MIS and Organization flow of Information.</p>
3	<p><b>Importance of Information Security -</b> Improvement in corporate reputation based on the height of the level of information security, threat to business continuity due to accidents related to information systems, cyber space, information assets, threats, vulnerabilities. Information Security Measures.  <b>Threats :-</b> Types of threats: physical threats (accident, disaster, fault, destruction, theft, unauthorized intrusion, etc.), technical threats (unauthorized access, eave S dropping , spoofing, alteration, error, cracking, etc.), man-made threats (operational error, loss, damage, peep, unauthorized use, social engineering, etc.), cyber-attack, information leakage, intent, negligence, mistake, fraudulent behavior, sabotage, DoS attack, rumor, flaming, SPAM e-mail, file sharing software [Malware / malicious programs] computer virus, macro virus, worm, bot (botnet, remote operated virus), Trojan horse, spyware, ransom ware, key logger, root kit, backdoor, fake anti-virus software</p>
4	<p><b>Information security technology (cryptography)-CRYPTREC</b> ciphers list, cryptography (encryption key), decryption (decryption key), decoding, symmetric cryptography (common key), public key cryptography (public key, private key)), AES (Advanced Encryption Standard), S/MIME (Secure MIME), PGP (Pretty Good Privacy), hybrid encryption, hash function (SHA-256, etc.), key management, disk encryption, file encryption, compromise. digital signature (signature key, verification key), timestamp (time authentication), message authentication, MAC (Message Authentication Code), challenge-response authentication.</p>
5	<p><b>Information security Management:</b>  management of information based on the information security policy, information, information assets, physical assets, software assets, human assets (people, and their qualifications, skills, and experience), intangible assets, service, risk management (JIS Q 31000), monitoring, information security events, information security incidents.  <b>Risk analysis and evaluation (Information asset review / Classification)</b> information assets review, classification and management by importance of information assets, information assets ledger Risk analysis and evaluation (Risk type)loss of property, loss of responsibility, loss of net earnings, human cost, operational risk, supply chain risk, risk involved in usage of external service, risk involved in distribution of information by SNS, moral hazard, estimated annual loss, scoring method, cost factor .</p>
6	<p><b>Information security regulations:</b>  (Company regulations including information security policy)organizational operation according to the information security policy, information security policy, information security purpose, information security measures criteria, information management regulations, security control regulations, documentation control regulations, regulations on measures to be taken against</p>

	computer virus infection, regulations on measures against accidents, information security education regulations, privacy policy (personal information protection policy), employment agreement, office regulations, penal provisions, outward explanation regulations, regulations for exceptions, regulations for updating rules, procedure for approving regulations.
7	<p><b>Management of Information Asset:</b> Security Incidents management, reducing risk in Information loss and keeping the information safe from unauthorized users and threats.</p> <p><b>Information Technology Act:</b> Cyber Crimes and Cyber Laws. -What are cyber-crimes? Types of cyber-crimes. Categories of Cyber Crime, Online business threats, Online business frauds Safety tips for online business.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
403	Design Patterns	3L+1T+0P=4C	2018
<p><b>Course Objective:</b> The objective of the course to emphasize how to use design patterns as general reusable solution to a commonly occurring problem. Understand the Design patterns that are common in software applications and how these patterns are related to Object Oriented design.</p>			
<p><b>Pre-requisites:</b> This course assumes students should have following knowledge:</p> <ul style="list-style-type: none"> <li>• OOAD and UML.</li> <li>• Software Engineering, Java Programming</li> </ul>			
<p><b>Learning Outcomes:</b> After completing this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand meaning and types of design Patterns</li> <li>• Identify structure and describe structure of Design Pattern</li> <li>• Given a problem able to decide which design Pattern is used</li> <li>• Understand the Design patterns that are common in software applications</li> <li>• Understand how these patterns are related to Object Oriented design.</li> </ul>			
<p><b>Text Book(s) :</b></p> <ul style="list-style-type: none"> <li>• Design Patterns Elements of Reusable Object-oriented Software- Erich Gama, Richjard Helm, Ralph Jonson and Jon Vlissides.</li> <li>• Design Patterns- Vhristopher G. Lasater, BPB Publications, 1<sup>st</sup> Indian Edition 2007.</li> <li>• Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates,</li> <li>• Ben Shneiderman, Designing the User Interface, Pearson Education, 1998</li> </ul>			
<b>Syllabus</b>			
Unit	Contents		
1	<p><b>Introduction to Design Patterns:</b> Reusable design Patterns: Meaning &amp; Use of Design Patterns, Organizing the Patterns, Describing pattern, how to use the patterns while solving the problem, Applications of different design patterns in various cases. Selection of a Design Pattern</p>		
2	<p><b>Creational Patterns:</b> <b>Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences and Implementation of following Creational Patterns :-</b> Factory Method, Abstract Factory, Builder, Prototype, Singleton. <b>Tutorial:</b> Tutorials should be conducted in LAB using JAVA for implementing Creational design pattern.</p>		
3	<p><b>Structural Patterns:</b> Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of Following Structural Patterns <b>Adapter (class), Adapter (object), Bridge, Composite, Decorator. Façade. Flyweight, Proxy.</b></p>		

	<p><b>Tutorial:</b> Tutorials should be conducted in LAB using JAVA for implementing Structural design patterns.</p>
4	<p><b>Behavioral Patterns:</b>  Intent, Motivation, Applicability, Structure, Participants, Collaborations, Consequences, Implementation of following Behavioral Pattern  <b>Interpreter, Template Method, Chain of Responsibility, Command, Iterator, Mediator, Memento, Observer, State, Strategy, Visitor</b>  <b>Tutorial:</b> Tutorials should be conducted in LAB using JAVA for implementing Behavioral Design Pattern.</p>
5	<p><b>Introduction to Human Computer Interface:</b> Need &amp; Importance of HCI, HCI &amp; human diversity, Goals and Objectives of HCI.  <b>Models of HCI:</b> Conceptual, semantic, Syntactic and Lexical Model, GMOS Model, Object-Action Interaction model, Action-Object Interaction model.</p>
6	<p><b>Principles of Design:</b> Recognition and Diversity, Eight golden rules of interface design, Error Prevention.  <b>Interaction style of Design:</b> Guidelines for Data Display and Data Entry, Direct and Menu selection, Form filling, Command Language.</p>
7	<p><b>Computer Supported co-operation:</b> Goals of co-operation, Synchronous Interactions, asynchronous and face to face Interactions.  <b>Application to education and social issues:</b> Future Applications of HCI.  Tutorials should be conducted in LAB using JAVA for implementing design patterns of Creational, Structural and Behavioral design pattern.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
407	Lab on Linux Operating System	0L+1T+4P=2C	2018
<b>Course Objective:</b> The student would be able <ul style="list-style-type: none"> <li>• To obtain knowledge of how to manage files in Linux system.</li> <li>• To understand Linux commands and write shell programming.</li> <li>• To grasp the concepts of User Management in Linux.</li> <li>• To control the system running Ubuntu operating system.</li> </ul>			
<b>Expected Outcome :</b> The course is to provide the knowledge of the Linux Operating System. This course intends to teach various features that will help the students to use and learn the working of Ubuntu /Red Hat operating system			
<b>Prerequisite:</b> Students should have basic knowledge of working on an operating system. <ul style="list-style-type: none"> <li>• Linux for beginners : An introduction to the linux operating system and command line</li> <li>• Linux: the complete reference, sixth edition paperback by Richard Petersen, McGraw Hill education</li> <li>• Unix shell Programming: by yashwant Kanitkar</li> <li>• UNIX Concepts and Applications - by Sumitabha Das</li> </ul>			
<b>Course Plan</b>			
Unit	Contents		
1	Introduction to Linux Operating system, various flavors of Linux O.S., Learning to use and Install Linux, Booting Any one flavor of Linux like ubuntu, red hat etc, Starting up ,Logging in, Exploring the desktop ,Working with virtual desktops, Getting Everything up and running ,Viewing your hardware , Getting online Using an Ethernet Card ,Joining wireless network ,Configuring Email and instant messaging, Adding a Printer , Configuring a local printer, Configuring a network printer, Setting up digital imaging devices, Transferring photos from digital camera, Configuring scanner, Configuring Bluetooth.		
2	<b>General Purpose Utilities:</b> banner (display a blown-up message), cal (The calendar), date-display the system date, who-Login detail tty-knowing your terminal uname-know your machine name passwd-change your password lock-lock your terminal echo-display message bc-the calculator. who am i,- display login name		
3	<b>Navigating the file system:-</b> pwd-checking your current directory, cd-changing directories, mkdir-Making directories rmdir-moving directories		

	<p>ls-listing files</p> <p><b>Handling Ordinary files:</b></p> <p>cat-displaying and creating files,  touch-creating empty file  cp-copying a file  rm-deleting files  mv-renaming files  more-paging output  lp-printing a fiile  file-know the file type  wc-line, word and character counting  split-splitting file in to multiple files  cmp-comparing two files  comm.-finding common  chmod-changing file permission  files searches using find command,  locate command, mount and unmount command. Understanding vi modes, Using vi to edit the file, Creating a new text file using vi, Searching through files.</p>
4	<p><b>Filters:</b></p> <p>pr- paginating files  head-displaying the beginning of a file,  tail- displaying the end of file  cut- slitting a file vertically  paste- pasting file  sort- ordering file  uniq- locating repeated line  nl- line numbering  tr-translating characters.  regular expressions and grep to find text  ps-process status  kill-terminate process  Other process related commands</p>
5	<p>sh command, pattern matching- the wild cards, escaping-the backslash(\), quoting, redirection, pipes, tees</p>
6	<p>What is Shell, Different types of shells, Shell as command processor, shell variables, creating command substitution, various shell scripts using functions, conditionals, loops, customizing environment</p>

# **SEMESTER V**



Course Number	Course Name	L-T-P- Credits	Year of Introduction
501	Data Science	3L+1T+0P= 4C	2018-19
<b>Course Objective :</b>			
You will learn data science basics, statistics, R programming fundamentals of big data, hadoop and mapreduce, and Machine Learning Basics. By the end of this students should be able to handle and program on machine learning techniques using R-tool			
<b>References (Books, Websites etc) :</b>			
Refer web sources			
<b>Suggested MOOC :</b>			
Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Syllabus:</b>			
Unit	Contents		
1	<b>Introduction To Data Science:</b> What is data science, relation to data mining, machine learning, big data and statistics, Several data science settings, Introduction to the WEKA tool		
2	<b>Data analysis:</b> <b>From data to features:</b> Interactive group discussion, Representing problems with matrices, Representing problem with relations, Examples <b>Computing simple statistics:</b> Means, variances, standard deviations, weighted averaging, modes, quartiles, Examples <b>Simple visualizations:</b> Histograms, Boxplots, Scatterplots, Time series, Spatial data <b>Case studies:</b> X & Y examples, Medical data ,Hands-on R-Tool		
3	<b>Exploratory Data Mining:</b> Introduction to Exploratory Data Mining, <b>Association discovery</b> What is association discovery?, What are the challenges? , In detail: Apriori <b>Clustering</b> What is clustering? , What are the challenges? ,In detail: agglomerative clustering Hands-on: clustering in WEKA		
4	<b>Evaluation And Methodology Of Data Science:</b> <b>Experimental setup</b> Training, tuning, test data, Holdout method, cross-validation, bootstrap method <b>Measuring performance of a model</b> Accuracy, ROC curves, precision-recall curves, Loss functions for regression		

	<p><b>Interpretation of results</b>  Confidence interval for accuracy  Hypothesis tests for comparing models, algorithms</p>
5	<p><b>Data Engineering:</b>  <b>Attribute selection</b>  Filter methods, Wrapper methods  <b>Data discretization</b>  Unsupervised discretization, Supervised discretization  <b>Data transformations</b>  PCA and variants  Exercises</p>
6	<p><b>Introduction To Machine Learning:</b>  <b>Linear Regression</b>  Learn to implement linear regression and predict continuous data values  <b>Classification</b>  Understand and implement algorithms like K-NN*, Naive Bayes and Logistic Regression  <b>Clustering</b>  Learn how to create segments based on similarities using K-Means and Hierarchical clustering</p>
7	<p><b>Big Data Analytics:</b>  <b>Introduction to Big Data And Hadoop:</b>  Understand the basic concepts of Big Data and Hadoop as processing platforms for Big Data  <b>Managing Big Data:</b>  Learn and Use Hadoop Ecosystem tools for data ingestion, extraction and management. Hadoop ecosystem tools namely Sqoop, Hive will be covered in this Module</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
502	Optimization Techniques	3L+1T+0P=4C4	2018
<p><b>Course Objective:</b> Operations Research is a method of mathematically based analysis for providing a quantitative basis for analytical decisions in management. It provides different techniques based on logic and mathematics, and hence form the backbone of computer science.</p>			
<p><b>Expected Outcome :</b> This module helps to introduce students to use quantitative methods and techniques for effective decisions–making model formulation and applications that are used in solving business decision problems.</p>			
<p><b>References (Books, Websites) :</b>  <b>Books:</b>  Operations Research Theory and Applications by J. K. Sharma  Operations Research: An Introduction (Pearson Publication, 8<sup>th</sup> edition) by H. A. Taha  <b>Web Resources :</b>  For video lectures refer to site – <a href="http://mech19.blogspot.in/2015/08/operation-research-video-lectures.html">http://mech19.blogspot.in/2015/08/operation-research-video-lectures.html</a></p>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOC's:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			
<b>Syllabus</b>			
Unit	Contents		
1.	<p><b>Introduction to OR and Linear Programming Problem:</b>  <b>Operation Research</b> – Introduction, Models, Areas of Application, Basic terminologies in OR.  <b>Introduction to LPP</b>  Mathematical Formulation of L.P.P.  <b>Solution to LPP using</b> –  Graphical Method (Minimization and Maximization).  Simplex Method – Concept of slack, surplus &amp; artificial variables. Manual solutions of L.P.P. (up to 3 iterations).  Solution using Big M method  Duality and sensitivity Analysis in LPP  <b>Variations of LPP</b> –  Alternative optimal, Unbounded solutions &amp; Infeasible solutions to be shown graphically &amp; also by simplex method.</p>		

2.	<p><b>Transportation</b>  Definition and mathematical formulation of the transportation model.  <b>Finding initial basic feasible solution using –</b>  North-West Corner Rule  Least cost method  Vogel’s approximation method  Checking for Optimality &amp; obtaining of optimal solution using MODI method.  <b>Variations of Transportation Problem-</b>  Unbalanced problems  Maximization.  Degenerate Solutions</p>
3.	<p><b>Assignment Model</b>  Definition and mathematical formulation of Assignment Problem.  Finding BFS and optimal solution for Assignment Problem using Hungarian method.  <b>Variations of Assignment Problem –</b>  Unbalanced problems  Maximization  Travelling Salesman Problem</p>
4.	<p><b>Network Analysis</b>  Introduction to project management and significance of PERT/CPM in project management. Components of network.  Construction rules and precautions Network of phases of project.  Critical Path Analysis (CPM): Calculating Earliest Time and Latest Time for events, finding critical path for project, Calculating floats (Total, free and independent float), Calculating probability for completion of projects.</p>
5.	<p><b>Simulation</b>  Introduction to simulation, types of simulation, advantages and disadvantages of simulation  Steps in solving problem using simulation  <b>Monte Carlo Method for Simulation for –</b>  Inventory, Queuing, PERT, Investment  Applications of Simulation</p>
6.	<p><b>Decision Theory and Decision Tree</b>  Introduction to terminologies in Decision Making (Decision alternatives, States of alternatives, payoff table) and steps in Decision Making.  Types of Decision Environments – Decision making under Uncertainty &amp; Decision making under Risk.  Criteria for Decision making under uncertainty-  Minimin or Maximax criteria,  Miximin or Minimax Regret criterion,  Laplace criterion,  Hurwicz criterion.  Criteria for Decision making under Risk-  Expected Monetary Value criterion,  Expected Opportunity Loss (E.O.L.)</p>

	Expected Value of Perfect Information (E.V.P.I.) Decision Tree introduction and building decision tree for Simple problems.
7.	<b>Queuing Theory</b> Introduction, structure of queuing System, Performance measures of a Queuing System, Probability Distributions in Queuing Systems of – Arrivals, Interarrival Times, Departures, Service times, Single Server Queuing Models, Multi Server Queuing Models

Course Number	Course Name	L-T-P- Credits	Year of Introduction
503	<b>Software Project Management</b>	3L+1T+0P=4C	2018
<p><b>Course Objective :</b></p> <p>To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful high quality IT projects.</p>			
<p><b>Expected Outcome :</b></p> <ul style="list-style-type: none"> <li>• Evaluate project to develop scope of work, provide accurate cost estimation and to plan the various activities.</li> <li>• Identify resources required for a project and to produce a work plan and resources schedule</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>• Software Project Management – Bob and Huges</li> <li>• Software Project Management in Practice, Pankaj Jalote, Pearson Education,2002</li> <li>• Software Engineering by Pressman</li> <li>• Basic of Software Management ,NIIT, Prentice-Hall India ,2004</li> <li>• SOFTWARE REQUIREMENTS - MS project 2007 onward , CoStar 7 Onwards</li> </ul>			
<b>Syllabus:</b>			
Unit	Contents		
<b>1</b>	<b>Introduction to project management -</b> Project, project management, software project management, characteristics of project, how software projects are diff. Than other projects, Problems with software projects, All parties (stakeholders) involved in project. Role of Project Manager. Phases of project management life Cycle.		
<b>2</b>	<b>Project Management Body of Knowledge –</b> Project management institute, PMBOK. Role of PMBOK , Knowledge area's identified by PMBOK, Various certifications provided by PMBOK with their importance, Association for project management , project planning, importance.		
<b>3</b>	<b>Project planning –</b> Various plans to be prepared in SPM , Stepwise project planning , Importance of Project scheduling, project and activities, sequencing and scheduling activities , Importance of resource allocation, nature of resources , Identifying resource requirement , Scheduling resources , Work breakdown structure , Gantt chart, Network Planning models, formulating network model , Critical path analysis , PERT, Hands on experience with Microsoft Project.		
<b>4</b>	<b>Cost and effort estimation –</b> Where estimation done?, problem with over and under estimation , Cost to be considered during estimation, factors affecting cost estimation , cost estimation methods-non algorithmic , COCOMO model, Function point analysis model , Hands on experience with Costar or other estimation software's.		
<b>5</b>	<b>Project risk management -</b> The importance, top risk in projects , Classic mistakes, Elements of risk management – Risk		

	identification, risk analysis , Elements of risk management – Risk prioritization, risk control.
<b>6</b>	<b>Managing Contract –</b> Types of contract, Contract management and Acceptance Managing people and organizing teams - Organizational behavior, understanding behavior, Selecting Right person for right job, Motivation, Becoming a team and decision Making, Leadership styles, Organizational structures .
<b>7</b>	<b>Software quality –</b> Place of software quality in planning, Defining software quality and importance of it, Software quality measures, ISO standards, CMM standards, Quality Assurance document.

# **ELECTIVES**



### Elective Group:(01) Cloud Computing

Course Number	Course Name	L-T-P- Credit	Year of introduction
404-01-A	Virtualization	2L+1T+0P=3C	2018
<p><b>Course Objective:</b> Students will learn an overview of the field of Cloud Computing Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools. It is our objective that students will develop the skills needed to use cloud computing technique</p>			
<p><b>Course Outcome:</b> student will be able to:</p> <ul style="list-style-type: none"> <li>• Study core concept of cloud computing.</li> <li>• Study virtualization and outline its role in enabling the cloud computing system model.</li> <li>• Analyze various cloud computing models.</li> </ul>			
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• “Virtualization” – A Manager’s Guide, By Dan Kusnetzky, O’reilley Publications,</li> <li>• “Virtualization for Dummies”, 1<sup>st</sup> Edition, Kindle Edition, by Bernard Golden.</li> </ul>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
Unit	Contents		
1	<p><b>Overview Of Virtualization :</b> Introduction to Virtualization, Virtualization Approaches, Virtualization for Server Consolidation and Containment, Hardware Support for Virtualization, Para-Virtualization, vmWare’s Virtualization Solutions</p>		
2	<p><b>Understanding Virtualization :</b> The Roots of Virtualization, Making Better Use of Your Systems with Virtualization, Approaches to Virtualization, Understanding the Virtualization Ecosystem, Reasons to Invest in Virtualization Hardware.</p>		
3	<p><b>Hypervisor:</b> What is Hypervisor, Type 1 Hypervisor, Type 2 Hypervisor, Types of Hardware Virtualization : Full Virtualization, Emulation Virtualization Para virtualization., Installing Hyper-V In Windows Server 2012,</p>		
4	<p><b>Types Of Virtualization :</b> Server Virtualization, Client &amp; Desktop Virtualization Services and Applications Virtualization, Network Virtualization, Storage Virtualization</p>		
5	<p><b>Tools For Virtualization:</b> Virtualization with Xen, Virtualization with Bochs and QEMU, Virtualization with Lguest, Virtualization with KVM</p>		
6	<p><b>Virtualization For Businesses:</b> Need for Virtualization in a Business, Implementation of Virtualization in a Business, Cost-Benefit Analysis of Virtualization,</p>		

7	<b>Openstack And Its Role In Virtualization :</b> Understanding Openstack, nine Core key components of openstack. CASE STUDIES OF VIRTULIZATION : Xen Hypervisor, OpenVZ Hypervisor, MS Virtual Server 2005 R2, Oracle VM
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### Elective Group :( 01) Cloud Computing

Course Number	Course Name	L-T-P- Credit	Year of introduction
405-01-B	Cloud Computing Concepts	2L+1T+0P=4C	2018

**Course Objective:**

Students will learn an overview of the field of Cloud Computing Students will gain hands-on experience solving relevant problems through projects that will utilize existing public cloud tools. It is our objective that students will develop the skills needed to use cloud computing technique.

**Course Outcome:**

student will be able to:

- Study core concept of cloud computing.
- Study cloud application with various service providers services
- Analyze various cloud computing models.

**References:**

- Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

Unit	Contents
1	<b>Cloud Computing Fundamentals:</b> Definition of Cloud Computing , private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public Vs private clouds
2	<b>Virtualization And Cloud Computing:</b> Role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications, Visualizing Virtualization, Managing Virtualization, Taking Virtualization into the Cloud
3	<b>Service Oriented Architecture And The Cloud :</b> Defining Service Oriented Architecture, Understanding the Coupling, Implementation of Service Oriented Architecture (SOA), Understanding Services in the Cloud, Serving the Business with SOA and Cloud Computing
4	<b>Cloud Applications :</b> Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages
5	<b>Management Of Cloud Services:</b> Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google,

	Salesforce.com, Ubuntu and Redhat)
6	<b>Application Development:</b> Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App.
7	<b>Cloud It Model:</b> Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)

### Elective Group :( 01) Cloud Computing

Course Number	Course Name	L-T-P-Credit	Year of Introduction
504-01-C	Cloud Solutions	2L+1T+0P=3C	2018
<b>Course Objective:</b> Students will learn different cloud solutions available.			
<b>Course Outcome:</b> student will be able <ul style="list-style-type: none"> <li>• Design their cloud solution for organization.</li> <li>• Implement the cloud solutions. And</li> <li>• Analyze various cloud computing models.</li> </ul>			
<b>Reference Books:</b> <ul style="list-style-type: none"> <li>• “AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud” by <u>Mike Ryan</u> , <u>Federico Lucifredi</u> .</li> <li>• “Expert AWS Development: Efficiently develop, deploy, and manage your enterprise apps on the Amazon Web Services platform” Kindle Edition, by <u>Atul Mistry</u>.</li> <li>• “VMware vSphere 6.5” Cookbook, 3rd Edition Kindle Edition</li> </ul>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC’s: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
Unit	Contents		
1	<b>Coriolis Technologies :</b> About Coriolis Technologies, storage, virtualization, security, The Colama suite of products, benefits of colama suite, Virtualization of Computer Laboratories, Colama Powered Virtual Computer Laboratory		
2	<b>vmWare :</b> what is VmWare, Virtualization with Vmware, VmWare Products, Data Center and Cloud Infrastructure, Networking and Security, SDDC Platform, Storage and Availability, The vmWare Approach to the Cloud, vmWare vSphere 4, Server Consolidation and Containment		
3	<b>Microsoft :</b> Exploring Platform as a Service, Putting Platform as a Service Pedestal		
4	<b>Microsoft :</b> Integrated Lifecycle Platform, Anchored Lifecycle Platform as a Service Enabling Technologies as a Platform		
5	<b>Google :</b> Google App Engine, Details of Google app engine.		
6	<b>Amazon :</b>		

	Infrastructure as a Service, Tracing IaaS to ISP, Amazon EC2
7	<b>Other Solutions :</b> Infrastructure as a Service, Other IaaS Companies, IaaS-Enabling Technology, Issues related to Trust in Cloud, Infrastructure as a Service in a Business Organization

### Elective Group: Cloud Computing

Course Number	Course Name	L-T-P-Credit	Year of introduction
505-01-D	Cloud Computing	2L+1T+0P=3C	2018
<b>Course Objective:</b> Students will learn how to use Amazon web service portal and its services			
<b>Course Outcome:</b> Student will be able. Design their cloud solution using AWS. Implement the cloud solutions Using AWS. Practice of AWS applications			
<b>Reference Books:</b> <ul style="list-style-type: none"> <li>• “AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud” by <u>Mike Ryan</u> , <u>Federico Lucifredi</u> .</li> <li>• “Expert AWS Development: Efficiently develop, deploy, and manage your enterprise apps on the Amazon Web Services platform” Kindle Edition, by <u>Atul Mistry</u>.</li> </ul>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a>			
1	<b>Getting Started with Amazon Cloud :</b> Introduction to AWS, AWS history, AWS Infrastructure, AWS ecosystem, Setting up AWS accounts Evaluating Service Level Agreements (SLA) Various AWS Services AWS Management Console The AWS CLI		
2	<b>Identity Access Management (IAM) :</b> Introduction to IAM, IAM users and their access, IAM roles and their permission Active Directory Federation Web Identity, Federation IAM Best Practices. Assignment: Configuring IAM users, groups and policies, AWS CLI/SDK access to manage services using Credentials and Roles lab. Programming, management console and storage on AWS Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms		
3	<b>Elastic Load Balancing &amp; Auto Scaling :</b> Components and types of load balancing Auto scaling and its benefits Life cycle of auto scaling Components and policies of auto scaling Assignment - Configure Load Balancer, Auto scaling as per utilization in different situations		
4	<b>Amazon EC2 :</b> EC2 Overview Amazon Machine Images(AMI) AMI creation Security groups Key pairs Assigning elastic IP address Elastic IP v/s Public IP Bootstrap Scripts Overview of Amazon EBS , Various login ways from different OS, putty and putty keygen use, Assigning EIP, AMI assignment, Creating and restoring snapshot, snapshot to AMI, EC2 Bootstrapping, Cloudformation & CloudWatch assignments.		
5	<b>Amazon Simple Storage Service(S3) :</b> Introduction to S3 Creating an S3 bucket S3 Version Control S3 Lifecycle Management & Glacier S3 Uploading & Downloading S3 durability & redundancy Cloud front overview Create a CDN Security & Encryption Storage Gateway Import & Export using Snowball Cross		

	region replication Static website using S3 Assignment - Creating S3 bucket, S3 ACL, S3 permissions, hosting static website on S3, Cross region replication assignment, S3 lifecycle assignment
6	<b>Database Services:</b> Database overview Amazon Relational Database Service ( RDS) AMI databases Amazon Redshift DynamoDB Amazon ElastiCache AWS Database Migration Service(DMS) Amazon Aurora Assignment - Creating RDS instance, DB backups, RDS Read Replica
7	<b>AWS identity services, security and compliance Users, groups, and roles –</b> Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.



### Elective Group: (02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-02-A	Algorithms For Advanced Analytics	2L+1T+0P = 3C	2018
<b>Prerequisite:</b> Knowledge in basic analytical algorithms			
<b>Course Objective :</b> <ol style="list-style-type: none"> <li>1. Learn concepts and techniques and how to find useful knowledge.</li> <li>2. Understanding of the topics that can create an ideal analytic environment that is better suited to the challenges of today's analytics demands.</li> <li>3. Harness the power of high performance computing architectures and data mining, text analytics, and machine learning algorithms.</li> </ol>			
<b>Expected Outcome :</b> At the end of the course a student should be able: This course gives a comprehensive coverage of algorithms specially meant for analyzing data at an in-depth level. Decision trees, Support Vector machines and Neural networks are considered to be highly effective in analyzing complex data.			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.</li> <li>2. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.</li> <li>3. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.</li> <li>4. Vojislav Kecman, "Learning and Soft Computing", MIT Press, 2010.</li> <li>5. Jared Dean, "Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley India Private Limited, 2014.</li> </ol>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC's: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Unit	Contents		
1	<b>Predictive Analytics:</b> Predictive modeling and Analysis - Regression Analysis, Multicollinearity , Correlation analysis, Rank correlation coefficient, Multiple correlation, Least square, Curve fitting and goodness of fit.		
2	<b>Classification Algorithms:</b> Issues regarding classification and prediction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods, Classification accuracy.		

3	<p><b>Decision Trees:</b>  Introduction to Decision trees - Classification by decision tree induction – Various types of pruning methods – Comparison of pruning methods – Issues in decision trees – Decision Tree Inducers – Decision Tree extensions.</p>
4	<p><b>Text Analytics:</b>  Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.</p>
5	<p><b>Support Vector Machines:</b>  Learning and Soft Computing: Rationale, Motivations, Needs, Basics: Examples of Applications in Diverse Fields, Basic Tools of Soft Computing: Neural Networks, Fuzzy Logic Systems, and Support Vector Machines,</p>
6	<p><b>Computing:</b>  Basic Mathematics of Soft Computing, Learning and Statistical Approaches to Regression and Classification - Support Vector Machines - Risk Minimization Principles and the Concept of Uniform Convergence, The VC Dimension, Structural Risk Minimization, Support Vector Machine Algorithms.</p>
7	<p><b>Neural Networks:</b>  Single-Layer Networks: The Perception, The Adaptive Linear Neuron (Adaline) and the Least Mean Square Algorithm - Multilayer Perceptions: The Error Back propagation Algorithm – The Generalized Delta Rule, Heuristics or Practical Aspects of the Error Back propagation Algorithm.</p>

### Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-02-B	Machine Learning Techniques	2L+1T+0P = 3C	2018
<b>Prerequisite:</b> Knowledge in basic analytical algorithms.			
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>• To introduce students to the basic concepts and techniques of Machine Learning.</li> <li>• To have a thorough understanding of the Supervised and Unsupervised learning techniques.</li> <li>• To study the various probability based learning techniques.</li> <li>• To understand graphical models of machine learning algorithms.</li> </ul>			
<b>Expected Outcome :</b> Upon completion of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Distinguish between, supervised, unsupervised and semi-supervised learning</li> <li>• Apply the appropriate machine learning strategy for any given problem</li> <li>• Suggest supervised, unsupervised or semi-supervised learning algorithms for any given Problem</li> <li>• Design systems that uses the appropriate graph models of machine learning</li> <li>• Modify existing machine learning algorithms to improve classification efficiency</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>• Ethem Alpaydin, —Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)ll, Third Edition, MIT Press.</li> <li>• Jason Bell, —Machine learning – Hands on for Developers and Technical Professionalsll, First Edition, Wiley.</li> <li>• Peter Flach, —Machine Learning: The Art and Science of Algorithms that Make Sense of Datal, First Edition, Cambridge University Press.</li> <li>• Stephen Marsland, —Machine Learning – An Algorithmic Perspectivel, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series.,.</li> <li>• Tom M Mitchell, —Machine Learningll, First Edition, McGraw Hill Education.</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Unit	Contents		
1	<b>Introduction:</b> Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.		
2	<b>Linear Models :</b> Multi-layer Perception – Going Forwards – Going Backwards: Back Propagation Error – Multilayer Perception in Practice – Examples of using the MLP – Overview – Deriving Back Propagation – Radial Basis Functions and Spines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector		

	Machines.
3	<b>Tree And Probabilistic Models:</b> Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities.
4	<b>Basic Statistics:</b> Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map
5	<b>Dimensionality Reduction And Evolutionary Models :</b> Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares
6	<b>Optimization:</b> Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting Lost Example – Markov Decision Process.
7	<b>Graphical Models :</b> Markov Chain Monte Carlo Methods, Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods

### Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-02-C	<b>Weka</b>	2L+1T+0P = 3C	2018
<b>Prerequisite:</b> Knowledge in basic analytical algorithms			
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>• To introduce the basic concepts and various techniques of machine learning</li> <li>• To give idea about supervised and unsupervised learning techniques.</li> <li>• The purpose of machine learning is to discover patterns in your data and then make predictions based on those often, complex patterns to answer business questions, and help solve problems. Machine learning helps analyze your data and identify patterns</li> </ul>			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>• After Completion of this course students will be able to understand the difference between supervised, unsupervised and semi supervised learning.</li> <li>• To apply appropriate machine learning algorithms using weka tool to given problem.</li> <li>• To as per data result requirement to modify existing algorithms for better result.</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>• Data Mining Concepts and Techniques By Jiawei Han &amp; Micheline Kamber</li> <li>• Data Mining: Practical Machine Learning Tools and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, Kindle Edition</li> <li>• An Introduction to Machine Learning Hardcover by Miroslav Kubat (Author)</li> <li>• An Introduction to weka: Machine Learning in Java by Giorgio Sironi</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC's: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Unit	Contents		
1	<b>Machine Learning and Weka basics:</b> Overview about machine learning concepts, Data Cleaning by weka, Major issues of machine learning, core algorithm type, Overview about weka basics , File type, Experimenter and explorer. Bayesian network, neural network, Trees, Rule concepts		
2	<b>Creating Dataset for Weka:</b> Creating ARFF, CSV file format, Data Types, Class enumeration, filtering algorithms based on feature type in weka, Interpreting and refining results		
3	<b>Linear Model:</b> Classification concepts, how classification works in data sample, Classifying data in weka using classification rules. Concept of Regression, Choose algorithm for regression. Multilayer perception –forward and backward propagation. Support vector machine classification and regression for predictive analysis		
4	<b>Decision Tree and model:</b> Decision tree concepts, Attribute selection measures, visual mining for decision tree, rule based classification, Ensemble methods- Bagging and boosting, Random forest method,		

	cross validation concept.
5	<p><b>Dimensionality Reduction And Evolutionary Models:</b>  Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis ,parametric and nonparametric method</p>
6	<p><b>Cluster Analysis using different methods:</b>  Concept of cluster analysis, methods of clustering with constraints, dimensional reduction methods, biclustering, probabilistic model based clustering.</p>
7	<p><b>Knowledge Data Flow:</b>  Create knowledge data flow on data sample, Analysis data flow, Interpret results with weka , Generate the rules on the basis of result.</p>

### Elective Group:(02) Data Analytics

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-02-D	Statistical Computing	2L+1T+0P = 3C	2018
<b>Course Objective :</b> The main objective of this course is to acquaint students with some basic concepts in Statistics. They will be introduced to some elementary statistical methods of analysis of data.			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>• To compute various measures of central tendency, dispersion, skewness and kurtosis.</li> <li>• To analyze data pertaining to attributes and to interpret the results.</li> <li>• To compute the correlation coefficient for bivariate data and interpret it.</li> <li>• To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables.</li> <li>• To fit linear regression model to the bivariate data</li> <li>• They are able to construct predicate model.</li> </ul>			
<b>References (Books, Websites etc) :</b> Fundamentals of Statistics , S.C.Gupta, Seventh Edition ,Himalaya Publishing House			
<b>Suggested MOOC:</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Unit	Contents		
1	<b>Random Number:</b> Concept of random number generator, congruential method of generating uniformvariate, Generation of Binomial, Poisson, Geometric, Negative Binomial& Multinomial variate. Proofs of related results. Generation of continuous random variables covering Exponential, Normal, Gamma, Chi-square, Bivariate exponential, Bivariate Normal distributions, and mixture of distributions.		
2	<b>R – Language:</b> Introduction to R, elementary programming, application to data analysis, Descriptive statistics, Fitting of Distributions, Cross Tables, Correlations and Regression, Hypothesis Testing, ANOVA.		
3	<b>Simulation Technique:</b> Concept of Simulation, advantage, Disadvantage, Phases of Simulation ,Application of Simulation Models, Types of Simulation Models, Random Numbers, Monte-Carlo(Computer) Simulation Procedure for Monto-Carlo Simulation.		
4	<b>Queuing and Forecasting:</b> Concept of Queuing, Queuing models, Forecasting techniques, forecasting methods: Subjective For casting, Structural and Economic Model, Determination Models, Moving Average, Regression Average, Least Square Method of curve fitting.		
5	<b>Statistical Decision Theory:</b> Concept, state of Nature or Events, Payoff table, Opportunity Loss, Decision Making Environment, Decision Making Under Certainty, Decision Making Under Uncertainty, Maximax, Minimin, Maximax, Laplace Criterion, Hurwicz ,EMV,EOL, EVIP, Bayes		

	Decision rule
6	<b>Statistical Applications:</b> Regression analysis, Paired test, T-test,F-test, Chi test, Decisions Tree, Probability distributions
7	<b>Programming in C++:</b> Concept of OOP, Data types, Variables, Statements, Expressions, Control structures, Looping, Functions, Pointers. Programming for problems based on all Unit .



**Elective Group: (03) Linux Environment**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credit</b>	<b>Year of introduction</b>
404-03-A	Linux Desktop Environment and Shell Programming	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to have understanding of Linux operating system and environment

**Expected Outcome :**

At the end of the course a student should be able:

To use Linux operating system for configuring the environment.

**Textbook:**

- Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus
- UNIX Concepts and Applications - by Sumitabha Das

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

<b>Unit</b>	<b>Contents</b>
1	<p><b>Using Shell Interface:</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to Linux</li> <li>▪ Internal and external commands</li> <li>▪ General purpose utilities</li> <li>▪ Navigating the file system</li> <li>▪ Handling ordinary files</li> </ul> <p><b>Using GUI Environments:</b></p> <ul style="list-style-type: none"> <li>▪ GNOME desktop environment</li> <li>▪ KDE desktop environment</li> </ul>
2	<p><b>Using open source office suite</b></p> <ul style="list-style-type: none"> <li>▪ Word processor application</li> <li>▪ Spreadsheet application</li> <li>▪ Presentation application</li> <li>▪ Desktop database application</li> </ul> <p><b>Using the Internet</b></p> <ul style="list-style-type: none"> <li>▪ World wide web</li> <li>▪ FTP</li> <li>▪ Telnet</li> </ul>
3	<p><b>Using Multimedia</b></p> <ul style="list-style-type: none"> <li>▪ Graphics</li> <li>▪ Audio</li> <li>▪ Video</li> </ul>
4	<p><b>Introduction to shell</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to 'bash' shell</li> </ul>

	<ul style="list-style-type: none"> <li>▪ Redirection</li> <li>▪ Pipes</li> <li>▪ Tees</li> <li>▪ Command substitution</li> <li>▪ Introduction to other shells: Korn shell, C Shell etc.</li> </ul> <p><b>Shell environment</b></p> <ul style="list-style-type: none"> <li>▪ Shell variables</li> <li>▪ Handling the command line arguments</li> <li>▪ Login scripts</li> <li>▪ Terminal characteristics</li> <li>▪ Aliases</li> </ul>
5	<p><b>Text editors</b></p> <ul style="list-style-type: none"> <li>▪ 'vi' editor</li> <li>▪ 'emacs' editor</li> </ul>
6	<p><b>Shell commands</b></p> <ul style="list-style-type: none"> <li>▪ General purpose utilities</li> <li>▪ File management</li> <li>▪ Process management</li> <li>▪ Communication management</li> </ul> <p><b>Regular expressions</b></p> <ul style="list-style-type: none"> <li>▪ Pattern matching</li> <li>▪ Wild cards</li> <li>▪ Regular expressions</li> <li>▪ Utilities: grep, egrep, fgrep etc.</li> </ul> <p><b>Filters</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to filters</li> <li>▪ Utilities: pr, head, tail, cut, paste, sort, uniq, nl, tr etc.</li> </ul>
7	<p><b>Shell scripting</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to shell scripting</li> <li>▪ Programming constructs</li> <li>▪ Mathematical operators</li> <li>▪ Logical operators</li> <li>▪ String manipulation</li> <li>▪ Interactive scripts</li> <li>▪ Handling command line arguments</li> </ul>

**Elective Group :( 03) Linux Environment**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credit</b>	<b>Year of introduction</b>
405-03-B	Linux System Administration	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to have understanding of Linux operating system and system administration

**Expected Outcome :**

At the end of the course a student should be able:

1.To use Linux administration for user management and security.

**Reference books :**

UNIX Concepts and Applications - by Sumitabha Das

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

<b>Unit No</b>	<b>Contents</b>
1	<p><b>Linux installation:</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to Linux distributions</li> <li>▪ Normal installation</li> </ul>
2	<p><b>Linux installation:</b></p> <ul style="list-style-type: none"> <li>▪ Dual boot installation</li> <li>▪ Virtual installation</li> <li>▪ Troubleshooting an installation</li> </ul>
3.	<p><b>Understanding system administration:</b></p> <ul style="list-style-type: none"> <li>▪ Introduction to the routine activities in system administration</li> <li>▪ Shell commands for system administration</li> <li>▪ Administrative tools</li> <li>▪ Managing file systems and disk space</li> </ul>
4.	<p><b>Setting up and supporting users:</b></p> <ul style="list-style-type: none"> <li>▪ Managing user accounts</li> <li>▪ Providing support to the users</li> </ul>
5.	<p><b>Automating system tasks:</b></p> <ul style="list-style-type: none"> <li>▪ Aut System initialization</li> <li>▪ System startup and shutdown</li> <li>▪ Scheduling system tasks omating system tasks:</li> </ul>
6.	<p><b>Backing up and restoring files:</b></p> <ul style="list-style-type: none"> <li>▪ Backup and restore strategy</li> <li>▪ Backup and restore tools</li> </ul>
7.	<p><b>Computer security issues:</b></p> <ul style="list-style-type: none"> <li>▪ Password protection</li> <li>▪ Firewalls</li> </ul>

### Elective Group :( 03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
504-03-C	Linux Network Administration	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to have understanding of Linux operating system and Network administration.

**Expected Outcome :**

At the end of the course a student should be able

1. To use Linux administration for creation of server and management.

**Reference books :**

1. Linux Administration : A Beginner's Guide, Shah, TMH
- 2.LINUX: The Complete Reference, Petersen, TMH
- 3.LINUX Network Administrator's Guide, Kirch,SPD/O'REILLY

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

www.edx.com

www.coursera.com

Unit No	Contents
1	<b>Setup And Manage a Local Area Network:</b> Basic Networking, Introduction to networking, OSI Model,IP addressing (IPV4, IPV6) & LAN establishment with Linux , Configuring internet in Linux through broadband, dial-up, data card & through mobile (gprs).
2	<b>Setup And Manage Proxy Server :</b> Basics of proxy services, Configuring proxy services, Creating ACL's for controlling access to internet, SQUID: Proxy server setup, Blocking Websites, content filtering, Bandwidth Management
3.	<b>Setup And Manage FILE Server:</b> NFS: network file sharing & resource sharing across Linux environment. YUM server: Setting up local YUM, FTP YUM, HTTP YUM, EPEL, REMI & RPMForge like YUM configuration, DHCP:Dynamic Host Configuration Protocol setting up, Allocating IP, Subnet mask, default gateway and hostname, communication with DNS and other protocols.
4.	<b>Setup And Manage FTP Server:</b> Basics of File Transfer Protocol., Configuring vsftpd for anonymous ftp service. FTP:Setting up file transfer protocol,user management for FTP,hands on with ftp clients, FTP security (file,user, host,network based). Remote Services:SSH, Telnet & VNC (remote access services) with security(file,user, host,network based). Network Installation: NFS, HTTP, FTP, Kickstart, TFTP SAMBA: Linux to window data sharing along with security (file,user, host,network based) & managing SAMA graphically. Ticket Server: (OS-Ticket & ORTS) installing, configuring and managing.
5.	<b>Setup And Manage Web Server :</b> Basics of Web Services, Introduction to Apache, Configuring Apache for main site, Configuring Apache for multiple sites using IP-based, port based and name-based, Web Server: Apache installation, configuring dedicated server, shared server, user based authentication, load balancing and apache tuning. NIS, LDAP: (user's liberty to sit into remote machine) MAIL Server: knowing MUA,MTA& MDA, setting up and configuring POSTFIX,PO3s v/sIMAPs,

	Squirrel mail, accessing via Outlook, Thunderbird and evolution. Multi/virtual domain management, email security. Postfix Administration.
6.	<b>Setup And Manage boot Server :</b> What is booting and boot process of Linux?, Init Process or Run levels
7.	<b>Setup And Manage DNS Server :</b> Basics of Internet, Basics of DNS and BIND 9, Configuring DNS primary server, DNS:master DNS, slave DNS with forward & reverse zone, one DNS resolving multiple domain, dynamic DNS etc

### Elective Group: (03) Linux Environment

Course Number	Course Name	L-T-P- Credit	Year of introduction
505-03-D	Linux Internals and Network	2L+1T+0P=3C	2018

**Course Objective:**

- To get acquainted with Linux kernel and system calls
- To get knowledge about Process and managing process life.
- Build deeper view IPC and its applications.
- To make able to use Signals and threads and using thread library.
- Make them understanding network communications and using API to write socket programs.
- Make them understand about scheduling and memory management.

**Expected Outcome :**

At the end of the course a student should be able:

- 1.To use programming for kernel management and networking.

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

Unit No	Contents
1	<b>Introduction</b> Architecture of Linux, User and Kernel Space, Introduction to System Calls, System Calls in Detail, trace – Tracing system calls.
2	<b>Process management</b> Introduction to Process and process attributes, process vs. Program, Process States, Creating Process, Process termination, process commands Special case of processes.
3.	<b>Inter Process Communication</b> Introduction to IPC, Pipe, FIFO, Shared Memory, Advantages and Disadvantages of various IPC mechanisms, Application of IPC
4.	<b>Working with Signals and Threads</b> Introduction to Signals, Default disposition of Signals, Handling the Signals, Signal Related Functions Introduction to Threads, Creating Thread, Data handling with Thread , Types of Threads – Thread Attributes, Thread Cancellation , Threads vs. Process
5.	<b>Thread and Process Synchronization</b> Threads and resources management, Race condition in multi-threaded applications, writing thread safe code, Mutex, POSIX Semaphores, Usage of Binary semaphores and Mutex Race condition in multi-process applications, Limitations of shared memory, Semaphore Implementation.
6.	<b>Linux Networking</b> OSI and TCP/IP models, Addressing in TCP/IP, IPv4 and IPv6 differences, TCP three-way handshake, Network packet analysis in Linux, Networking commands in Linux, Using socket API to implement client server communication, Working with TCP and UDP sockets, Synchronous I/O

7.

**Process and Memory Management**

Need of Process scheduler, scheduling algorithms,  
Memory Management Unit (MMU) introduction, Concept of Virtual memory, using Paging & Page fault, other MMU concepts: Relocation, Protection, Sharing, Logical and physical organization.

### Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-04-A	Python	2L+1T+0P=3C	2018
<b>Course Objective :</b> Main objective of this paper is to learn functioning of various commands of Python language. Also study the practical applications in the field of Software development.			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>• Basic familiarity with Python</li> <li>• Development tools used for the Python programming</li> <li>• Implementation of OO concepts.</li> </ul>			
<b>References (Books, Websites etc) :</b> A Python Book: Beginning Python, Advanced Python, and Python Exercises : Dave Kuhlman			
<b>Suggested MOOC :</b> Swayam			
Course Plan			
Unit	Contents		
1	<b>Introduction to Python:</b> Etc, Lexical matters : Lines, Comments, Names and tokens, Blocks and indentation, Doc strings, Program structure, Operators, Code evaluation		
2	<b>Built-in Data types :</b> Numeric types, Tuples and lists, Strings, 1 The new string. format method, Unicode strings, Dictionaries, Files, Other built-in Types, The None value/type, Boolean values, Sets and frozen sets		
3	<b>Statements:</b> Assignment statement, import statement, print statement, if: elif: else: statement, for: statement., while: statement., continue and break statements, try: except: statement., raise statement..., with: statement, del, case statement		
4	<b>Functions, Modules, Packages, and DebuggingFunctions :</b> The def statement Returning values, Parameters, Arguments, Local variables, Other things to know about functions, Global variables and the global statement, Doc strings for functions, Decorators for functions, lambda Iterators and generators, Modules, Doc strings for modules, Packages		
5	<b>Classes:</b> A simple class, Defining methods, The constructor, Member variables, Calling methods, Adding inheritance, Class variables, Class methods and static methods, Properties, Interfaces, New style Classes, Doc strings for classes, Private members		
6	<b>Extending and embedding Python:</b> Introduction and concepts, Extension modules, SWIG, Pyrex, SWIG vs. Pyrex, Cython, Extension types, Extension classes		
7	<b>GUI Applications:</b> Introduction PyGtk, EasyGUI, Guidance on Packages and Modules, End Matter,		



### Elective Group:(04) Open Source Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-04-B	Perl Scripting	2L+1T+0P=3C	2018
<b>Course Objective :</b> To introduce the basic concepts of Perl Programming and write, modify, and run simple Perl scripts and study working with files and using perl as an object oriented language			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>• The syntax and semantics of the Perl language</li> <li>• how to develop and implement various types of programs in the Perl language</li> <li>• various forms of data representation and structures supported by the Perl language</li> <li>• the appropriate applications of the Perl language</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>• Mastering Perl : Brian, O'Reilly</li> <li>• <a href="http://www.tutorialspoint.com/perl/index.htm">www.tutorialspoint.com/perl/index.htm</a></li> </ul>			
<b>Suggested MOOC :</b> Swayam			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Perl – Introduction :</b> What is Perl? Perl features , Perl – Syntax Overview, Perl – Data Types , Numeric Literals String Literals , Perl – Variables , Creating Variables, Perl– Scalars, Scalar Operations Perl – Arrays Perl – Hashes		
2	<b>Control Flow and Looping Statement:</b> if statement ,if else statement, if elsif else statement, unless statement, switch statement, The ? : Operator <b>Perl – Loops :</b> while loop , until loop for loop, For each loop do while loop nested loops, next statement, last statement, continue statement, redo statement, go to statement, Infinite Loop		
3	<b>Perl – Operators :</b> What is an Operator? Perl Arithmetic Operators, Perl Equality Operators, Perl Assignment Operators, Perl Bitwise Operators, Perl Logical Operators, Quote-like Operators Perl – Date and Time, GMT Time Format, Date & Time, Epoch time, POSIX Function strftime()		
4	<b>Perl – Subroutines :</b> Define and Call a Subroutine, Passing Arguments to a Subroutine, Passing Lists to Subroutines, Passing Hashes to Subroutines, Returning Value from a Subroutine, Private Variables in a Subroutine, Temporary Values via local(), State Variables via state() Subroutine, Call Context <b>Perl – References :</b> Create References Dereferencing Circular References, References to Functions Perl – Formats Define a Format Using the Format, Define a Report Header Number of Lines on a Page, Define a Report Footer		

5	<p><b>Perl – File I/O :</b>  Opening and Closing Files, Open Function, Sysopen Function, Close Function, The Operator getc Function, read Function, print Function, Copying Files Renaming a file, Deleting an Existing File Positioning inside a File  <b>Perl – Directories :</b>Display all the Files, Create new Directory, Remove a directory, Change a Directory</p>
6	<p><b>Perl – Regular Expressions :</b>  Pattern Matching, Match Operator Match Operator Modifiers Matching Only Once Regular Expression Variables. The Substitution Operator Substitution Operator Modifiers. The Translation Operator Translation Operator Modifiers More Complex Regular Expressions Matching Boundaries Selecting Alternatives Grouping Matching. The \G Assertion Regular-expression Examples</p>
7	<p><b>Introduction to Object Oriented Programming in Perl :</b> Object Basics, Defining a Class Creating and Using Objects, Defining Methods, Inheritance Method Overriding , Default Auto loading, Destructors and Garbage Collection, Object Oriented Perl Example</p>

**Elective Group:(04) Open Source Technologies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-04-C	PHP	2L+1T+0P=3C	2018
<b>Course Objective:</b>			
To make students able to design and develop the web based applications and systems.			
<b>Expected Outcome:</b>			
After completion of this course students will able to develop static and dynamic web applications through Word press, PHP and Joomla.			
<b>References (Books, Websites etc) :</b>			
<ul style="list-style-type: none"> <li>• PHP and MySQL Web Development by Welling Thomson Fourth Edition, Pearson publication</li> <li>• Teach Yourself PHP, MySQL and Apache by Julie C. Meloni Pearson publication</li> </ul>			
<b>Suggested MOOC :</b>			
<b>SWAYAM</b>			
Unit	Contents		
1	<b>Introduction To PHP:</b> Installing and configuring PHP, <b>Building blocks of PHP:</b> PHP tags, variables, data types, operators, expressions, constants, <b>Control Structures:</b> conditional statements, loops, switch statement		
2	<b>Working With Functions And Arrays:</b> <b>Working with functions:</b> What is a function? Function declaration and definition, Calling function, user-defined functions, variable scope, <b>Working with arrays:</b> Creating, sorting and reordering arrays, PHP classes. <b>Working with strings, dates and time:</b> Formatting, investigating and manipulating strings with PHP, using date and time functions in PHP, <b>Working with forms:</b> Creating a simple input form		
3	<b>Working With Files:</b> Saving data, storing and retrieving Bob's order, processing files, opening file, writing to a file, closing a file, reading from a file, uses other useful file functions.		
4	<b>Working With Cookies And Sessions:</b> <b>Working with cookies:</b> Introducing cookies, setting and deleting cookies with PHP <b>Working with session:</b> starting a session, working with session variables, passing session IDs in the query string, destroying sessions and unsetting variables, using sessions		
5	<b>MYSQL:</b> Creating web database: Using MySQL monitor, logging into MySQL, creating databases and users, setting users and privileges, column data types <b>Working with MySQL database:</b> Inserting data into database, retrieving data from the database, retrieving data with specific criteria, retrieving data from multiple tables, retrieving data in particular order, grouping and aggregate data, using sub queries, updating records, deleting records from databases, dropping table and database		

6	<p><b>Accessing My-SQL Database From Web With PHP :</b></p> <p>Web database architecture</p> <p><b>Querying database from the web:</b> checking and filtering input data, setting up connection, Choosing database to use, querying database, retrieving the query result, disconnecting from the database.</p>
7	<p><b>WORDPRESS AND JOOMLA:</b></p> <p><b>WORDPRESS</b> - Word press Theme, Integration Adding Pages and posts Manage Widgets, Plug - In Project in Word press</p> <p><b>JOOMLA</b> – Joomla Installation, Template Integration, Adding content (articles management) Adding content (articles management) Project in Joomla</p>

**Elective Group:(04) Open Source Technologies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-04-D	Ruby	2L-1T-0P=3C	2018
<p><b>Course Objective:</b> Main objective of this paper is to learn, object-oriented programming with Ruby, Rails fundamentals and how to create basic online applications. How to work with HTML controls, use models in Rails applications, and work with sessions. Details on working with databases and creating, editing and deleting database records, Methods for handling cookies and filters and for caching pages.</p>			
<p><b>Expected Outcome:</b> At the end of this course, student should be able to understand</p> <ul style="list-style-type: none"> <li>• Programming experience in an object-oriented language.</li> <li>• Basic familiarity with HTML important for Rails project.</li> </ul>			
<p><b>References (Books, Websites etc.):</b></p> <ul style="list-style-type: none"> <li>• Programming Ruby: The Pragmatic Programmers' Guide, Second Edition</li> <li>• Agile Web Development with Rails, Third Edition</li> <li>• <a href="http://www.webtechlearning.com">www.webtechlearning.com</a></li> </ul>			
<p><b>Suggested MOOC :</b> SWAYAM</p>			
Unit	Contents		
1.	<p><b>Introduction to Ruby :</b> Creating a first web application, getting started with Ruby, Checking the ruby documentation, working with numbers in ruby, working with strings in ruby.</p>		
2.	<p><b>Variables and Constants in Ruby :</b> Storing data in variables, creating constants, interpolating variables in Double-Quoted strings, reading text on the command line, creating symbols in ruby, working with operators, Handling operator precedence, working with Arrays, using Two Array Indices, working with Hashes, working with ranges.</p>		
3.	<p><b>Conditional Loops, Methods and Blocks:</b> If Statement, Using the case statement, using loops, creating and calling a method, making use of Scope, working with Blocks</p>		
4.	<p><b>Classes:</b> Encapsulation, creating a class, creating an object, basing one class to another,</p>		
5.	<p><b>Objects:</b> Understanding Ruby's object Access, overriding method, creating class variables, creating class methods, creating Modules, creating Mixins</p>		
6.	<p><b>Rails:</b> Putting Ruby to Rails, introducing Model View Controller Architecture, giving the view something to do, mixing ruby code and HTML inside the view, passing data from an action to a view, escaping sensitive text, adding a second action.</p>		
7.	<p><b>Building Simple Rails Applications :</b> Accessing data the user provides, using rails shortcuts for HTML controls, working with models, tying controls to models, initializing data in controls, storing data in sessions</p>		

**Elective Group: (05) Mobile Computing Technologies**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
404-05-A	HTML 5	2L+1T+0P= 4C	2018-19
<b>Objectives:</b>			
<b>Expected Outcome :</b>			
<b>References (Books, Websites etc) :</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC's: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Introduction to HTML	<ul style="list-style-type: none"> <li>▪ History and Evolution of HTML Types</li> <li>▪ Introduction to HTML5</li> <li>▪ Differences between types of HTML(HTML,XHTML,HTML5)</li> </ul>		
Features of HTML5	<ul style="list-style-type: none"> <li>▪ Detection of HTML5 Support</li> <li>▪ Modernizr: An HTML5 Detection Library</li> <li>▪ Canvas</li> <li>▪ Canvas Text</li> <li>▪ Video</li> <li>▪ Video Formats</li> <li>▪ Local Storage</li> <li>▪ Web Workers</li> <li>▪ Offline Web Applications</li> <li>▪ Geolocation</li> <li>▪ Input Types</li> <li>▪ Placeholder Text</li> <li>▪ Form Autofocus</li> <li>▪ Microdata</li> </ul>		
Elements of HTML5	<ul style="list-style-type: none"> <li>▪ The Doctype</li> <li>▪ The Root Element</li> <li>▪ The &lt;head&gt; Element</li> <li>▪ New Semantic Elements in HTML5</li> <li>▪ Headers</li> <li>▪ Articles</li> <li>▪ Dates and Times</li> <li>▪ Navigation</li> <li>▪ Footers</li> </ul>		
HTML Media	<ul style="list-style-type: none"> <li>▪ Adding Media to Web Page</li> <li>▪ Video Tag and its attributes</li> <li>▪ Audio Tag and its attributes</li> </ul>		

HTML Graphics	<ul style="list-style-type: none"> <li>▪ Introduction to Canvas</li> <li>▪ Simple Shapes</li> <li>▪ Canvas Coordinates</li> <li>▪ Paths</li> <li>▪ Text</li> <li>▪ Gradients</li> <li>▪ Images</li> </ul>
Geolocation	<ul style="list-style-type: none"> <li>▪ Geolocation API</li> <li>▪ Handling Errors</li> <li>▪ geo.js Library</li> </ul>
Local Storage for Web Applications	<ul style="list-style-type: none"> <li>▪ Evolution of Local Storage</li> <li>▪ Introduction to HTML5 Storage</li> </ul>
Offline Web Application	<ul style="list-style-type: none"> <li>▪ Introduction to Offline Web application</li> <li>▪ The Cache Manifest</li> </ul>
Web Forms	<ul style="list-style-type: none"> <li>▪ Introduction to Web Forms and its elements</li> <li>▪ Placeholder Text</li> <li>▪ Autofocus Field</li> <li>▪ e-Mail Addresses</li> <li>▪ Web Addresses</li> <li>▪ Numbers as Spinboxes</li> <li>▪ Numbers as Sliders</li> <li>▪ Date Pickers</li> <li>▪ Search Boxes</li> <li>▪ Color Pickers</li> </ul>
CSS3	<ul style="list-style-type: none"> <li>▪ Introduction</li> <li>▪ Basic designs (Color, Background, Padding, Margin, Height/Width)</li> <li>▪ CSS Box-Model</li> <li>▪ CSS Positions</li> <li>▪ CSS Selectors</li> <li>▪ Advanced CSS <ul style="list-style-type: none"> <li>• Media queries</li> <li>• Transitions</li> <li>• Animations</li> <li>• Flex-box</li> <li>• Gradients</li> </ul> </li> </ul>
Miscellaneous	Introduction to CSS Preprocessors ,SASS & LESS, CSS framework, Bootstrap, Cross browser compatible CSS

**Elective Group: (05) Mobile Computing Technologies**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
405-05-B	<b>JavaScript Programming</b>	2L+1T+0P= 4C	2018-19
<b>Objectives:</b>			
<b>Expected Outcome :</b>			
<b>References (Books, Websites etc) :</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Syllabus:</b>			
Introduction to Javascript	<ul style="list-style-type: none"> <li>▪ JavaScript Overview</li> <li>▪ JavaScript Programming Basics</li> </ul>		
Variables and Operators	<ul style="list-style-type: none"> <li>▪ Variables and Data Types</li> <li>▪ Operators</li> <li>▪ Array</li> </ul>		
Control Statements	<ul style="list-style-type: none"> <li>▪ Controlling the Flow: JavaScript Control Statements</li> </ul>		
Functions	<ul style="list-style-type: none"> <li>▪ Functions</li> </ul>		
The Window Object	<ul style="list-style-type: none"> <li>▪ The Window Object</li> <li>▪ Dialog Boxes</li> <li>▪ Window functions</li> </ul>		
The Document Object	<ul style="list-style-type: none"> <li>▪ The Document Object</li> <li>▪ Writing to Documents</li> <li>▪ Document related functions</li> </ul>		
Forms and Forms-based Data	<ul style="list-style-type: none"> <li>▪ The Form Object</li> <li>▪ Working With Form Elements and Their Properties</li> <li>▪ Event related with form</li> </ul>		
Form Validation	<ul style="list-style-type: none"> <li>▪ Form Validation: A Process</li> <li>▪ Testing Data</li> <li>▪ Preparing Data for Validation and Reporting Results</li> <li>▪ Validating Non-text Form Objects</li> </ul>		
Frames	<ul style="list-style-type: none"> <li>▪ HTML Frames Review</li> <li>▪ Scripting for Frames</li> </ul>		
The String and RegExp Objects	<ul style="list-style-type: none"> <li>▪ The String Object</li> <li>▪ Properties and methods of String Object</li> <li>▪ Using String Object Methods to Correct Data Entry Errors</li> <li>▪ The RegExp Object</li> </ul>		
Dates and Math	<ul style="list-style-type: none"> <li>▪ The Date Object</li> <li>▪ Properties and methods of Date Object</li> <li>▪ The Math Object</li> </ul>		



	<ul style="list-style-type: none"><li>▪ Properties and methods of Math Object</li></ul>
Animation	<ul style="list-style-type: none"><li>▪ Frequently used Animation function</li><li>▪ Manual and Automated animation.</li></ul>
AJAX	<ul style="list-style-type: none"><li>▪ Introduction to AJAX</li><li>▪ Interacting with the Web Server using XMLHttpRequest Object</li><li>▪ Need of Web server</li><li>▪ Need of JSON</li><li>▪ RESTful API with JSON</li></ul>
JS Frameworks & Libraries	<ul style="list-style-type: none"><li>▪ jQuery<ul style="list-style-type: none"><li>• Intro</li><li>• Effects and animations</li><li>• DOM/HTML Updates</li><li>• jQuery and Ajax</li></ul></li></ul>

**Elective Group: (05) Mobile Computing Technologies**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
504-05-C	<b>Android</b>	2L+1T+0P= 4C	2018-19
<b>Objectives:</b>			
<b>Expected Outcome :</b>			
<b>References (Books, Websites etc) :</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Syllabus:</b>			
Introduction to Android	<ul style="list-style-type: none"> <li>▪ Evolution of Android</li> <li>▪ Advantages of Android</li> <li>▪ SDK Tools for Android</li> </ul>		
Overview of Android Platform	<ul style="list-style-type: none"> <li>▪ Android Development IDE Understand the Working of Android</li> <li>▪ The Android Application Framework</li> <li>▪ Screen Layout Design</li> <li>▪ User Interface Design</li> <li>▪ Introduction to Graphics and Animation Design</li> <li>▪ Interactivity</li> <li>▪ Introduction to Content Providers</li> <li>▪ Intent and Intent Filters</li> </ul>		
Setting up the Android Development Environment	<ul style="list-style-type: none"> <li>▪ Installing Android Development Environment</li> <li>▪ Updating the Android SDK</li> <li>▪ Setting up AVDs and Smartphone Connections</li> </ul>		
Introduction to the Android Software Development Platform	<ul style="list-style-type: none"> <li>▪ Understanding Java SE and Dalvik Machine</li> <li>▪ The Directory Structure of an Android Project</li> <li>▪ Android XML</li> <li>▪ Android Application Resources</li> <li>▪ Launching an Android Application</li> <li>▪ Creating first Hello Application</li> </ul>		
Overview of Android Framework	<ul style="list-style-type: none"> <li>▪ Overview of Object Oriented Programming</li> <li>▪ Overview of XML</li> <li>▪ The Anatomy of an Android Application</li> <li>▪ Components of an Android Application</li> <li>▪ Android Intent Objects</li> <li>▪ Android Manifest XML</li> </ul>		
Screen Layout Design	<ul style="list-style-type: none"> <li>▪ Android View Hierarchies</li> <li>▪ Activity Lifecycle</li> <li>▪ Defining Screen Layouts ( Screen size, pixel density)</li> </ul>		

User Interface Design	<ul style="list-style-type: none"> <li>▪ Using Common UI Elements</li> <li>▪ Using Menus in Android</li> <li>▪ Adding Dialogs(Date picker, Time picker, Custom Dialog, Alert Dialog)</li> </ul>
Introduction to Graphics Resources	<ul style="list-style-type: none"> <li>▪ Introduction to Drawables</li> <li>▪ Using Bitmap Images</li> <li>▪ Using Transitions</li> <li>▪ Creating 9-Patch Custom Scalable Images</li> <li>▪ Playing Video in Android Apps</li> </ul>
Handling User Interface Events	<ul style="list-style-type: none"> <li>▪ An Overview of UI Events</li> <li>▪ Handling onClick Events for all Views</li> <li>▪ Android Touch-screen Events: onTouch</li> <li>▪ Touch-screen's Right-Click Equivalent: onLongClick</li> <li>▪ Keyboard Event Listeners: onKeyUp, onKeyDown</li> <li>▪ Context Menus: onCreateContextMenu</li> <li>▪ Controlling the Focus</li> </ul>
Understanding Content Providers	<ul style="list-style-type: none"> <li>▪ An Overview of Android Content Providers</li> <li>▪ Defining a Content Provider</li> <li>▪ Working with a Database</li> </ul>
Intents and Intent Filters	<ul style="list-style-type: none"> <li>▪ Understanding the Intents</li> <li>▪ Android Intent Messaging via Intent Objects</li> <li>▪ Intent Resolution</li> <li>▪ Using Intents with Activities</li> <li>▪ Android Services</li> <li>▪ Using Intents with Broadcast Receivers</li> </ul>
Bars and Views	<ul style="list-style-type: none"> <li>▪ Action Bar, Toolbar, Navigation Drawer, TextView, EditView, Button, WebView, ImageView ,ListView etc</li> </ul>

**Elective Group: (05) Mobile Computing Technologies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-05-D	Hybrid Application Development	2L+1T+0P= 4C	2018-19
<b>Objectives:</b>			
<b>Expected Outcome :</b>			
<b>References (Books, Websites etc) :</b>			
<b>Suggested MOOC :</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus:</b>			
Introduction to Mobile App Development (Warm-up)	<ul style="list-style-type: none"> <li>▪ Introduction</li> <li>▪ Introduction Types of mobile apps               <ul style="list-style-type: none"> <li>• Web Apps</li> <li>• Native Apps</li> <li>• Hybrid Apps</li> </ul> </li> <li>▪ Intro to Web Apps               <ul style="list-style-type: none"> <li>• Concept</li> <li>• Single Page Apps</li> <li>• Progressive Web Apps</li> <li>• Accelerated Mobile Pages</li> <li>• PWA vs AMP</li> </ul> </li> <li>▪ Intro to Native Apps               <ul style="list-style-type: none"> <li>• Concept</li> <li>• Pros and Cons</li> </ul> </li> <li>▪ Intro to Hybrid Apps               <ul style="list-style-type: none"> <li>• Concept</li> <li>• Pros and Cons</li> <li>• Native vs Hybrid apps</li> </ul> </li> <li>▪ Web Or Native Or Hybrid?</li> </ul>		
Getting Started with React Native (Getting in action)	<ul style="list-style-type: none"> <li>▪ Introduction to React Native</li> <li>▪ Installing dependencies               <ul style="list-style-type: none"> <li>▪ Installing Node, Python2, JDK</li> <li>▪ The React Native CLI</li> <li>▪ Android development environment</li> </ul> </li> </ul>		

	<ul style="list-style-type: none"><li>■ Creating a new application</li><li>■ Preparing the Android device</li><li>■ Running your React Native application</li></ul>
More Details (Diving deep)	<ul style="list-style-type: none"><li>■ Native modules</li><li>■ Components<ul style="list-style-type: none"><li>■ ActivityIndicator, Button, Image, ListView, Modal, ProgressBarAndroid, RefreshControl, ScrollView, Slider, StatusBar, Switch, Text, TextInput, ToolbarAndroid, WebView</li></ul></li><li>■ API's<ul style="list-style-type: none"><li>■ Alert, AppState, CameraRoll, Clipboard, DatePickerAndroid, Keyboard, PermissionsAndroid, Settings, Share, StyleSheet, TimePickerAndroid, ToastAndroid, Vibration</li></ul></li></ul>

### Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
404-06-A	C# Programming	2L+1T+0P=4C	2018

**Course Objective :**

The objectives of the course is to introduce Object Oriented Programming using C#, make student to use C# for implementing object- oriented concepts. Make student to create, compile and run object-oriented C# programs using Visual Studio.

**Expected Outcome :**

At the end of this course, student should be able to

- Design classes using inheritance and polymorphism.
- Design interfaces, abstract and concrete classes.
- Design Console Based Applications.
- Design applications using event driven programming.
- Write basic LINQ programs.

**References (Books, Websites etc) :**

- C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt.
- C # Programming- Wrox publication.
- Programming in C# -A Primer. E. Balaguruswamy.

**Suggested MOOC :** 1) Coursera ([www.coursera.org](http://www.coursera.org))  
 2) mymooc ([www.my-mooc.com](http://www.my-mooc.com))  
 3) Class Central ([www.class-central.com](http://www.class-central.com))  
 4) edX ([www.edx.org](http://www.edx.org))  
 5) Mooc List ([www.mooc-list.com](http://www.mooc-list.com))

**Syllabus:**

Unit No.	Contents
1.	<p><b>Introduction to C#</b>                      The Dot Net Framework, CLR, CLS, CTS, MSIL, Managed Code, Programming Features of C#, Compile and Execution of C# Program, Keywords in C#, Namespaces, Data Types, Declaration and Initialization of Variables, Operators, Type Conversions,                      If, If...else, switch, The ‘?:’ Operator, The while Loop, The do....while Loop, The for Loop, ‘var’ Variable.</p>
2.	<p><b>Methods and Arrays:</b>                      Define Method, Declaring and Calling a Method, Passing Method Parameters (Pass By Value, Pass by Reference), Method Overloading,                        Define Array, One Dimensional Array (Declaration, Creation and Initialization), Two Dimensional Array, Multidimensional Array, ArrayList Class, Jagged Array,                        Manipulating Strings, String Methods, Regular Expressions, foreach Loop.</p>
3.	<p><b>Class and Objects:</b>                      Basic Principles of OOP, Define a Class, Member Access Modifiers,                        Constructors, Types of Constructors (Default Constructor, Overloaded Constructor, Static</p>

	<p>Constructor, Private Constructor and Copy Constructor), Destructors,  ‘this’ Reference, Constant Members, Properties, Auto Implemented Properties, Object Initializer, Collection Initializer, Anonymous Types, Extension Methods,  Partial Class, Partial Methods, Indexers.</p>
4.	<p><b>Inheritance and Polymorphism</b>  Define Inheritance, Types of Inheritance, Method Overriding, Abstract Class, Abstract Methods, Sealed Class and Methods,  Define Polymorphism, Static Polymorphism: Function Overloading Operator Overloading, Overloadable and Nonoverloadable Operators, Dynamic Polymorphism,  Defining Interface, Extending interface, Interface and Inheritance, Explicit Interface.</p>
5.	<p><b>Errors and Exception Handling</b>  Types of Errors, Exceptions, Syntax for Exceptions Handling Code, Multiple catch Statements, finally Statement, Nested try Blocks, Throwing Our Own Exception.</p>
6.	<p><b>Delegates, Events and LINQ</b>  Define Delegate, Singlecast Delegate, Multicast Delegate, Events, Declaring Events,  Introduction to LINQ, LINQ Query Operators, LINQ-SQL, LINQ-Objects, LINQ-Dataset.</p>
7.	<p><b>Professional Techniques for C#</b>  Runtime Type Identification, Reflection, Attributes, Generics, Generic Structure, Unsafe code, Iterators Examples.</p>

### Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
405-06--B	ASP.Net with C#	3L+1T+0P=4C	2018

#### Course Objective:

The objective of the course is to introduce web programming using C#, make student to use C# for implementing different controls of ASP.Net. To introduce designing and interacting tools such CSS and JavaScript.

#### Expected Outcome :

At the end of this course, student should be able to

- Design websites using C# platform
- Work with various controls of ASP.Net
- Work with different states, cookies, themes etc.
- Work with data access controls using different databases.

#### References (Books, Websites etc) :

- ASP.Net: The Complete Reference, Matthew MacDonald
- Professional ASP.Net (4/4.5) in C #- Wrox publication.

**Suggested MOOC:** 1) Coursera ([www.coursera.org](http://www.coursera.org))  
 2) mymooc ([www.my-mooc.com](http://www.my-mooc.com))  
 3) Class Central ([www.class-central.com](http://www.class-central.com))  
 4) edX ([www.edx.org](http://www.edx.org))  
 5) Mooc List ([www.mooc-list.com](http://www.mooc-list.com))

#### Syllabus

Unit	Contents
1.	<b>Introduction of ASP.Net:</b> Introduction to ASP.Net, ASP.Net Architecture, ASP.Net Page Life Cycle, Page Life Cycle Events, ASP.Net Directives.
2.	<b>Using ASP.Net Rich, Validation, and Navigation Controls:</b> FileUpload Control, Calendar Control, AdRotator Control, MultiView Control, and Wizard Control Examples. RegularFieldValidator, RegularExpressionValidator, RangeValidator, CompareValidator, CustomValidator, ValidationSummary, Menu, SiteMapPath, TreeView Control.
3.	<b>Master Pages, CSS, and JavaScript:</b> Working With Master Pages, Nested Master Pages, CSS Overview, Adding Style Sheets into, Web Pages, Editing Styles, Applying Styles to Master Pages, Applying Styles to Web Page, JavaScript Overview, Adding JavaScript files into ASP.Net, Editing JavaScript Files, Applying JavaScripts to Master Pages, Applying JavaScripts to Web Page.
4.	<b>State Management:</b> View State, Hidden Field, Session State, Application State, QueryString, HttpContext, Cookies, Caching, Types of Caching



<b>5.</b>	<b>Personalization and Security:</b> Configuration Overview, Concept of Theme, Applying Themes, Types of Themes- Page Theme and Global Theme, Skins, Security in ASP.Net, Authentication and Authorization Membership and Roles.
<b>6.</b>	<b>Data Access in ASP.Net:</b> Data Source Controls, DataList, DataPager, GridView, DetailsView, FormView, Object Data Sources, ListView, DataPager, Repeater
<b>7.</b>	<b>Publishing and Testing Website:</b> IIS, Configuration of IIS, Setting Application Pool, Publish Website, Testing Website.

### Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
504-06-C	C# Windows Programming	3L+1T+0P=4C	2018

#### Course Objective:

The objective of the course is to introduce windows programming using C#, make student to use C# for implementing basic and advanced controls of windows applications. To introduce ADO.Net, XML, and Report Wizards with windows applications.

#### Expected Outcome :

At the end of this course, student should be able to

- Design Windows forms applications
- Work with advanced controls of windows forms application
- Work with ADO.Net classes and XML
- Generate reports

#### References (Books, Websites etc) :

- C#: The Complete Reference, McGraw-Hill Osborne Media- Herbert Schildt.
- C # Programming- Wrox publication.
- Programming in C# -A Primer. E. Balaguruswamy.

#### Suggested MOOC:

- 1) Coursera ([www.coursera.org](http://www.coursera.org))
- 2) mymooc ([www.my-mooc.com](http://www.my-mooc.com))
- 3) Class Central ([www.class-central.com](http://www.class-central.com))
- 4) edX ([www.edx.org](http://www.edx.org))
- 5) Mooc List ([www.mooc-list.com](http://www.mooc-list.com))

#### Syllabus

Unit	Contents
1	<b>Introduction to Windows Programming:</b> Overview of Windows Forms, Windows Forms Class Hierarchy, Windows of Visual Studio IDE (Start Page, Menu Bar, Solution Explorer Window, Properties Window, Server Explorer Window, Toolbox, Forms Designer), Dynamic Controls.
2	<b>Working with Windows Forms Controls:</b> Properties, Events and Examples of: Button, Label, LinkLabel, TextBox, RichTextBox, ListBox, ListView, ComboBox, RadioButton, CheckBox, CheckedListBox, DateTimePicker, PictureBox, Timer, ProgressBar, TrackBar, HScrollBar, VScrollBar
3	<b>Dialog Controls:</b> ColorDialog, FolderBrowserDialog, FontDialog, OpenFileDialog, SaveFileDialog. Examples.
4	<b>Menus, MDI and Containers:</b> ContextMenuStrip, MenuStrip, StatusStrip, ToolStrip, SDI and MDI, Visual Inheritance, GroupBox, Panel, TreeView, SplitContainer, TabControl Examples.
5	<b>File Handling using C#:</b> FileStream, BinaryReader, BinaryWriter, StreamReader, StreamWriter, StringReader, StringWriter, DirectoryInfo, FileInfo Examples.

6	<b>Data Access and Data Binding:</b> ADO.NET Overview, .NET Data Providers, ADO.Net Objects, Connections, Commands, Data Adapters, Data Readers , Data Sets , Data Tables , Data Views , Data Binding, Reports.
7	<b>XML with Windows Forms Applications:</b> XML file, Create XML file, Write data into XML, Read Data from XML file using C#. Update, Filter, and Delete data form XML File.

### Elective Group: (06) Dot Net Technologies

Course Number	Course Name	L-T-P-Credits	Year of Introduction
505-06--D	Advanced ASP.Net with MVC	2L+1T+0P=3C	2018

#### Course Objective:

The objective of the course is to introduce advanced ASP.Net using C#, make student to use C# for implementing advanced features of ASP.Net such JQuery and MVC framework.

#### Expected Outcome :

At the end of this course, student should be able to

- Work with web parts and AJAX controls.
- Create and consume web services using C#.
- Work with WPF and WCF.
- Work with JQuery and MVC framework.

#### References (Books, Websites etc) :

- ASP.Net: The Complete Reference, Matthew MacDonald
- Professional ASP.Net (4/4.5) in C #- Wrox publication.
- *Microsoft ASP.NET Step by Step (Microsoft Press)* - G. Andrew Duthrie

#### Suggested MOOC:

- 1) Coursera ([www.coursera.org](http://www.coursera.org))
- 2) mymooc ([www.my-mooc.com](http://www.my-mooc.com))
- 3) Class Central ([www.class-central.com](http://www.class-central.com))
- 4) edX ([www.edx.org](http://www.edx.org))
- 5) Mooc List ([www.mooc-list.com](http://www.mooc-list.com))

#### Syllabus

Unit	Contents
1	<b>ASP.Net Web Parts:</b> Introduction, Advantages of Web Parts, WebPartsManager, CatalogPart, PageCatalogPart, EditorPart, WebPartZone, EditorZone, CatalogZone Controls.
2	<b>ASP.Net AJAX:</b> AJAX control toolkit, Building a ASP.NET Page with Ajax ScriptManager Control, UpdatePanel Control, UpdateProgress Control, Timer Control.
3	<b>ASP.Net Web Services:</b> Introduction to Web services, Creating Web Services, Setting the Web Service Attributes, Test and Run Web Services, Consuming Web Services.
4	<b>Windows Presentation Foundation:</b> Overview of WPF, Creating Simple Program in WPF, WPF-Command line, WPF-Data Binding, WPF-Resources, and WPF-Templates.
5	<b>Windows Communication Foundation:</b> Overview of WCF, WCF-architecture, Creating WCF Service, Hosting WCF Service, Types of Hosting WCF Service, Consuming WCF Services. Difference between WCF and Web Services.

6	<b>JQuery:</b> Introduction to JQuery, Features, JQuery Selectors, Working of JQuery, JQuery UI Library, Document Ready Event, Events Handling, Effects Methods.
7	<b>Working with MVC:</b> Introduction to .Net MVC Framework, MVC Framework Features, MVC Architecture, MVC Components, MVC Application Folders, Configuration files- global.asax, packages.config, web.config, Working with Views, Working with Controls.

### Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-07-A	<b>HTML5</b>	3L+1T+0P=4C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>• Understand the Concepts of HTML 5 &amp; the Applications of HTML 5 to Website Development.</li> <li>• Design and Develop Websites for various Business Applications.</li> <li>• Check information inputted into a Database and validate it.</li> </ul>			
<b>Pre-requisites:</b> Basic concepts of Languages and HTML tags with functions.			
<b>Expected Outcome :</b> After going through this course a student should be able to understand : <ul style="list-style-type: none"> <li>• The Learners will be able to write HTML 5 code for developing website applications.</li> <li>• The websites developed can be uploaded and implemented for the business areas .</li> </ul>			
<b>References (Books, Websites etc.):</b> <ul style="list-style-type: none"> <li>○ Bruce Lawson, Remy Sharp –Introducing HTML 5.0 –Google Books 2010.</li> <li>○ Jeffrey Zeldman and Jeremy Keith “HTML 5 for Webdesigners –Google Books-2010.</li> <li>○ Book by Brian Albers, Frank Salim, and Peter Lubbers “Pro HTML 5.0 Programming</li> <li>○ Christopher Murphy, Divya Manian, and Richard Clark :Beginning HTML5 and CSS3.2012.</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Introduction to HTML:</b> MIME Types, Standards for the Internet, Evolution of HTML, Introduction to XHTML, Introduction to Working Group, W3C		
2	<b>Features of HTML5:</b> Detection of HTML5 Support, Modernizr: An HTML5 Detection Library, Canvas, Canvas , Text, Video, Video Formats, Local Storage, Web Workers, Offline Web Applications, Geolocation, Input Types, Placeholder Text, Form Autofocus, Microdata		
3	<b>Elements of HTML5:</b> The Doctype, The Root Element, The <head> Element, New Semantic Elements in HTML5, Handling of Unknown Elements by the Browsers, Headers, Articles, Dates and Times, Navigation, Footers		
4	<b>Drawing Surface:</b> Introduction to Canvas, Simple Shapes, Canvas Coordinates, Paths, Text, Gradients, Images		
5	<b>Video on the web</b> Video Containers, Video Codecs, Audio Codecs		

6	<b>Geolocation and Local Storage for Web Applications</b> Geolocation API, Handling Errors, geo.js Library, Evolution of Local Storage, Introduction to HTML5 Storage
7	<b>Web Forms and Offline Web Application</b> Introduction to Web Forms, Placeholder Text, Autofocus Field, e-Mail, Addresses, Web Addresses, Numbers as Spinboxes, Numbers as Sliders, Date Pickers, Search Boxes, Color Pickers, Introduction to Offline Web application, The Cache Manifest

**Elective Group: (07) Net Centric Technologies**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-07-B	JavaScript Programming	2L+1T+0P=3C	2018

**Course Objective:**

- Understand the JavaScript language & the Document Object Model.
- Alter, show, hide and move objects on a web page.
- Check information inputted into a form.
- Javascript allows programming to be performed without server interaction.
- Javascript can respond to events, such as button clicks.
- Javascript can validate data before sending out a request.
- Javascript can adjust an HTML document for special effects

**Pre-requisites:**

Computer. Pre-requisite / Target Audience: An intermediate knowledge on Java and Advanced Java Technology.

**Expected Outcome :**

After going through this course a student should be able to understand :

- The Learners will be able to write Java Script code for developing website applications.
- The websites developed can be uploaded and implemented for the business areas in java Script Code.

**References (Books, Websites etc.):**

1. 1. Danny Goodman Michael Morrison Paul Novitski Tia GustaffRayl, “Javascript Bible” , 7th Edition Wiley India Pvt Ltd.
2. Kogent Learning Solutions Inc, “Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX , “ Dreamtech Press.
3. Fritz Schneider,Thomas Powell ,“JavaScript : The Complete Reference”, 2nd Edition Tata McGraw - Hill Education

**Suggested MOOC:**

Please refer these websites for MOOC’s:

NPTEL / Swayam

www.edx.com

[www.coursera.com](http://www.coursera.com)

**Syllabus**

Unit	Contents
1	<b>Introduction to Javascript:</b> JavaScript Overview , Comparison between Java, JavaScript & VB Script, JavaScript Programming Basics
2	<b>Variables and Operators:</b> Variables and Data Types , Using Variables and Literals , Operators
3	<b>Introduction to Objects, Methods and Events</b> Objects, Methods, and Events, Events and Program Flow, Jumping Right In, Running Scripts.
4	<b>Control Statements</b> Controlling the Flow: JavaScript Control Statements



5	<p><b>Understanding Functions</b> Built in Functions , Standard Date and Time Functions</p>
6	<p><b>The Window Object</b> The Window Object, Dialog Boxes , Status Bar Messages , Window Manipulations</p> <p><b>The Document Object</b> The Document Object, Writing to Documents, Dynamic Documents</p> <p><b>Dates and Math Objects</b> The Date Object , Using and Manipulating Dates , The Math Object , Doing Math with JavaScript</p>
7	<p><b>Frames , Forms and Forms-based Data and Form Validation .</b> HTML Frames Review, Scripting for Frames, The Form Object , Working With Form , Elements and Their Properties, Form Validation: A Process , Testing Data , Preparing Data for Validation and Reporting Results , Validating Non-text Form Objects</p> <p><b>The String and RegExp Objects</b> The String Object , Using String Object Methods to Correct Data Entry Errors , Creating Dynamic Effects with Substring Methods , The RegExp Object</p>

### Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-07-C	AJAX Programming	2L+1T+0P=3C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>• Understand the Concepts of AJAX Programming &amp; the Applications of AJAX to Website Development.</li> <li>• Design and Develop Websites for various Business Applications using AJAX Programming.</li> <li>• Check information and handle database in websites.</li> </ul>			
<b>Pre-requisites:</b> Computer. Pre-requisite / Target Audience: An intermediate knowledge on Programming Languages and its structure for developing professional websites.			
<b>Expected Outcome :</b> After going through this course a student should be able to understand : <ul style="list-style-type: none"> <li>• Concepts of AJAX Programming and its Applications to website Development.</li> <li>• Design and develop professional web applications in the business domain.</li> </ul>			
<b>References (Books, Websites etc.):</b> <ul style="list-style-type: none"> <li>○ Ajax: The Definitive Guide: Interactive Applications by Anthony T. Holdener -2014.</li> <li>○ Kris Hadlock “Ajax for Web Developers Amazon Books 2012.</li> <li>○ Ajax: The Complete Reference by Thomas A. Powell-Amazon Books 2013</li> <li>○ Website :- <a href="https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/">https://www.amazon.com/Learn-JavaScript-Ajax-w3Schools-W3Schools/dp/0470611944/</a></li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Introduction to AJAX:</b> Introduction to Web Architecture, Traditional Web Communication Processes and Technologies , Introduction to AJAX		
2	<b>Interacting with the Web Server using XMLHttpRequest Object:</b> Introduction to Interaction with Web Server, Create an XMLHttpRequest Object, Interact with the Web Server		
3	<b>Working with PHP and AJAX:</b> Introduction to PHP , Process Client Requests , Accessing Files Using PHP		
4	<b>Manipulating XML Data:</b> Basics of XML , Create an XML Document Using DOM , Retrieve Data from XML		
5	<b>Working with XSLT and AJAX:</b> Basics of XSLT , Transform Responses Using XSLT		
6	<b>Working with JSON:</b> Introduction to JSON Format, Create Data in JSON Format , Implement JSON on the Server		

	Side
7	<p><b>Using Frameworks in AJAX:</b> Understand AJAX Frameworks , Use Prototype and Script.aculo.us , Use jQuery</p> <p><b>Applying Basic AJAX Techniques</b> Download Images Using AJAX, Auto-Populate Select Boxes</p> <p><b>Implementing Security and Accessibility in AJAX Applications</b> Create Secure AJAX Applications , Create Accessible Rich Internet Applications</p>

### Elective Group: (07) Net Centric Technologies

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-07-D	Web Services	2L+1T+0P=4C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>• Understand the Concepts of Web services the Applications for Website Development.</li> <li>• Design and Develop Websites for various Business Applications using XML</li> <li>• Check and Validate information inputted into a Database and validate it.</li> </ul>			
<b>Pre-requisites:</b> Computer. Pre-requisite / Target Audience: An intermediate knowledge on XML			
<b>Expected Outcome :</b> After going through this course a student should be able to understand : <ul style="list-style-type: none"> <li>• Learners will be able to write code in XML and Understand the basic concepts of web services .</li> <li>• The programmes written can be implemented for business applications using XML and apply web services in different areas of business .</li> </ul>			
<b>References (Books, Websites etc.):</b> <ul style="list-style-type: none"> <li>○ Book by Ethan Cerami Web Services Essentials Amazon Books 2014.</li> <li>○ Book by Eric Newcomer Understanding Web Services: XML, WSDL, SOAP, and UDDI-Amazon Books 2013.</li> <li>○ Erik T. Ray “Learning XML Google Books 2015.</li> <li>○ Website :- <a href="https://www.w3schools.com/xml/default.asp">https://www.w3schools.com/xml/default.asp</a></li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus</b>			
Unit	Contents		
1	<b>XML Technology Family:</b> Introduction to XML, Advantages of XML, EDI, Databases for Web, XML Based Standards, Structuring with Schemas: DTD, XMLSchemas , XML Processing: DOM, SAX , Presentation Technologies: XSL, XFORMS, XHTML Transformation: XSLT, XLINK, XPATH, XQuery		
2	<b>Architecting Web Services:</b> Business Motivations for Web Services , Technical Motivations for Web Services, Limitations of CORBA and DCOM, Service Oriented Architecture (SOA), Architecting Web Services, Implementation View: Web Services Technology Stack, Logical view: Composition of Web Services, Deployment View: From Application Server to Peer to Peer, Process View: Web Service Lifecycle		
3	<b>Building Blocks of Web Services:</b>		

	Transport Protocols for Web Services, Messaging with Web Services, Protocols for Web Services, SOAP, WSDL, UDDI
4	<b>Creation of Web Services:</b> Web Services using .Net, Web Services using J2EE
5	<b>Implementing XML in e-Business:</b> B2B Applications, B2C Applications, Different types of B2B Interactions, Components of e-Business XML Systems, ebXML, RosettaNet, Applied XML in Vertical Industry: Web Services for Mobile Devices
6	<b>XML Content Management:</b> Semantic Web, Role of Metadata in Web Content, Resource Description Framework: RDF Schema, Architecture of Semantic Web, Content Management Workflow: XLANG, WSFL
7	<b>Security in Web Services:</b> Meeting Security Requirements, XML Encryption, Client / Server Security Issues

### Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-08-A	Enterprise Resource Planning	2L+1T+0P=3C	2018
<p><b>Course Objective:</b> The objective of the course is to enable students in learning basic concepts of Enterprise Resource Planning so that they can understand how to use the organizational resources effectively.</p>			
<p><b>Pre-requisites:</b> Knowledge of Business Process , Business Functions and MIS</p>			
<p><b>Expected Outcome :</b> After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> <li>• Will be able to understand the concepts of ERP.</li> <li>• Can be able to design and develop ERP systems for Business applications .</li> <li>• Implementation of ERP for various areas of Interest in Business Organizations .</li> </ul>			
<p><b>References (Books, Websites etc.):</b> 1. Alexis Leon, ERP (Demystified Hrs), 5/E, Tata McGraw-Hill, 2006. 2. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2006. 3 Sinha; Enterprise Resource Planning , Cengage Learning, New Delhi,</p>			
<p><b>Suggested MOOC:</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Syllabus</b>			
Unit	Contents		
1	<p><b>Introduction to ERP:</b> Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP , Business Modeling , Integrated Data Model , ERP Market.</p>		
2	<p><b>ERP Technologies:</b> Business Process Re-engineering (BPR), BPR Process, Clean Slate Re-engineering Technology Enabled Re-engineering , Myths regarding BPR , Business Intelligence Systems- Data Mining, Data Warehousing, On-Line Analytical Processing (OLAP), Supply Chain Management, Best Practices in ERP.</p>		
3	<p><b>ERP Modules :</b> (a) Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System (b) ERP System Options and Selection (c) ERP proposal Evaluation.</p>		

4	<p><b>ERP Implementation:</b> Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success</p>
5	<p><b>Maintenance and Benefits of ERP:</b> Improvement opportunities , IT Maintenance, Business Needs , Business Priority , Maintenance Cost , User Training, ERP Solutions</p>
6	<p><b>ERP &amp; Information System:</b> Reduction of Lead Time, On-Time Shipment , Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance , Increased Flexibility , Reduced Quality Costs, Improved Information Accuracy and Decision Making Capabilities.</p>
7	<p><b>Case Studies on ERP :</b> ERP for Finance , Manufacturing , Supply Chain and Quality Management for any Business Organization</p>

### Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-08-B	E-Commerce	2L+1T+0P=3C	2018
<p><b>Course Objective:</b> This course explores the basics of working with internet including WWW, Email, Browsing, Chatting etc., and understands the potential of secured electronic transactions, E-mail security and electronic publishing.</p>			
<p><b>Pre-requisites:</b> Knowledge of Internet and Internet Technologies , Programming knowledge and Network Technology basics.</p>			
<p><b>Expected Outcome :</b></p> <ul style="list-style-type: none"> <li>• Will be able to understand the concepts of E-Commerce.</li> <li>• Can be able to design and develop E-Commerce facilities for Business applications . Implementation of E-Commerce Websites for Business firms.</li> </ul>			
<p><b>References (Books, Websites etc.):</b></p> <ol style="list-style-type: none"> <li>1. Web Commerce Technology Handbook, byDanielMinoli, EmmaMinoli, McGraw-Hill.</li> <li>2. Frontiers of electroni commerce by Galgotia.</li> <li>3. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.</li> <li>4. E-Commerce, S.Jaiswal – Galgotia.</li> <li>5. E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.</li> <li>6. Electronic Commerce – Gary P.Schneider – Thomson.</li> <li>7. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.</li> </ol>			
<p><b>Suggested MOOC:</b> Please refer these websites for MOOC's: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Syllabus</b>			
Unit	Contents		
1	<p><b>Introduction and Concept</b> What is E-Commerce? Types of E-Commerce and Applications of E-Commerce, E-Commerce Basic Requirements, Internet and Concepts of Internet.</p>		
2	<p><b>Approaches to Safe Electronic Commerce:</b> Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers and Enterprise Networks, Electronic Cash and Electronic Payment Schemes: Internet Monetary, Payment &amp; Security Requirements. Payment and Purchase Order Process,On-line Electronic cash.</p>		



3	<p><b>Internet/Intranet Security Issues and Solutions:</b>  The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.</p>
4	<p><b>Master Card/Visa Secure Electronic Transaction:</b>  Introduction, Business Requirements Concepts, payment Processing, E-Mail and Secure E-mail , Technologies for Electronic Commerce: Introduction, The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.</p>
5	<p><b>Internet Resources for E-Commerce</b>  Introduction, Technologies for web, Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet, Advertising on Internet: Issues and Technologies, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.</p>
6	<p><b>E-Commerce Website Development</b>  Website Development , Online Transactions and Payments , Security Issues in E-Commerce website</p>
7	<p><b>Case Studies on E-Commerce :-</b>  Amazon , Flip kart , Myantra</p>

## Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-08-C	Recommender System	2L+1T+0P=3C	2018
<b>Course Objective:</b>			
<b>Pre-requisites:</b> Knowledge about Business Organizations and its functions , Theory of Recommender Systems and Decision Making process .			
<b>Expected Outcome :</b> After going through this course a student should be able to understand : <ul style="list-style-type: none"> <li>• Will be able to understand the concepts of Decision Making Process.</li> <li>• Can be able to design and develop Recommender for Business applications.</li> <li>• Implementation of Recommender System for various areas of Interest in Business Organizations .</li> </ul>			
<b>References (Books, Websites etc.):</b> <ol style="list-style-type: none"> <li>1. “Recommender systems An Introduction” by Dietmar Jannach, Markus Zanker, Alexzander Felfering, Gerhard friedrich by Cambridge university press 2011</li> <li>2. <a href="#">recommender systems handbook [book] by francesco ricci, lior rokach, paul b. kantor in books</a></li> </ol>			
<b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Introduction to Basic Concepts:</b> Collaborative Recommendation: User Based Nearest Neighbor recommendation, Item Based Nearest Neighbor recommendation, model based and pre-processing based approaches. Recent practical approaches and systems. Content based Recommendation: content representation and content similarity, similarity based retrieval, other text classification methods, Knowledge Based Recommendation: Knowledge representation and reasoning, interacting with constraint based recommenders, interacting with case based recommenders,		
2	<b>Hybrid recommendation approaches:</b> Opportunities for hybridization, Monolithic hybridization design, parallelized hybridization design, pipelined hybridization design,		
3	<b>Evaluating recommender systems :</b> General properties of Evaluation research, popular evaluation designs, evaluation on historical datasets, alternate evaluation design		
4	<b>Recent developments:</b> Attacks on collaborative recommender systems, Online consumer decision making		

5	<b>Recommender systems and the next-generation web</b> Recommendations in ubiquitous environments.
6	<b>Explanations in recommender systems</b> Explanations in constraint-based recommenders, explanation in case based recommenders, explanation in collaborative filtering recommenders.
7	<b>Case studies on Recommender System.</b>

### Elective Group:(08) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-08-D	Knowledge Management	2L+1T+0P=3C	2018
<p><b>Course Objective:</b> The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.</p>			
<p><b>Pre-requisites:</b> Knowledge about Information System and MIS with Implementation of MIS</p>			
<p><b>Expected Outcome :</b> After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> <li>• Will be able to understand the concepts of Knowledge and knowledge management .</li> <li>• Can be able to design and develop Knowledge management systems for Business applications .</li> <li>• Implementation of KM to various areas of Interest in Business Organizations .</li> </ul>			
<p><b>References (Books, Websites etc.):</b></p> <ol style="list-style-type: none"> <li>1. Madhukar Shukla:Competing Through Knowledge-Building a learning Organisation(Response Books, New Delhi.</li> <li>2. Tiwana, The Knowledge Management Toolkit: Practical Techniques for building a Knowledge Management Systemes, 2/e, Pearson Edu.</li> <li>3. Honey Cutt : “Knowledge Management Strategies”, PHI, New Delhi.</li> <li>4. A wad, KM, Pearson Edn, 2007.</li> <li>5. Barnes, Knowledge Management Systems, 1/e, Thomson 2006.</li> <li>6. Ikudiro Nonka &amp; Hirotaka Takeuchi, “ The Knowledge – Creating Company”, Oxford University Press, London.</li> </ol>			
<p><b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Syllabus</b>			
Unit	Contents		
1	<p><b>Introduction:</b> Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge</p>		
2	<p><b>Drivers of knowledge Management:</b> Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.</p>		
3	<p><b>Technology and KM:</b> Technology components of KM – IT &amp; KM , Ecommerce and KM</p>		

4	<p><b>Total Quality Management and KM:</b> TQM and KM , Bench marking and KM.</p>
5	<p><b>Implementation of KM:</b> Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM</p>
6	<p><b>KM and Organizational Restructuring:</b> The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.</p>
7	<p><b>Case studies in Knowledge Management</b> Knowledge management in Health Care, Knowledge Management in Human Resource Management</p>

### Elective Group:(09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-09-A	IoT Architecture And Protocols	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

**Expected Outcome :**

At the end of the course a student should be able:

- 1.To Understand the Architectural Overview of IoT
2. To Understand the IoT Reference Architecture and Real World Design Constraints
3. To Understand the various IoT Protocols ( Datalink, Network, Transport, Session, Service)

**References:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer 46.

[http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot\\_prot/index.htm](http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm)

**Text Books:**

- Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.

**Suggested MOOC:**

Please refer these websites for MOOC’s:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

### Course Plan

Unit	Contents
1	IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management
2	Architecture of IoT 1. Hardware 2. Software Reference Model and architecture, IoT reference Model - IoT Reference

	ArchitectureIntroduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints-Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.
3	IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS (12 hours) PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15),
4	WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP
5	Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS)
6	Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT
7	SERVICE LAYER PROTOCOLS & SECURITY - Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

**Elective Group: (09) Internet Of Things**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-09-B	Sensors and Fundamentals with Hands-on lab Node.js/Raspberry PI/Python	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

**Expected Outcome :**

At the end of the course a student should be able:

1.To Understand the basics of Python and node js to interface with sensors

**REFERENCES:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1 st Edition, Academic Press, 2014.

[http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot\\_prot/index.htm](http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm)

**Text Books:**

- Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications

**Suggested MOOC :**

Please refer these websites for MOOC’s:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

**Course Plan**

Unit	Contents
1	Sensing and Measurements 0-5 Voltage Analog I/O Pulse Width Mode I2C Communication
2	Sensor Types, Classification Visual, Fleet Tracking sensors Wiring Basics
3	Practical: Working with Temperature, Humidity, Light & Motion Detector, Promity Sensor
4	Edge Devices & Gateway Devices With hands-on using Raspberry PI using Node.js/Python Introduction to Edge Devices Wired, Wireless Communications Serial Port/UART BLE/WIFI



	<p>Introduction to Arduino [Serial port communication]  Introduction to ESP32 [WIFI/BLE Device] (Micro Controller for Edge Devices)  Hands-on using C [Arduino], Embedded JavaScript [ESP]</p>
5	<p>Actuators and Controllers with Hands-on using Raspberry PI with Node.js/Python  Actuators and Controllers  Controllers Introduction  Buzzer  Relay Switches  Servo Motors</p>
6	<p>Gateway with Raspberry PI  Gateway Introduction  Needs for Gateway, Roles of Gateway  Edge/Gateway Connectivity</p>
7	<p>Raspberry PI, Single Board Linux Computer  WIFI/BLE Communication with Edge Devices  Hands on using Node.js/Java/C#/Python based on training needs</p>

### Elective Group:(09) Internet Of Things

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-09-C	Internet Of Things: Sensing And Actuator Devices	2L+1T+0P=3C	2018

#### Course Objective:

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

**Expected Outcome :** At the end of the course a student should be able:

1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules
3. Market forecast for IoT devices with a focus on sensors
4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

#### REFERENCES

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors Ovidiu Vermesan Peter Friess, 'Internet of Things – From Research and Innovation to Market
4. Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

[http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot\\_prot/index.htm](http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm)

#### Text Books:

- Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on Approach)”, 1st Edition, VPT, 2014.

#### Suggested MOOC :

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

## Course Plan

Unit	Contents
1	Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device
2	SEVEN GENERATIONS OF IOT SENSORS TO APPEAR Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics– Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap
3	TECHNOLOGICAL ANALYSIS - Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module
4	IOT DEVELOPMENT EXAMPLES:ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks - Focus on Wearable Electronics
5	- PREPARING IOT PROJECTS (9 hours) Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data -
6	External representation of sensor values - Exporting sensor data - Creating the actuator projectHardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states
7	- Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera

**Elective Group: (09) Internet Of Things**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-09-D	Smart city use case, MQTT, Integrating on Cloud	2L+1T+0P=3C	2018

**Course Objective:**

The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus on wearable electronics

**Expected Outcome :**

At the end of the course a student should be able to upload IoT application on cloud.

**REFERENCES:**

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors Ovidiu Vermesan Peter Friess, 'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

[http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot\\_prot/index.htm](http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.htm)

**Text Books:**

- Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on Approach)”, 1st Edition, VPT, 2014.

**Suggested MOOC :**

Please refer these websites for MOOC's:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

**Course Plan**

Unit	Contents
1	LoRA, LoRAWAN - Smart City Use Cases Working with Smart City Solutions Problem understanding Introduction to LoRA
2	LoRA Hardware and bandwidth Communication between Lora Devices,
3	LoRA Gateway, LoRAWAN WIFI vs BLE vs ZigBee vs LoRA
4	IoT and Cloud IoT and Cloud introduction

5	Data ingestion using MQTT
6	Understanding Device Management Device Security
7	Device Connectivity MQTT MQTT Introduction Brokers Publish/Service Topics QOS [0, 1, 2 levels] MQTT Message Format Messaging, Ack format Payload Security [TLS, User Authentication] MQTT Authorization

### Elective Group:(10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-10-A	Business Intelligence Applications	2L-1T-0P= 3C	2018
<b>Course Objective :</b> To introduce learner with Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.			
<b>Pre-requisites:</b> Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>• Good knowledge of Business Intelligence Tools.</li> <li>• Knowledge of Decision making using analysis on the Big Data using Excel Tools.</li> <li>• Case Studies: Knowledge about different applications used in industries.</li> </ul>			
<b>Reference Books :</b> 1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. Business Intelligence Strategy -By John Boyer, Bill Frank, Brain Green, Tracy Harris			
Course Plan			
Unit	Contents		
1	<b>Introduction To Business Intelligence Applications:</b> Introduction to Big Data, Business Intelligence Data Mining, and Data Warehousing, What are Business Intelligence Applications (BIA). Features of BIA.		
2	<b>Sales, Finance And Marketing:</b> Introduction to Sales, Finance and Marketing Concept, features of Sales, features of Finance, features of Marketing, Use of Business Intelligence in Sales, Finance and Marketing in any Organization, Case Study.		
3	<b>Education And Learning:</b> Introduction to Education System, Learning Concept, Difficulties in Education Systems, Use of Business Intelligence for Education and Learning, Case Study.		
4	<b>Vertical Ai Applications:</b> Overview of AI, What is Vertical AI, Features of Vertical AI, Use of Business Intelligence in Vertical AI, Case Study.		
5	<b>Security:</b> Define Security, Security in Big Data, Problems with Security, Business Intelligence for Security, Case Study.		
6	<b>Lifescience:</b> Introduction to Life Science, Life Science Intelligence, Features of Life Science Intelligence, Use of Life Science Intelligence in Decision Making, Case Study.		
7	<b>Ad Optimisation:</b> Define Optimization, Introduction to Ad Optimization, Uses of Ad Optimization for Industry, Use if Business Intelligence in Ad Optimization, Case Study.		

### Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405-10-B	Business Intelligence Tools	2L-1T-0P= 3C	2018-2019
<p><b>Course Objective :</b>            To introduce learner with Big Data Concept. Using different Advance Excel Functions (like Optimization) and implementing it on Big Data for decision making. By solving Case Studies the students will get real example of using BI Tools in industry. To introduce learner with Business Intelligence Concept, decision making by Business Intelligence Tools on Applications such as Finance, Marketing, Education etc.</p>			
<p><b>Pre-requisites:</b> Preliminary knowledge of computer, Big Data Analysis and Business Intelligence.</p>			
<p><b>Expected Outcome :</b></p> <ul style="list-style-type: none"> <li>• Good knowledge of Business Intelligence Tools.</li> <li>• Knowledge of Decision making using analysis on the Big Data using Excel Tools.</li> <li>• Case Studies: Knowledge about different applications used in industries.</li> </ul>			
<p><b>Reference Books :</b></p> <ul style="list-style-type: none"> <li>▪ Tutorials Point for advance Excel Tools.</li> <li>▪ Excel 2010 Bible by John Walkenbach, John Wiley &amp; Sons, 2010 Edition.</li> <li>▪ <a href="https://office.live.com/start/Excel.aspx">https://office.live.com/start/Excel.aspx</a></li> <li>▪ <a href="https://www.talend.com/">https://www.talend.com/</a></li> </ul>			
Course Plan			
Unit	Contents		
1	<p><b>Introduction To Big Data:</b>  <b>Overview of</b> - Data Mining, Data Warehousing, Big Data, How Business Intelligence is useful for Big Data, Big Data Problems.</p>		
2	<p><b>Introduction To Business Intelligence:</b>            Introduction to BI, <b>Data Cleaning-</b> Editing a Workbook, Data Cleaning Using Te Functions, Using Validation To Keep Data Clean, <b>Working with Multidimension Data-</b> Pivot Tables, Pivot Charts.</p>		
3	<p><b>Applications Of Business Intelligence:</b>            CRM Domain, Banking Domain, Health Care Domain, Mobile Industry Domain, Creation of a New Product, Providing Personalized Services</p>		
4	<p><b>Optimization Modeling With Solver:</b>            Introduction to MS-Excel and MS-Excel Formulas, Understanding Optimization Modeling, Setting Up a Solver Worksheet, Solving an Optimization Modeling Problem, Reviewing the Solver Reports</p>		
5	<p><b>Working With Solver:</b>            Working With the Solver Options, Setting a Limit on Solver, Understanding the Solver Error Messages, Case Studies (Solver Problems).</p>		
6	<p><b>Advance Excel Tools:</b>  <b>Using Shared Work Books-</b> Sharing a workbook, Opening and editing a shared workbook, Tracking changes, Resolving conflict in a shared workbook, Multiple workbooks- Linking workbooks, Editing the Link, Consolidating the workbook.</p>		
7	<p><b>Working With Macros:</b></p>		

	Introduction to Macros? Where are Macros, Features of Macros, <b>Working with Macros-</b> Display the developer Tab, Changing Macro security Settings, Recording and running a Macro.
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### Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
504-10-C	Introduction to Big Data	2L-1T-0P= 3C	2018

**Course Objective :**

To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Tools like Apache Hadoop, Pig and Hive. What are the problems of Big Data and how it can be solved by different tools.

**Pre-requisites:** Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.

**Expected Outcome :**

- Good knowledge of Big Data Concepts
- Knowledge of Decision making using analysis on the Big Data
- Introduction to Big data Tools like Hadoop and Weka.

**Reference Books :**

1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo
2. Edureka lectures **Link:-** <https://www.youtube.com/watch?v=A02SRdyoshM>

#### Course Plan

Unit	Contents
1	<b>Introduction:</b> Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data
2	<b>Big Data In Organization:</b> Data Analytics Lifecycle, <b>Data Scientist Roles and Responsibilities</b> – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.
3	<b>Decision Theory And Strategy:</b> Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, <b>Strategy for Decision Making-</b> Big Data Strategy Document, Case Study.
4	<b>Value Creation Process:</b> Understanding Big Data Value Creation, Value Creation Drivers, <b>Michael Porter's Value Creation Models-</b> Michael Porter's Five Forces Analysis, Michael Porter's Value Chain Analysis, Case Study.
5	<b>Big Data User Experience:</b> The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience.
6	<b>Big Data Use Cases:</b> <b>The Big Data Envisioning Process</b> –1. Research Business Initiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas , 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.
7	<b>Big Data Architecture:</b>

	New Big Data Architecture, <b>Introducing Big Data Technologies</b> – Apache Hadoop, MapReduce, R, WEKA etc.
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### Elective Group: (10) Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-10-D	HADOOP	2L-1T-0P= 3C	2018
<b>Course Objective :</b> To introduce learner with HADOOP Tool for Business Intelligence, decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.			
<b>Pre-requisites:</b> Preliminary knowledge of computer, Big Data Analysis and Business Intelligence. Also students must know Core Java, C Programming and Data Structure Languages.			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>• Good knowledge of HADOOP Tool.</li> <li>• Knowledge of Decision making using HADOOP analysis on the Big Data</li> <li>• Hands-on Big Data tools- Hadoop, Pig, Hive, HBase</li> </ul>			
<b>Reference Books :</b> 1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo 2. <a href="http://www.tutorialspoint.com">www.tutorialspoint.com</a>			
Course Plan			
Unit	Contents		
1	<b>BIG DATA Overview :</b> What is Big Data?, What Comes Under Big Data?, Benefits of Big Data, Big Data Technologies Operational vs. Analytical Systems, Big Data Challenges.		
2	<b>Introduction To HADOOP:</b> Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop.		
3	<b>HDFS Overview:</b> Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.		
4	<b>MAPREDUCE:</b> What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way.		
5	<b>Introduction To Hadoop Features:</b> New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.		
6	<b>Multi Node Cluster:</b> Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster.		
7	<b>Environment Setup:</b> Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.		

### Elective Group: (11) Cyber Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404-11-A	Introduction to Linux	2L+1T+0P=4C	2018
<b>Course Objective:</b> Introduce the learner to Linux environment			
<b>Expected Outcome :</b> Practical understanding of Linux environment			
<b>References (Books, Websites etc) :</b> Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
Unit	Contents		
1	Installation of Kali-Linux, Understanding Kali Linux		
2	<b>Using Shell Interface</b> Introduction to Linux, Internal and external commands, General purpose utilities, Navigating the file system, Handling ordinary files		
3	<b>Using GUI Environments</b> GNOME desktop environment, KDE desktop environment		
4	<b>Using open source office suite:</b> Word processor application , Spreadsheet application, Presentation application, Desktop database application		
5	<b>Using the Internet</b> World wide web, FTP, Telnet		
6	<b>Using Multimedia</b> Graphics, Audio, Video		
7	<b>Shell commands</b> General purpose utilities, File management , Process management, Communication management		

**Elective Group: (11) Cyber Security**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
405-11-B	Information Security Concepts	2L+1T+0P=3C	2018
<b>Course Objective:</b> Introduce the learner to concepts involved in Information Security domain			
<b>Expected Outcome :</b> Theoretical understanding of Information Security Concepts			
<b>References (Books, Websites etc) :</b> CEH Study Guide - Sybex			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Information Security Concepts:</b> Confidentiality, Integrity and Availability of Information, Identification, Authentication and Authorization, Security Principles and Models		
2	<b>Physical Security:</b> Facility Requirement, Perimeter Security, Fire Protection, Fire Suppression, Power Protection, General Environmental Protection, Equipment Failure Protection		
3	<b>Network Security:</b> Secure Network design, Firewalls, WLAN Security, VPNs, Types and Sources of Network Threats		
4	<b>Operating System Security:</b> Windows, Linux/UNIX		
5	<b>Database Security:</b> MS SQL		
6	<b>Web Application Security:</b> Web Application Vulnerabilities, Secure Coding Techniques, Continuous Security Testing and Assessments		
7	<b>Compliance Standards :</b> IT Act, ISO 27001, ITIL Framework		

**Elective Group: (11) Cyber Security**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
504-11-C	Information Security Threats	2L+1T+0P=4C	2018
<b>Course Objective:</b> Introduce the learner to threats involving Information Systems			
<b>Expected Outcome :</b> Practical understanding of threats involving Information Systems			
<b>References (Books, Websites etc) :</b> CEH Study Guide - Sybex			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
<b>Unit</b>	<b>Contents</b>		
1	<b>Introduction to Information Security Threats</b> TCP/IP Fundamentals , Operating System Fundamentals , Web Application and Database Fundamentals , Introduction to Ethical Hacking, Advanced Persistent Threats		
2	<b>Information Gathering:</b> Footprinting, Advanced Google Hacking, Nmapping the network, Fingerprinting		
3	<b>Exploitation:</b> Hacking Networks, Hacking Servers, Hacking Databases, Password Cracking		
4	<b>Advanced Exploitation:</b> Hacking WLANs, Evading IDS, Firewalls, Web Application Hacking, Advanced Web Hacking, Hacking Web Browsers		
5	<b>Social Engineering:</b> Introduction to Social Engineering, Common Types of Attacks, Online Social Engineering		
6	<b>Cryptography:</b> Introduction to Cryptography, Encryption and Decryption, Cryptographic Algorithms, Digital Signature, Cryptography Tools, Cryptography Attacks		
7	<b>Malware Attacks:</b> Viruses, Worms, Trojans		

**Elective Group: (11) Cyber Security**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
505-11-D	Information Security Administration	2L+1T+0P=3C	2018
<b>Course Objective:</b> Introduce the learner to concepts involving security administration			
<b>Expected Outcome :</b> Practical understanding of setting, managing and securing Information Systems			
<b>References (Books, Websites etc) :</b> Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
<b>Unit</b>	<b>Contents</b>		
1	<b>Setup a Client:</b> Introduction to client-side devices, Setup, Manage and Secure a Desktop PC Setup, Manage and Secure a Mobile Device		
2	<b>Setup a LAN:</b> Introduction to LAN devices, Simulate a LAN, Setup, Manage and Secure a Local Area Network		
3	<b>Connect a LAN to the Internet:</b> Introduction to WAN devices, Setup, Manage and Secure a Connection to the Internet		
4	<b>Share an Internet Connection across a LAN:</b> Introduction to Internet Connection sharing, Introduction to NAT and PAT Setup, Manage and Secure a Proxy Server		
5	<b>Share resources over a LAN:</b> Setup, Manage and Secure a Print Server, Setup, Manage and Secure a File server		
6	<b>Host a Website:</b> Introduction to website hosting, Setup, Manage and Secure a Web Server		
7	<b>Setup support servers:</b> Setup, Manage and Secure a Mail Server, Setup, Manage and Secure a FTP Server, Setup, Manage and Secure a Boot Server, Setup, Manage and Secure a DNS Server		

# CC503: Software Project Management

(4 Credits, 3L + 2T)

**Objectives:** To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful IT projects and how the software is tested using various techniques to improve the quality of software. This course is designed to provide an understanding of the particular issues encountered in handling IT projects and to offer students methods, techniques and 'hands-on' experience in dealing with them.

**Learning Outcomes:** At the end of this course, student should be able to

- Understand and practice the process of project management and its application in delivering successful IT projects;
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;
- Identify the resources required for a project and to produce a work plan and resource schedule;
- Understand diff. types of testing and how it is conducted.
- Practice the automated tools available for testing

## **Text Book(s):**

A) Information Technology Project Management” Kathy schwalbe, International student edition, THOMSON course Technology, 2003

B) “Software project management “Bob Hughes and Mike Cottrell, Third edition, Tata McGraw-Hill

C) “Microsoft office Project 2003 Bible”, Elaine Marmel, Wiley publishing Inc.

**Software Requirement:** Microsoft project 2003

## **UNIT1:**

### **Introduction to project management: (5L)**

Project, project management, Importance, characteristics of project how software projects are diff. than other projects, Problems with software projects, Phases: Initiation phase, planning phase, execution phase, monitoring and controlling phase, and closing phase. All parties involved in project, Role of Project Manager, Project management framework, Software tool for project management

## **UNIT2:**

### **Project planning: (6L)**

Integration management: What is integration management, plan development and execution, What is scope management, methods for selecting project, scope statement, Work Breakdown Structure, main steps in Project planning: identify project scope and objective, identify project infrastructure, analyze project characteristics, identify project products and activities, estimate effort for each activity, identify risk activity, allocate resources, review plan, execute plan. Use of software (Microsoft Project) to assist in project planning activities



### **UNIT3:**

#### **Project scheduling: (6L)**

Time management: importance of Project schedules, schedules and activities, sequencing and scheduling activities, Network Planning models, duration estimation and schedule development, Critical path analysis, PERT, Use of software( Microsoft project) to assist in project scheduling

### **UNIT4:**

#### **Project cost management: (6L)**

Importance and principles of project cost management, Resource planning, Attributes to be considered in cost estimation, factors affecting the cost, various costs involved in it. Traditional method: Estimation by analogy, Expert judgment, Parkinson, price to win, top down, bottom up. COCOMO Model, Function point analysis, Function point analysis, Cost control, Use of software( Microsoft project) to assist in cost management

### **UNIT5:**

#### **Project quality management: (5L)**

Quality of information technology project, Stages of software quality management, PMBOK, Quality standards, Tools and techniques for quality control.

### **UNIT6:**

#### **Project risk management: (5L)**

The importance, Top risk in projects, Common sources of risk in IT projects, elements in risk mgt., Risk identification, Risk quantification, Risk response development and control, using software to assist in project risk management

### **UNIT7:**

#### **Fundamentals of Testing: (12L)**

Fundamentals of Software quality, quality views, People challenges in testing, Principles of Verification and validation, Techniques of verification, V model, Testing process, Unit testing, Integration testing, System Testing and Acceptance testing, Testing new product versions, Testing planning: test plan, test plan template, risk analysis, Test Design, good test case, test case template, test case mistakes, Testing Execution: objectives, execution considerations, test execution activities, executing test, Defect management: what is defect, defect life cycle, defect management process, Test Metrics: purpose, characteristics of good metrics, metrics, Functional testing tools, Unit testing tools, Test management tools.

# **CC501 SOFT COMPUTING**

(Credit 4 , L-3, T-2)

## **objectives**

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

**Learning Outcomes:** To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

## **Text Books:**

**1. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.**

**2. N.P. Padhy, “Artificial Intelligence and Intelligent Systems” Oxford University Press.**

## **Reference Books:**

**3. Siman Haykin, “Neural Networks” Prentice Hall of India**

**4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.**

**5. Kumar Satish, “Neural Networks” Tata Mc Graw Hill**

6. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.

7. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.

8. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989.

9. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.

10.. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

## **Syllabus:**

### **Unit-I**

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory. (10)

### **Unit-II**

Neural Networks-II (Back propagation networks)

Architecture: perception model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications. (10)

### **Unit-III**

Fuzzy Logic

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications. (10)

### **Unit-IV**

Rough Sets

Introduction, Indisnibility Relations, Decernibility Matrix, Lower Approximation, Upper Approximation, Boundary, Accuracy of Approximation, Rule Induction, Case Study

## **Unit-V**

Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.  
(9)

## **CC502: Finite Automata and Grammars** (4 Credits, 3L + 2T, Level 3)

**Objectives:** The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc. The properties of these models will be studied and various rigorous techniques for analyzing and comparing them will be discussed, by using both formalism and examples. To introduce students the basic concepts in theoretical computer science, and the formal relationships among machines, languages and grammars.

**Learning Outcomes:** Upon successful completion of this course, students will be able to:

### **Sr.No. Learning Outcomes**

#### **Knowledge**

1. Explain the basic concepts of deterministic and non-deterministic finite automata, regular language, context-free language, Turing machines, Church's thesis, halting problem, computability and complexity
2. **Describe the formal relationships among machines, languages and grammars**

#### **Professional Skill**

3. **Perceive the power and limitation of a computer**
4. **Solve the problems using formal language**

#### **Attitude**

5. **Develop a view on the importance of computational theory**

**Textbook:** J. Hopcroft, R. Motwani, and J. Ullman. Introduction to Automata Theory, Languages, and Computation, 3rd edition, 2006, Addison-Wesley.

#### **Reference Books:**

- (1) P. Linz. Introduction to Formal Languages and Automata, 5th edition, 2011 (or 4th or 3rd edition), Jones and Barlett;
- (2) Michael Sipser, Introduction to the Theory of Computation, First Edition, 1997, PWS Publishing Company.

## **Syllabus:**

### **UNIT-1:**

Basic concepts of finite automata and languages, deterministic finite automaton, nondeterminism, equivalence between DFA and NFA, regular expression and equivalence to FA

### **UNIT-2:**

Algebraic laws for regular expressions pumping lemma and applications, properties of regular languages, minimization of automata and applications.

### **UNIT-3:**

Context-free grammars and languages, parsing (or derivation) and parse trees, ambiguity of grammar and language, Chomsky normal form of CFG, pumping lemma, properties of CFLs

### **UNIT-4:**

Pushdown automaton (PDA), various forms of PDA, equivalence between CFG and PDA, equivalence between CFG and PDA,

### **UNIT-5:**

Turing machines and (un)decidability

## **201: Computer Architecture**

**(4 Credits, 3L+2T, Level 3)**

**Objective:** Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components.

### **Learning Outcomes:**

At the end of this course, student should be able to understand

- Simple machine architecture and the reduced instruction set computers.
- Memory control, direct memory access, interrupts, and memory organization
- Basic data flow through the CPU (interfacing, bus control logic, and internal communications).
- Number systems, instruction sets, addressing modes, and data/instruction formats.

**Text Book(s): M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication**

### **UNIT 1.Introduction To Digital Computer – (7L)**

Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits

### **Unit 2.Introduction To Digital Components And Micro Operations – (6L)**

ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.

### **Unit 3.Computerorganization And Programming – (8L)**

Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler - Program Loops – Programming Arithmetic And Logic Operations – Subroutines – I/O Programming.

### **Unit 4: Memory Organization And CPU – (8L)**

Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware – CPU: General Register

Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC

**Unit5: Pipeline And Vector Processing – (5L)**

Parallel processing – Pipelining - Arithmetic pipeline - Instruction pipeline - RISC pipeline, - Vector processing - Array processor

**Unit6: Input – Output Organization – (5L)**

Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication.

**Unit7: Multiprocessors – (6L)**

Characteristics of Multiprocessors – interconnection structures – interprocessor Arbitration – interprocessor communication and synchronization – Cache coherence



## **202: Object Oriented Analysis and Design** **(4 Credits, 3L + 2T, Level 4)**

**Objectives:** The course aims at developing skills to analyze and design a software system using Object Oriented Analysis and Design (OOAD) and UML. And use these skills in Unified Process (UP) environment.

**Learning Outcomes:** At the end of the course, student should be able to

- A) Understand and describe the Object Oriented concepts
- B) Describe Object Oriented Analysis and Design(OOAD) concepts and apply them to solve problems
- C) Prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language
- D) Describe the activity carried out in each and every phase of Rational Unified Process(RUP)

**Text Book:**

1. Craig Larman (2004), Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, 3rd Edition, Pearson Education.

**Reference Books:**

1. Martin Fowler (2003), UML Distilled, 3<sup>rd</sup> Edition, Pearson Education.
2. Roger Pressman(2009), Software Engineering: A Practitioner's Approach, Roger Pressman, ; 7th edition, McGraw-Hill
3. Brett D. McLaughlin (2006), Head First Object-Oriented Analysis and Design , 1 edition, O'Reilly

### **Syllabus**

#### **Unit 1: ( 6L)**

Introduction to OO Concepts, Object, Abstraction, Class, Encapsulation, Message Sending, Inheritance and Polymorphism, Association, Aggregation, Concept of analysis and design, introduction to Object Oriented an Analysis and Design(OOAD), review of Software Development Life Cycle(SDLC), Iterative development and Rational Unified Process(RUP), Phases of RUP

#### **Unit 2: (6L)**

Understanding Inception and requirement, writing requirements in context, use case modeling, relating use cases to user goals and elementary business process, use cases for adding values and functional requirement, actors, actor types and goals in use cases, writing use cases in UI-free style, moving from inception to elaboration.

**Unit 3: (6L)**

Elaboration Iteration 1 emphasize and requirement, System behavior, System Sequence Diagrams, Inter-System SSDs, SSDs and Use Cases, System Events and the System Boundary, Naming System Events and Operation, SSD with Use Case Text, SSDs within the UP, UP Artifacts

**Unit 4: (6L)**

Domain Modeling, Conceptual Class Identification, Resolving Similar Conceptual Classes-Register vs. "POST", Specification or Description Conceptual Classes, UML Notation, Models, and Methods: Multiple Perspectives Lowering the Representational Gap, Domain Models Within the UP, Finding and adding association, Common Associations List and Guidelines, Association Roles, Naming Associations, finding attribute and its types, UML Attribute Notation, attributes and foreign Keys, Multiplicity

**Unit 5 : (6L)**

Use cases and operation contracts, pre and post conditions, contracts leads to domain model, contracts usefulness and guidelines, contract operations and UML, contracts within UP, GRASP: Designing Objects with Responsibilities, Patterns of General Principles in Assigning Responsibilities, Object Design and CRC Cards, Use Case Realization with GRASP Patterns, Determining visibility, Design Class Diagrams(DCD), from elaboration iteration 1 to 2, Iteration 2 emphasize and requirements, Refinement of Analysis-oriented Artifacts in this Iteration 2.

**Unit- 6: (7L)**

Elaboration Iteration 3 requirements and emphasis, Use case relationships (include, extend and generalize); Concrete, Abstract, Base, and Addition Use Cases, Modeling generalization, conceptual superclass and subclass, abstract conceptual class, modeling changing states, Class Hierarchies and Inheritance in Software, Association Classes, aggregation and composition, Association Role Names, Roles as Concepts vs. Roles in Associations, Derived Elements, Qualified and Reflexive Associations, Ordered Elements, Using Packages to Organize the Domain Model

**Unit 7: (8L)**

Modeling behavior in statechart diagram, events, states, and transitions in statechart Diagrams, statechart diagrams in the UP, Use Case State chart Diagrams, classes that benefit from statechart diagrams, external and Interval events, additional statechart diagram notation, Activity diagrams, activity diagrams Vs Statechart diagrams, concept of interface, interface realization, using stereotypes in UML, collaboration diagrams , putting sequence diagram as collaboration diagrams, component and deployment diagrams.

## **203: Business Information Systems** **(4 Credits, 3L + 2T, Level 4)**

**Objectives :** The main objective is to

- a) Acquaint students with basic concepts and major issues of Business Information Systems
- b) To describe current techniques and tools used for analysis and design.
- c) To understand and develop the functionalities of various types of systems.

**Learning Outcomes :**

At the end of this course, student should be able to

- (a) Analyze user requirements using different Information gathering tools.
- (b) Apply systematic approaches to software development
- (c) Provide solutions to different systems.

**Pre-requisites:** Students should know basic concepts of computer systems and DBMS.

**Text Book(s)**

- 1) Elias M. Awad Systems Analysis and Design
- 2) V. Rajaraman Analysis and Design of Information Systems
- 3) Dr. Arpita Gopal Engineering MIS for strategic Business Processes
- 4) James A. Senn Analysis & Design of Information Systems
- 5) S. Parthasarthy and B.W. Khalkar System Analysis & Design
- 6) S.A. Kelkar Structured System Analysis and Design

**Unit 1 : Introduction to system concepts(3L)**

Introduction to system Definition of system, its characteristics. Elements of system and system types. Categories of system. Examples of system: - Business, Computer, Human as system. Computer based information systems (MIS, DSS, ES) Phases of SDLC: - a) Preliminary Investigation (Problem Identification Feasibility Study with its types) b) System Analysis. c) System Design. d) Coding. e) Testing. f) Implementation. g) Maintenance.

**Unit 2 : System Development Life Cycle (6L)**

Various models of SDLC:- Waterfall, Rapid Application Development model, Prototyping model, Spiral model, Qualities of Software, Introduction to Agile Methodology.

**Unit 3 : Information Gathering Techniques(3L)**

Record Review about firm, user staff, work flow from various literatures, forms, Manuals, On site Observations. Interviews and its types, Questionnaires.

**Unit 4 : Structured Analysis Tools(6L)**

- a) Data Flow Diagram b) Data Dictionary, c) Structured English, d) Decision Trees
- e) Decision Table and its types.

**Unit 5 : Designing Methodologies(6L)**

Designing process: - Logical and Physical. Designing Tools: Structured Charts, Functional Decomposition (concept of module with coupling and cohesion), System Flowcharts, Entity Relationship Diagram. Normalizing Relations: First Normal form, Second Normal form, Third Normal form, Boyce-Codd Normal Form(BCNF). Data Input Methods: Coding techniques, Detection of Error in code, Validations, Interactive Data Inputs. Output Design : Objectives of Output Design, Design of Output Reports, Design of Screens.

Unit 6 : Control, Audit and security Control in Information system, Audit of Information System, Testing of Information System, Security of Information System. (3L)

**Unit 7: Overview of different Business Application Systems(18L)**

Education Institute Management System, Library Management Systems, Inventory Management System, Bank Management System, Hospital Management System, Payroll System, Financial Accounting System, Hotel Management System, Human Resource System.

## **204: Discrete Structures II**

**(3 Credits, 2L+2T, Level 3)**

### **Objectives:**

The aims of this Graph theory is a delightful playground for the exploration of proof techniques in discrete mathematics and its results have applications in many areas of the computing ,social and natural science,

### **Learning Outcomes:**

At the end of the course student should be able to:

- A) Use graphs as models in a variety of areas.
- B) Formulate several real- real world problems in mathematical terms

**Pre-requisites:** Discrete Structures I

### **Text Book:**

Kenneth H. Rosen , Discrete Mathematics and its Applications Edition 6<sup>th</sup> Tata McGraw Hill

### **Syllabus:**

#### **Unit -1(6L)**

Preliminary concept, Introduction, Konigsberg Bridges problem, Utilities problem, seating arrangement problem

Concept of Graph, Graph models, types of Graph, representing Graph, incidence and Adjacency Graph, Graph Isomorphism, Graph representing in computer, planner and Dual Graph

#### **Unit -2 (12 L)**

Walk, paths and Euler circuit, Hamiltonian Graph and Graph Algorithm, Konigsberge Bridge problem, city route ,puzzle problem, seating arrangement problem, Travelling salesman problem ,Warshall's algorithm, Floyd's algorithm, Dijkstra's algorithm, Depth-First Search in Directed Graph, coloring Graph and their theorem, Applications of Graph coloring

#### **Unit -3 (12 L)**

Concept of Trees, definition and properties of Trees, Application of Trees, Trees as Models, Game Trees, Tree Traversal, Infix and Postfix notation, Binary Trees and Properties , Spanning Tree, Minimum spanning Tree, Depth First search, Breadth –First search, Back tracking applications, Kruskal algorithm, Prims algorithm, Huffman's algorithm, sorting technique ( Merge sort, Heap sort),computer representation of Tree

#### **Unit-4 (9L)**

Basic counting principles-The product and Sums rules, The Inclusion-Exclusion principle, The Pigeonhole principle, Generalized Pigeonhole principle ,Application, Permutation and Combination, Generalized Permutation and Combination, Generating Permutation and

Combinations, Permutation with Indistinguishable objects, Binomial coefficients and their properties, Algorithm to compute Binomial coefficient Pascal Identity and triangle

**Unit-5 (6L)**

Advance Counting Technique-Recurrence relations and modeling with recurrence relations, Solutions to Linear recurrence relations, Divide and Conquer algorithms and recurrence relations, Master Theorem regarding recurrence relations

## **205: Financial Accounting and Management** **(3 Credits, 3L+1T, Level 2)**

### **Objectives:**

1. To orient the students to basic concepts of accounting. costs
2. To make them understand the techniques of management accounting
3. To make them understand the concepts of financial management
4. To give the dimensions of three aspects finance application background in IT packages

### **Learning outcome:**

At the end of the course the students shall be able to

1. The student shall be able to have basic understanding necessary for development of software for accounting and cost and finance
2. Interrelation of concepts as dimensions of financial management process.

**Prerequisites:** Good understanding of nature of business expenses and income/ revenue

### **Recommended Books:**

1. Ashok Sehagal and Deepak Sehagal , Financial Accounting – Taxman
2. Tulsian – Financial Accounting
3. Jain Naramg – Cost Accounting Principles and Practice
4. I.M. Pandey ,FinacialMangementVikas Publishing House
5. Book Keeping and Accountancy, M.G. Patkar

### **Syllabus:**

#### **Unit 1 : Introduction to Financial Accounting( 10 L )**

Principles of double entry book keeping, preparation of journal , ledger, trial balance and final accounts ( Trading and Profit and Loss Account and Balance Sheet ) for a sole proprietor. Accounting concepts and conventions

#### **Unit 2 : Introduction to Cost and Techniques ( 06 L )**

Concept of cost , classification of cost and preparation of cost sheet , Budgetary Control – concept and importance, Simple problems on flexible and cash budget

#### **Unit 3 : Standard and Marginal Costing ( 08 L )**

Concept of Standard Cost , Variance , advantages and limitations , Computation of basic variances of material and labour cost , concept of marginal cost P/V ration . Contribution, BEP, Margin of Safety and problems on above

**Unit 4 : Introduction to Financial Management : (04 L)**

Scope and Nature of Financial Management, Consideration while preparing financial plan.

Concept of Profit Maximization and Wealth Maximization .

Advantages and Limitation of Long Term Sources of Finance, Venture Capital

**Unit 5 : Sources of Short Term Finance (07 L)**

Concept of inventory management and EOQ.

Concept of Working Capital and factors affecting working capital, simple problems on estimation of working capital.

**Unit 6: Investment Decision( 10L )**

Concept of Time value of money, Risk and Return, Simple problems on Capital Budgeting Techniques – Simple Pay Back , Discounted Pay Back , NPV, ARR, Profitability Index

Ratio Analysis : ( At theory level ) significance of ratios with reference to examples of leverage ,profitability , activity, liquidity ratio



## **206: Database Management with Oracle** **(4 Credits, 2L + 4P, Level 3)**

**Objectives:** The main objective is to teach the concepts related to database its techniques and operations. SQL (Structured Query Language) is introduced in this subject. This helps creates strong foundation for application of data design.

**Learning Outcomes:** At the end of this course, student should be able to (a) Simple Query using sample datasets(b) Complex queries using SQL.(c) Writing PL/SQL blocks (d) Introducing Object Oriented Concepts in Oracle.

**Pre-requisites:** Concept of Database Management Systems

### **Text Books:**

1. Ivan Bayross SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition  
BPB Publications

### **Syllabus:**

#### **Unit 1: Introduction (6L)**

Concepts of RDMS, Introduction to Oracle, SQL, Defining a database in SQL, creating table, Dual, Arithmetic Operators, comparison operator, Logical operator,

DDL Commands – Creating table, changing table definition, removing table, Creating Tables with constraints on row level and column level, primary key, foreign key, check ,alter, copy. creating data integrity controls, DML Commands- Inserting, updating, deleting data – batch input, deleting database content, changing database content, processing single table clauses of select statement, using expressions, using functions, using wildcards, sorting results; order by clause, categorizing result; group by Having clause. Project Case – Library, Hospital, Reservation system. SET Operations, Intersect, Union, Minus, Union ALL, SUBMULTISET, MULTISET UNION. DCL commands- Granting and Revoking Permissions, Revoking Privileges given

#### **Unit 2: Database Objects: (3L)**

Creating index, simple index, composite index, unique index, dropping indexes, multiple indexes on table, using rowed to delete duplicate rows from a table, Creating sequence, altering sequence, dropping sequence, Views -Using and defining, modifying, deleting. Insert / Drop / filter view. Complex view.

#### **Unit 3: Joins and Oracle Functions: (3L)**

Table Alias, Inner Join, Outer Join, Self Join, cross join, Outer join left right, Aggregate Functions , Numeric Functions , String Functions, Conversion functions, Date conversion functions, Date functions

#### **Unit4: Introduction to PL/SQL programming – ( 6L)**

What is PL/SQL, Structure of PL/SQL block, header section, declaration section, execution section, exception section. Creating a simple PL/SQL procedure, procedure versus functions, creating stored procedure, creating a functions , PL/SQL variable and constants. Declaring PL/SQL variables and constants, assigning values to variable. Using variables, control structures in PL/SQL – conditional control, iterative control, sequential control. Error handling – Exceptions, System defining exceptions, user defined exception with example.

#### **Unit 5: Cursor and Triggers – (9L)**

Types of cursor, implicit cursor attributes, explicit cursor attributes, functionality of Open ,fetch and close commands , cursor FOR loops, parameterized cursors. Triggers- Introduction, Database Triggers, Database Triggerv/s Procedures,Database Triggers v/s Declarative Integrity constraints, Types of Triggers –Row Triggers, Statement Triggers, Before Triggers, After Triggers, Combination Triggers, Deleting a Trigger

#### **Unit 6: Object oriented concepts –(3L)**

Introductions to Object Oriented concepts in Oracle. V-array, object type, nested table with examples.

#### **Assignment on PL/SQL**

- 1) Print the name, salary and deptno of all employees who belong to deptno 10.
- 2) Print the name, job of employees having job as manager or analyst.
- 3) Write a PL/SQL block to print 3<sup>rd</sup>, 6<sup>th</sup>, and 7<sup>th</sup> record from employee.
- 4) Write a PL/SQL block which assign comm = 500 for those employee who are getting null commission.
- 5) Update the salary of employee by 20 for even records and 100 for odd records.
- 6) Print the information of all employees using cursor.
- 7) Print 4<sup>th</sup>, 6<sup>th</sup> and 10<sup>th</sup> records from employee table.
- 8) Print the names of employee having commission as null.
- 9) Print the information of 1<sup>st</sup> five highest salary earner.
- 10) Update salary of dept 10 by 1000 and dept 20 by 2000 using cursor.
- 11) Accept deptno and print the number of employees working in that department.
- 12) Accept the deptno and print department name and location.
- 13) Accept employee name and print date of joined.
- 14) Print the name of employee having maximum and minimum salary.

- 15) Accept salary and print number of employees having salary less than or equal to accepted salary.
- 16) Print the name of employees working in department no 10 and having maximum salary.
- 17) Print the number of employees joined in the month of December.
- 18) Increment the salary of employee by 1000 having location as New York.
- 19) Increment the salary of employee 'Raj' by 10% and of 'Ravi' by 20%.
- 20) Check whether Smith's salary is greater than Black's salary or not.
- 21) If Smith's salary is greater than Black's salary then update employee table and set Black's salary same as Smith's salary otherwise set Smith's salary same as Black's salary.
- 22) Write PL/SQL block to process an order for keyboard.
  - a. Check  $Quantity > 0$
  - b. If Yes then insert in purchase order 'One Keyboard purchased' and sysdate.
  - c. Less 1 from Product\_Master.
  - d. Else in purchase\_order 'No Keyboard Available' sysdate.
- 23) Accept a number and print factorial of it.
- 24) Accept a number and print it in reverse order.
- 25) Accept a number and print it in reverse order.
- 26) Accept a number and print it is prime or not.
- 27) Accept 10 numbers in loop and print sum of accepted numbers.
- 28) Accept 10 numbers in loop and print sum of accepted even numbers and odd numbers separately.
- 29) Accept a string and print it as follows:
  - O
  - Or
  - Ora
  - Orac
  - Oracl
  - Oracle
- 30) Using PL/SQL block generate square and cube of 1 to 10 numbers.  
Store the same in a table with columns no, square and cube.

## **207: Project I**

**(2 Credits, 4 Lab)**

**Objectives:** Few computing professionals can expect to work in isolation for very much of the time. Software development projects are always implemented by groups of people working together as a team. MCA students therefore need to learn about the mechanics and dynamics of effective team participation as part of their education. Moreover, because the value of working in teams (as well as the difficulties that arise) does not become evident in small-scale projects, students need to engage in team-oriented projects that extend over a reasonably long period of time, possibly a full semester or a significant fraction thereof. To ensure that students have the opportunity to acquire these skills, the MCA programme has four Minor Projects and one full semester project. The course 207 is the first in this series. Students in groups of 3 or 4 (only) are expected to undertake a project preferable in C environment. Every student in the group spends about 50 hours on the project. The guide should simulate the team environment and each student performance their major responsibilities satisfactorily.

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# **BHARATI VIDYAPEETH**

**[ DEEMED TO BE UNIVERSITY ]**

**‘A’ Grade University Status by Ministry of HRD, Govt. of India**

**Re-Accredited by NAAC with ‘A’ Grade**

## **FACULTY OF MANAGEMENT STUDIES**

### **BACHELOR OF BUSINESS ADMINISTRATION**

**Choice Based Credit System**

**(BBA - 2018) (CBCS)**

## **SYLLABUS**

**Course Structure**

**Applicable with effect from 2018-19**

**Bharati Vidyapeeth**  
**[ Deemed to be University],**  
**Pune**  
**Faculty of Management Studies**  
**Bachelor of Business Administration Programme (BBA)**  
**Revised Course Structure**  
**(To be effective from 2018-2019)**

**The BBA Programme.....**

The Bachelor of Business Administration Programme (BBA) is a full time three year programme offered by Bharati Vidyapeeth Deemed University (BVDU), Pune and conducted at its management institutes in New Delhi, Pune, Navi Mumbai, Kolhapur, Sangli, Karad and Solapur. All the seven institutes have excellent faculty, Laboratories, Library, and other facilities to provide proper learning environment. The University is accredited by NAAC with an 'A' grade. The Bachelor of Business Administration (BBA) is designed to provide a strong practical understanding of the principles, theories, and tools necessary to succeed in businesses. The BBA programme focuses on imparting to students the ability to demonstrate leadership, understand human relationships, and problem-solving abilities essential for success in any business endeavour. While designing the BBA course, the above facts are considered and the requirements for higher studies and immediate employment are visualized. This effort is reflected in the Vision and Mission statements of the BBA programme. Of course, the statements also embody the spirit of the vision of Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth Deemed University which is to usher in “Social Transformation Through Dynamic Education.”

**Vision**

To prepare the students to cope with the rigor of Post Graduate Programmes in India and Abroad as well as to prepare them for managing Businesses globally and as Entrepreneurs who will also be sensitive to societal concerns.

**Mission**

To impart sound conceptual knowledge and skills in the field of Business Management studies that can be leveraged for enhancing career prospects and higher education in the said discipline.

## **Objectives**

The Bachelor of Business Administration (BBA) degree programme has the following objectives...

- To provide students with an in-depth knowledge of Management and Business concepts
- To provide students with a firm foundation in both theoretical and practical concepts and applications to meet the various needs of business organisations at a global level
- To prepare students for the responsibilities and career opportunities with corporations and as entrepreneurs.

## **Duration :**

The duration of the BBA degree programme shall be of three years divided into six Semesters. i.e. BBA Part – I (Sem-I & II), BBA Part – II (Sem-III & IV) and BBA Part – III (Sem V & VI). The medium of instruction and examination will be only English.

## **Eligibility Requirements**

A candidate applying for BBA programme should have passed higher secondary or equivalent examination (10 + 2) of any recognized Board satisfying the following conditions:

1. Subject to the above conditions, every eligible candidate has to pass a common All India Entrance test (B-UMAT) conducted by Bharati Vidyapeeth Deemed University, Pune. The final admission is based solely on the merit at the B-UMAT test

**Note : Elective will be offered only if a minimum of ten (10) students opt for the same in semester V.**

## **Grading System for Programmes under Faculty of Management Studies:**

1. **Grade Points:** The Faculty of Management Studies, Bharati Vidyapeeth University has suggested the use of a 10-point grading system for all programmes designed by its various Board of Studies. A grading system is a 10-point system if the maximum grade point is 10. The system is given in Table I below.

**Table I: The 10-point Grading System Adapted for Programmes under FMS**

Range of Percent Marks	[80, 100]	[70, 79]	[60, 69]	[55, 59]	[50, 54]	[40, 49]	[00, 39]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.0	0.0
<b>Grade</b>	<b>O</b>	<b>A+</b>	<b>A</b>	<b>B+</b>	<b>B</b>	<b>C</b>	<b>D</b>

Formula to calculate GP is as under:

Set  $x = \text{Max}/10$  where Max is the maximum marks assigned for the examination (i.e. 100)

Formula to calculate the individual evaluation

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

**2.Scheme of Examination:** Courses having Internal Assessment (IA) and University Examinations (UE) shall be evaluated by the respective institutes and the University at the term end for **40(forty)** and **60(Sixty)** Marks respectively. The total marks of IA and UE shall be 100 Marks and it will be converted to grade points and grades.

CCA – Comprehensive Continuous Assessment - Courses having *only Comprehensive Continuous Assessment (CCA)* the respective institutes will evaluate the students in various ways such as *Class Test, Presentations, Field Assignments and MiniProjects* for a total of 100 marks during the term. Then the marks will be converted to grade points and grades.

*Open Courses shall be evaluated for 50 marks only (fifty marks only).*

### 3. Standard of Passing:

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If learner fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to reappear only at IA as backlog candidate and clear the Head of Passing. to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} \leq 80$	A+	9
$60 \leq \text{Marks} \leq 70$	A	8
$55 \leq \text{Marks} \leq 60$	B+	7
$50 \leq \text{Marks} \leq 55$	B	6
$40 \leq \text{Marks} \leq 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.



GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### Formula to calculate Grade Points (GP)

Suppose that „Max“ is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max}/10$  (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrollment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$\text{SGPA} = \frac{\sum C_k * GP_k}{\sum C_k}$$

where,  $C_k$  is the Credit value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the following formula

$$\text{CGPA} = \frac{\sum C_k * GP_k}{\sum C_k}$$

where,  $C_k$  is the Credit value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrollment and also during the semester for which CGPA is calculated.

**The CGPA shall be calculated up to two decimal place accuracy.**

**The formula to compute equivalent percentage marks for specified CGPA:**

% marks (CGPA)	$10 * \text{CGPA} - 10$	If $5.00 \leq \text{CGPA} \leq 6.00$
	$5 * \text{CGPA} + 20$	If $6.00 \leq \text{CGPA} \leq 8.00$
	$10 * \text{CGPA} - 20$	If $8.00 \leq \text{CGPA} \leq 9.00$
	$20 * \text{CGPA} - 110$	If $9.00 \leq \text{CGPA} \leq 9.50$
	$40 * \text{CGPA} - 300$	If $9.50 \leq \text{CGPA} \leq 10.00$

**Award of Honours:**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

**c) ATKT Rules:**

1. A student is allowed to carry backlog of any number of subjects for Semester IV.
2. A student must pass Semester I and Semester II to appear for Semester V.

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**BBA Program Structure 2018-19.**  
**(As per UGC guidelines – template for BBA – 136 credits)**

**BBA – Sem I and Sem II w.e.f 2018-19**

Semester I				Semester II			
Code	Course Title	Credit	Examination Pattern	Code	Course Title	Credit	Examination Pattern
101	Business English - Communication.	4	UE & IA	201	Environmental Science	2	CCA
102	Business Organization & Systems	4	UE & IA	202	Principles of Management	4	UE & IA
103	Micro Economics	4	UE & IA	203	Macro Economics	4	UE & IA
104	Business Accounting.	4	UE & IA	204	Management Accounting	4	UE & IA
105	Foundations of Mathematics and Statistics	4	UE & IA	205	Business Statistics	4	UE & IA
106	Community Work-I	2	CCA	206	Community Work – II	2	CCA
	Career & Life Skills				Swachha Bharat Abhiyan		
	Waste management				Sectoral Analysis		
					Smart Cities		
	Total Credits →	22				20	

**Exam Evaluation Pattern**

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

## BBA Program Structure 2018-21.

(as per UGC guidelines – template for BBA – 136 credits)

### BBA – Sem III and Sem IV w.e.f 2018-21

Semester III				Semester IV					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
301	SEC	Computer Applications for Business(Theory - 3 & Lab -2)	4	CCA	401	SEC	Enhancing Personal & Professional Skills (Theory - 3 & Lab -2)	4	CCA
302	C	Organizational Behavior.	4	UE & IA	402	C	Human Resource Management	4	UE & IA
303	C	Principles of Marketing.	4	UE & IA	403	C	International Business	4	
304	C	Introduction to Financial Management	4	UE & IA	404	C	Business Research	4	UE & IA
305	C	Entrepreneurship Development	4	UE & IA	405	C	Business Laws.	4	UE & IA
306	GE	Community Work	3	CCA	406	GE	Community Work	3	CCA
		Start-up Management					Basics of Taxation		
		Agro Tourism					Yoga - I		
		Total Credits→	23					23	

#### Courses Types

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course ( Lab / Practical / Demo etc )
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

#### Exam Evaluation Pattern

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

**BBA Program Structure 2018-21.**

**(as per UGC guidelines – template for BBA – 136 credits)**

**BBA – Sem V and Sem VI w.e.f 2018-21**

Semester V				Semester VI					
Code		Course Title	Credit	Examination Pattern	Code		Course Title	Credit	Examination Pattern
501	SEC	Summer Internship Report & Viva	6	CCA	601	SEC	Industrial Exposure. (Mini Project)	5	CCA
502	C	Services Management	4	UE & IA	602	C	Introduction to Strategic Management	4	UE & IA
503	DSE	Elective Paper – I	4	UE & IA	603	DSE	Elective Paper – III.	4	UE & IA
504	DSE	Elective Paper – II	4	UE & IA	604	DSE	Elective Paper – IV	4	UE & IA
505	C	Introduction to Operations Research	4	UE & IA	605		Disaster Management	4	CCA
506	GE	Social Media Management	2	CCA	606	GE	Business Ethics	3	CCA
		Road Safety & Management					Basics of Hospitality Management		
		Event Management					Yoga - II		
		Total Credits→	24					24	

**Courses Types**

- AECC/SEC – Ability Enhancement Compulsory Course / Skill Enhancement Course ( Lab / Practical / Demo etc )
- C - Core Course - Compulsory for BBA Discipline
- GE - Generic Elective – Open Elective / Interdisciplinary
- DSE - Discipline Specific Elective

**Exam Evaluation Pattern**

- CCA – Comprehensive Continuous Assessment
- UE – University Evaluation
- IA – Internal Assessment

**Specializations Offered:**

<b>Marketing Management</b>	<b>Human Resource Management</b>
<b>Financial Management</b>	<b>International Business Management</b>
<b>Entrepreneurship Development</b>	<b>Financial Markets</b>

**Note : ADD ON Courses :**

Courses such as mentioned below may be introduced as ADD-ON courses separately. The Add on Courses are not compulsory for the students and may be introduced on demand on Payment basis, with prior approval of concerned authorities)

- a) Foreign Language
- b) Office Automation Tools
- c) Supply Chain Management
- d) Event Management

Course Code 101

BBA- Sem - I (CBCS 2018)

## **Business English - Communication**

Credits : 4

**UE + IA: 60:40**

Course Type : AECC

### **Course Objectives:**

- To acquaint students in managerial communication from every perspective that is globally demanding.
- To acquaint students with the required skills for effective communication in business organizations
- To enable students to develop confidence and expertise in composing effective communication skills essential in Business Situations

### **Learning Outcomes:**

After studying this subject, the student should be able to:

- Understand how to converse in business situations
- Write effective e-mails, Letters
- Write formal and informal Reports

### **Unit 1: Concept and Nature of Communication**

**(12 hours)**

Meaning and Introduction, Importance and Nature of Communication. Process and Objectives of Communication. Channels of Communication, Barriers to Communication, Overcoming barriers, Seven C' s of effective communication

### **Unit 2: Verbal Communication**

**(12 hours)**

Verbal Communication (oral) – Meaning, Advantages, Disadvantages, Essentials of effective oral communication, Types. Speaking Skills – Meaning and importance – Guidelines for preparing a Speech – Strategies for good conversation

Exercises on Verbal communication.

**Unit 3: Non – Verbal Communication****(12 hours)**

Meaning , Importance, Uses of non verbal communication, Body Language, Gestures, Postures, Para Language, non verbal aspects of written communication.

**Unit 4: Listening, Reading Skills, Presentation Skills****( 12 hours)**

Listening Skills – Meaning and importance – Types – Listening Barriers – Overcoming barriers to improve Listening skills. Exercises on Listening Skills, Reading Skills – Meaning and importance – Steps for better reading. Exercises to improve Reading Skills ,

Introduction and importance, Planning the Presentation. Presentation Structure. Organizing the Presentation. Qualities of a skillful Presenter. Use of Visual aids in Presentation.

**Unit 5: Written Communication****(12 hours)**

Writing Skills – Meaning and importance of written communication in business, Business Letters : Tactful use of language – Structure of a Business letter - Business letter formats – Types of letters: Letters of inquiry and Reply, Letters placing orders and reply, Letter of Complaint, Claims and Adjustments, Sales letters, Job application letters.

**Reference Books :**

1. Urmila Rai and S. M Rai , Effective Communication (Himalaya Publishing House)
2. Shirley Taylor, Communication for Business, Pearson Education, New Delhi
3. Raymond Lesikar, Marie E Flatley, Basic Business Communication –(Tata McGraw – Hill)

**Online Resources:**

<http://www.notesdesk.com/notes/business-communications/business-communication-and-its-types/>

**MOOCs:**

<https://swayam.gov.in/>

<https://alison.com/>:

<https://edX.com/>:

<https://www.edx.org/course/business-communications-ubcx-bus2x>

<https://Coursera.com/>:

<https://www.coursera.org/courses?languages=en&query=business%20communication>



Course Code 102

BBA- Sem - I (CBCS 2018)

## **Business Organization & Systems**

Credits : 4

**UE + IA: 60:40**

Course Type : Core

### **Course Objectives:**

- To acquaint students with fundamentals of business organization and management systems as a body of knowledge.
- To impart to the students an understanding of business concepts with a view to prepare them to face challenge of managing business in the new era.

### **Learning Outcomes:**

On successful completion of this syllabi the students will

- Understand the basic concepts in commerce, trade and industry. He will be exposed to modern business world.
- Understand modern business practices, forms, procedures and functioning of various business organizations.

### **Unit 1: Introduction to Business**

**14 hrs.**

Concept of business – meaning, definition, nature and scope, characteristics of business. Business as an economic activity. Objectives of business. Structure of business. Requisites for success in modern business. Meaning, scope and evolution of commerce & industry, Industrial Revolution, beginning and growth of Indian business, industrialisation in India. Globalization & challenges for Indian Business in the modern era.

### **Unit 2: Forms of Business Ownership**

**8 hrs**

Introduction to various forms – factors affecting choices of an ideal form of ownership, features merits and demerits of sole proprietorship – joint Hindu family business – partnership – joint stock company – co-operative organisation, public enterprises.

### **Unit 3: Formation of a Company**

**10 hrs**

Stages in formation and incorporation of a company (i.e. promotion – incorporation and registration – capital subscription – commencement of business. - documents of a company i.e. Memorandum of association – articles of association – prospectus.

**Unit 4: Establishment of Business Enterprise****12 hrs**

Various factors to be considered while starting a new business enterprise i.e. Identification of business opportunity – market assessment – suppliers – technology – location – human resource – finance etc. Small and medium enterprises – meaning characteristics and objectives. Role of support organisation such as trade associations and chambers of commerce.

**Unit 5: Organization of Trade****12 hrs**

Channels of distribution – meaning, functions and types. Internal trade – wholesale and retail

External trade – import and export. Role and importance of support services to business such as transport insurance etc. Business combinations – mergers and acquisitions. Franchising. Business process outsourcing. Multinationals – concept and role of MNCs. Stock Exchange and Produce Exchange: Definition and Meaning, Importance, Functions, Listing, Dealers.

**Reference Books :**

- 1) S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House)
- 2) Y.K. Bhushan ,Fundamental Of Business Organization & Management – (S Chand Publishers)
- 3) Basu, C. R.; *Business Organization And Management*, Tata Mcgraw Hill, Publishing House, New Delhi, 1998
- 4) B S Moshal, J P Mahajan, j s gujral, business organization and management –. Galgotia publishing co, new Delhi
- 5) Redmond James, Robert Trager , media organization and management –, Biztantra, New Delhi
- 6) Business Environment Text and Cases By F. Cherunilam (Himalaya Publication House)

**Online Resources:**

- 1) <https://www.leanmethods.com/>
- 2) <https://sol.du.ac.in/library/>
- 3) <https://www.wto.org/>

**MOOCs:**

- 1) Designing the Organization: From Strategy to Organizational Structure (Coursera)
- 2) Understanding Modern Business & Organisations (FutureLearn)
- 3) Managing the Organization: From Organizational Design to Execution (Coursera)

Course Code 103

BBA- Sem - I (CBCS 2018)

## Micro Economics

Credits : 4

UE + IA: 60:40

Course Type : Core

### Course Objectives:

- To expose students to basic micro economic concepts.
- To apply economic analysis in the formulation of business policies.

### Learning Outcomes:

Students will be able to use economic reasoning to problems of business.

### Unit 1: Introduction to Micro Economics 12 hrs.

Business economics –meaning nature and scope; Micro and macro; Basic economic problems; Market forces in solving problems; Circular flow of income and expenditure; Tools for analysis (Functional relationships, Schedules, Graphs, Equations)

### Unit 2: Demand Analysis and Utility Concept

**12hrs.**

Concept of demand; Law of demand ; Factors affecting demand ;Exceptions to law of demand; Market demand ;Changes in demand ;Elasticity of demand (Price ,Income ,Cross)  
Concept of Utility, Cardinal & Ordinal Utility, Law Of Diminishing Marginal Utility

### Unit 3: Supply and Cost & Revenue concepts 12 hrs.

Concept of supply, Factors affecting supply, Law of supply, Exceptions of law of supply  
Types of cost, Fixed and variable, Accounting and economic, Total cost, marginal cost, average cost, implicit & explicit cost, real and money cost, Short run and long run, Average revenue, total and marginal revenue. Opportunity cost, Money cost, , Law of returns to scale, Economies and diseconomies of scale, Law of Variable proportions

### Unit 4: Market Analysis 12 hrs.

Features of markets, Pure, Perfect, Monopoly, Duopoly, Oligopoly, Monopolistic competition  
Equilibrium of firm and industry under perfect competition, Price determination under monopoly, Price and output determination under monopolistic competition

### Unit 5: Theories of Distribution 8 hrs.

Marginal productivity theory of distribution, Rent –modern theory of rent, Role of trade union and collective bargaining in wage determination, Interest –liquidity theory of interest  
Profits- Dynamic, Innovation, Risk and uncertainty bearing theories of profits

**Reference Books :**

1. Microeconomics theory and Application-D N DWIVEDI-Vikas.
2. Seth –micro economics
3. Mithani –managerial economics
4. M .jhingan
5. Ahuja.microeconomic analysis

**MOOCs:**

<https://swayam.gov.in/> :Accounting for Managerial Decisions

<https://alison.com/>: Fundamentals of Financial Accounting

Course Code 104

BBA- Sem - I (CBCS 2018)

## **Business Accounting**

Credits : 4

**UE + IA: 60:40**

Course Type : Core

### **Course Objectives:**

- To impart to the learners the basic accounting knowledge
- To train in the accounting process from entering business transactions to Journal to preparation of Final Accounts.

### **Learning Outcomes:**

After the completion of the course, the students will understand:

- Importance and utility of Financial Accounting
- Accounting process from entering the business transactions to journal to preparation of Final Accounts of a sole proprietor.

**Unit 1: Introduction to Financial Accounting: 6 hrs.**

Definition and Scope of Financial Accounting, Objectives of Financial Accounting, Book Keeping v/s. Accounting, Basic Terms used in Accounting, Users of Financial Statements, Limitations of Financial Accounting

**Unit 2: Accounting Principles and Accounting Standards: 6 hrs.**

Accounting Concepts, Accounting Conventions, Meaning of Accounting Standards, Significance of Accounting Standards.

**Unit 3: Journal & Subsidiary Books: 14 hrs.**

Accounting Process, Types of Accounts, Rules of Accounts, Preparation of Journal, Simple and Combined Journals entries.

Subsidiary Books: Purchase Book, Sales Book, Purchase Return Book, Sales Return Book, Cash Book

**Unit 4: Ledger Posting and Trial Balance: 12 hrs.**

Meaning and Utility of Ledger, Format of Ledger Account, Procedure of posting Journal entries to Ledger Accounts, Balancing of Ledger Account, Preparation of Trial Balance

**Unit 5: Depreciation: 8 hrs.**

Meaning of Depreciation, Causes of Depreciation, Methods of charging depreciation: Written Down Value & Straight Line Method, Accounting treatment of Depreciation

**Unit 6: Meaning and Preparation of Final Accounts: 14 hrs.**

Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary

business.

**Reference Books :**

1. Anil Chowdhry Fundamentals of Accounting & Financial Analysis (Pearson Education)
2. Jane Reimers Financial Accounting (Pearson Education)
3. Rajesh Agarwal & R Srinivasan, Accounting Made Easy (Tata McGraw –Hill)
4. Dr. S. N. Maheshwari, Financial Accounting For Management: (Vikas Publishing House)
5. Robert Anthony, David Hawkins , Business Accounting. (Tata McGraw –Hill)
6. Ashok Sehgal, Fundamentals of Financial Accounting, (Taxmann)
7. Dr. S. N. Maheshwari, Sharad K. Maheshwari, Financial Accounting for BBA

**Online Resources:**

[www.moneycontrol.com](http://www.moneycontrol.com)

[www.rbi.org.in](http://www.rbi.org.in)

[www.icai.org](http://www.icai.org)

**MOOCs:**

<https://swayam.gov.in/> :Accounting for Managerial Decisions

<https://alison.com/>: Fundamentals of Financial Accounting

Course Code 105

BBA- Sem - I (CBCS 2018)

## Foundation of Mathematics & Statistics

Credits : 4

UE + IA: 60:40

Course Type : Core

### Course Objectives:

- i) To develop knowledge of key theories, concepts in Mathematics.
- ii) To enhance ability to problem solving
- iii) To build ability to apply mathematical and statistical concept for business applications

### Learning Outcomes:

- i) Students will be able to solve problems in Mathematics using appropriate concepts
- ii) Students will be able to effectively apply the statistical tools for business applications

### Unit 1:

12hrs.

Profit and Loss, Discount, Commission, Brokerage, Rates and Taxes, Insurance, Partnership, Bill of Exchange, Stock and Shares, Payroll

### Unit 2:

12 hrs.

Simple interest and Compound interest and Annuity:

Simple interest, Compound Interest,, Interest Compounded Continuously, Compound Amount at changing rate, Introduction of Annuity, Amount and Present Value of Immediate or Ordinary Annuity, Annuity Due,

### Unit 3:

12hrs.

Matrices and Determinants & Simultaneous Linear equations:

Definition of a Matrix, Matrix operations, Determinants, Properties of determinants. Applications in Business Problem, Solution of Simultaneous equations Linear Equation in two unknowns. Permutations and Combinations

### Unit 4:

12 hrs.

#### Introduction to Business Statistics

Definition, descriptive and inferential statistics in business, scope of statistics, Population and sample, data, types of data, sources of data, methods of data collection.

### Unit 5:

12 hrs.

#### Data presentations and graphical displays

Frequency, cumulative frequency distribution, Frequency distributions, importance of Diagrammatic and Graphic Representation of data, frequency polygons and frequency curves, histograms, Ogive Curves.

### Reference Books :

1. Schaum Series , Basic Business Mathematics
2. Padmalochan Hazarika , A class textbook of Business Mathematics.
3. M. G. Dhaygude , Commercial Arithmetic and Statistics .

4. Business Statistics, S.C. Gupta

5. Eugene Don, Joel Ierner, Basic Business Mathematics, Tata McGraw Hill Publication.

6. Dr. Padmalochan Hazarika, A textbook of Business Mathematics

**Online Resources:**

[https://en.wikipedia.org/wiki/Business\\_mathematics](https://en.wikipedia.org/wiki/Business_mathematics)

<https://www.universiteitleiden.nl/.../mathematics/mathematics-and-science-based-business> Mathematics

<https://www.tru.ca/distance/courses/math1091.html>

**MOOCs:**

www/Alison

www/SWAYAM

www/NPTEL



# BACHELOR OF BUSINESS ADMINISTRATION

## Generic Elective / Interdisciplinary

Course Code 106  
BBA- Sem - I (CBCS 2018)

### Community Work

**Credits : 2**

**CCA : 50 marks**

**Course Type : Generic Elective / Interdisciplinary**

#### Course Objectives:

This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc

- (I) To expose the students towards social reality and role of community development for social upliftment and well being
- (II) To involve students in community work through active involvement and participation

#### Learning Outcomes:

Students will be able to know the community needs and understand their role to contribute meaningfully towards community development

#### Unit 1:

**5 hrs**

History, meaning, Goals, values, functions, role and process of community work. Professional and voluntary community work. Attitudes, roles and skills of a community worker

#### Unit 2:

**10 hrs**

Social concerns in India: poverty, unemployment, population, problems faced by women – dowry, domestic violence, etc. Social problems - terrorism, corruption, caste conflict, drug abuse, AIDS, ETC.

#### UNIT 3:

**15 hrs**

Types of community work. Caring for needy, helping the poor, fundraising drives- organizing

#### COMMUNITY HOURS:

Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken

Course Code 106

BBA- Sem - I (CBCS 2018)

## Career & Life Skills

Credits : 2

CCA : 50 marks

Course Type : **Generic Elective / Interdisciplinary**

### Course Objectives:

- To help students make well-informed, thoughtful decisions regarding your future as adults.
- To develop behaviours and attitudes that help students contribute to the community in a positive manner.
- Give you skills and knowledge to contribute to the well-being and respect of the self and others

### Learning Outcomes:

Students will be able to understand self potential and ways to enhance capabilities.

### Unit 1: Introduction to Life Management

Life management-definition, scope and application, concept of emotions, self belief, setting realistic goals, understanding system

### Unit 2: Developing Emotional Potential and Physical Potential

12 hrs

Improving thinking skills, improving study skills, planning education

Eating habits, healthy foods, staying healthy, changing habits-the self change model

### Developing Your Intellectual Potent

12 hrs

Effective communication, effective listening, effective speaking ,getting along with others, functioning in groups, how to delegate.

Definition-stress, handling change and stress, managing time, managing money, formulation of career plan, bring it all together

### Unit 3: Career and Life Choices

Managing personal, lifelong career development.

**Resource Choices...** Making responsible decisions in the use of finances and other resources that reflect personal values and goals as well as a commitment to self and others.

**Personal Choices...** Understand the emotional/psychological, intellectual, social, spiritual, and physical dimensions of health and how these dimensions of health work together to contribute to personal well-being.

### Reference Books :

*LifeChoices Series: - LifeChoices: Careers, Healthy & Well, Relationships, Venturing Out*

### Online Resources:

- [the life-changing magic of tidying up: the japanese art of decluttering and organizing](#) - marie kondo
- [how to organize \(just about\) everything: more than 500 step-by-step instructions for everything from organizing your closets to planning a wedding to creating a flawless filing system](#) – peter walsh
- Mindset: the new psychology of success -[carol s. Dweck](#)

Course Code 106  
BBA- Sem - I (CBCS 2018)

**Waste Management**

Credits : 2

CCA : 50 marks

Course Type : **Generic Elective / Interdisciplinary**

**Course Objectives:**

- to expose students to the issue of waste and waste management tools and techniques applicable for waste disposal and management.

**Learning Outcomes:**

After completion of the course students

- will be able to understand solid waste sources, health and environmental issues related to solid waste management.
- will get knowledge about Sources, handling and control of Biomedical, Chemical, Nuclear and e-wastes.
- will be able to understand the issues regarding waste disposal and management and will become aware of Environment and health impacts due to solid waste mismanagement

**Unit – I Solid Waste Management-**

**10 hrs**

**Introduction to waste Management**

Introduction, Meaning, Solid waste including municipal, hospital and industrial solid waste; health and environmental issues related to solid waste management. Provisions in Indian Penal Code for Environmental protection.

**Unit – II Biomedical, Chemical, Nuclear and e-wastes**

**10 hrs**

Biomedical wastes – Types – Management and handling – control of biomedical wastes, Chemical wastes – Sources – Environmental effects – Need for control – Health and environmental effects. Nuclear waste – Management of nuclear wastes, e-waste- sources and management.

**Unit – III**

**10 hrs**

**Waste reduction at source** – Treatment and disposal techniques for solid wastes – composting, vermin-composting, autoclaving, microwaving, incineration, non- incineration, Thermal techniques, use of refuse derived fuels, land-filling. **Reduce Reuse and Recycling Techniques:** Need for the concept- Various Types - Handmade Paper production – Reuse of materials- Recycle of material

**Books Recommended:**

- 1) A. D. Bhide and B.B. Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.
- 2) Biomedical waste (Management and Handling) Rules, 1998.
- 3) George Tchobanoglous, Hilary Theisen, Rolf Eliassen; Solid Wastes: Engineering Principles

and Management Issues; McGraw-Hill.

- 4) Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications.
- 5) Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill.
- 6) Constitutional Law of India – J.N. Pandey 1997 (31st Edn.) Central Law Agency Allahabad.
- 7) Diganta Bhusan Das , Diganta Bhusan Das; Solid Waste Management: Principles and Practice
- 8) George Tchobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.
- 9) A Study of Waste Management Systems in Pune Municipality Corporation, Rajendra Jagtap, Ph.D Thesis, Bharati Vidyapeeth University, Pune

**List of Software/Learning Websites:**

- i. <http://www.moef.nic.in/legis/hsm/mswmhr.html>
- ii. [en.wikipedia.org/wiki/waste\\_management](http://en.wikipedia.org/wiki/waste_management)
- iii. <http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf>
- iv. <http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514-solid-waste-management-and-recycling>
- v. [www.houstontx.gov/solidwaste](http://www.houstontx.gov/solidwaste)
- vi. [www.epa.gov/tribalmsw/](http://www.epa.gov/tribalmsw/)
- vii. [www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf](http://www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf)
- viii. [http://www.digitalbookindex.org/\\_search/search010environmenwasterefusea.asp](http://www.digitalbookindex.org/_search/search010environmenwasterefusea.asp) (e-books)

# BACHELOR OF BUSINESS ADMINISTRATION

## SEMESTER 2

Course Code 201

BBA- Sem - II (CBCS 2018)

### **Environment Studies**

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

#### **Course Objectives:**

- To sensitize the students on the environmental issues
- To educate the students about the threats to the environment and natural resources

#### **Learning Outcomes:**

Learners will be able to understand the different aspects of environments, the threats posed by human activities and the solutions for the same.

#### **Unit 1: Nature and Scope**

**(8 Hrs)**

The Multidisciplinary Nature of Environmental Studies Definition, scope and importance Need for public awareness.

Natural Resources Renewable and Non-renewable Resources: (a) Forest resources: (b) Water resources: (c) Mineral resources: (d) Food resources: (e) Energy resources: (f) Land resources:

#### **Unit 2: Ecosystems**

**(6 Hrs)**

Concept, Structure and function of an ecosystem. Energy flow in the ecosystem.

Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estauries)

Biodiversity and Its Conservation, Introduction, definition: genetic, species and ecosystem diversity. Threats to biodiversity: Endangered and endemic species of India. Conservation of biodiversity.

#### **Unit 3 : Pollution**

**(6 Hrs)**

Environmental Pollution (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards

#### **Unit 4: Social Issues and the Environment**

**(4 Hrs)**

Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

**Unit 5: Environment and human health****(6 Hrs)**

Population growth, Environment and human health. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health. Case Studies. Field Work -

Visit to a local area to document environmental assets—river/forest/grassland/hill/mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.

**Reference Books :**

1. Agarwal, K.C.2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd. , Ahmedabad — 380 013, India, Email: mapin@icenet.net ( R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001. Environmental Encyclopedia, Jaico Publ. House. Mumbai, 1196p
6. Dc A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment( R )

Course Code 202

BBA- Sem -II (CBCS 2018)

## Principles of Management

Credits : 4

UE + IA: 60:40

Course Type : Core

### Course Objectives:

Students will be given the opportunity to learn

- Basic concepts of management and to enable them to gain appreciation for emerging ideas, techniques, procedures and practices in the field of management.
- The role of leadership and management within an organization; appreciate different leadership styles and which one is suitable to a particular managerial context.

### Learning Outcomes:

- Integrate management principles into management practices.
- Assess managerial practices and choices relative to ethical principles and standards.
- Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
- Determine the most effective action to take in specific situations

### Unit 1: Introduction of Management

12 hrs

Introduction to Management- Definitions & Characteristics of Management-Scope of Management--Functions of Management. Skills for a Manager. The Evolution of Management Thoughts- Scientific Management, General Principles of Management.

### Unit 2: Planning

8 hrs

Overview of Planning: Introduction to Planning & it's Importance; Planning Process; Types of Planning, Decision making Process - Types and Techniques.

### Unit 3: Organizing

10 hrs

Introduction & Definition- Concept of Organization-Principles of Organization-Creating an Organization Structure- Informal Organization- Departmentalization, line and staff relationship.

### Unit 4: Leading

10 hrs

Defining leadership, ingredients of leadership, Trait approach to leadership, Behavioral approach to leadership, and different styles of leadership.

### Unit 5: Controlling

10 hrs

Controlling- Basic Concept, Relationship between Planning & Controlling. The Basic Control Process, Requirement for Effective Control, Control Techniques, Use of IT for Controlling.

**Reference Books :**

1. Stephen P Robbins, David A Decanzo, Fundamentals of Management, Pearson Education.
2. Richard L Daft, The New Era of Management, Thomson.
3. Prasad L.M, Principals & Practices of Management, Sultan Chand & Sons.
4. Philip Sadler, Leadership, Kogan Page.

**Online Resources:****Journals:**

1. HBR
2. Indian Management
3. Human Capital

**MOOCs:**

1. Strategic Management (Open2Study)
2. Introduction to Operations Management (Coursera)
3. Critical Perspectives on Management (Coursera)



Course Code 203

BBA- Sem -II (CBCS 2018)

## Macro Economics

Credits : 4

UE + IA: 60:40

Course Type : Core

### Course Objectives:

- To study the behavior and working of the economy as a whole.
- To study relationships among aggregates.
- To apply economic reasoning to problems of business and public policy.
- To enhance knowledge regarding current affairs of the economy as a whole.
- The course is designed to study the impact of monetary and fiscal policy on the aggregate behavior of individuals.

### Learning Outcomes:

The learner will get acquainted with the principles of Macroeconomics, determination of and linkages between major economic variables ; level of output and prices, inflation, interest rates and exchange rates.

### Unit 1: Basic Issues and features of Indian Economy

12 hrs

Macroeconomics- definition & nature, Scope , Importance, Limitations, Paradoxes, Macro economic variables. Concept and Measures of Development and Underdevelopment; Human Development; Composition of national income and occupational structure, Measurement of macroeconomic variables: National income accounting, Circular flow of income (four sector model ), Methods to calculate national income, Stock and flow concept, Gross domestic product(GDP), Gross national product(GNP), Net domestic product(NDP), Net national product(NNP), Personal and Personal disposable income; Classical theory of income and employment:

### Unit 2: Policy Regimes

12 hrs

- a) The evolution of planning and import substituting industrialization.
- b) Economic Reforms since 1991.
- c) Monetary and Fiscal policies with their implications on economy

### Unit 3:

12 hrs

Theory of Income & Employment, Says law of market, Keynes theory of Income & Employment: simple Keynesian model, components of aggregate demand, equilibrium income, changes in equilibrium, multiplier( investment, Government expenditure, lump sum tax, foreign trade), effect of fiscal and monetary policy, Classical aggregate demand curve, Classical theory

of interest rate, effect of fiscal and monetary policy.

**Unit 4: Money :**

**12 hrs**

Functions of money, quantity theory of money, determination of money supply and demand, Quantity Theory of Money

**Business cycle & Inflation & Deflation:**

Business cycle-nature, Features/Characteristics- Prosperity/Boom – Recession, Depression, Revival/Recovery

Inflation: Meaning , demand and supply side factors, causes & control,

Deflation: Meaning , causes & control, Phillips curve, Stagflation, Inflationary gap

**Unit 5: :**

**12 hrs.**

Macro economic policy: Monetary policy, Fiscal policy

Economic scenario analysis, Out of inflation & deflation , which is worst and why?

- What is the current CRR & SLR ratio? Are this ratios appropriate for current condition of the country
- Which trade cycle is prevailing in India at present

Which monetary & fiscal policy do you suggest for current condition of India?

**Reference Books :**

1. AHUJA H L - MACRO ECONOMY
2. BUSINESS ECONOMICS (MACRO) BY GIRIJA SHANKAR & KIRAN JOTWANI
3. M L SETH – MACRO ECONOMICS
4. D N DWIVEDI – MACRO ECONOMY

**Online Resources:**

<http://www.wisegeek.com/what-is-macroeconomics.htm>

<https://www.thoughtco.com/microeconomics-versus-macroeconomics-1147004>

<https://www.investopedia.com/terms/m/macroeconomics.asp>

**MOOCs:**

<https://swayam.gov.in/> :

<https://alison.com/>:

Course Code 204

BBA- Sem - II (CBCS 2018)

## Management Accounting

Credits : 4

UE + IA: 60:40

Course Type : Core

### Course Objectives:

- To Impart the Knowledge of Basic cost concepts, element of cost & Preparation of Cost Sheet.
- To provide basic knowledge of important Methods & Techniques of costing.
- To have basic knowledge about concept of management and cost audit

### Learning Outcomes:

At the end of the course students should be able to

1. Understand basic cost concepts, element of cost & Preparation of Cost Sheet.
2. Have practical applications of important Methods & Techniques of costing.
3. Understand the application of concept of management and cost audit.

### Unit 1: Introduction

(8 Hours)

Definition, Nature and scope of Management Accounting, Limitations of Financial Accounting, Advantages and Limitations of Management Accounting, Difference between Financial and Management Accounting.

### Unit 2: Introduction of Cost Accounting

(12 Hours)

Concept and need of Cost Accounting, Material, Labour and other Expenses, Classification of cost & Types of Costs, Preparation of Cost Sheet, Methods and techniques of Costing,

### Unit 3: Budget and Budgetary Control

(12 Hours)

Meaning and objectives of Budget, Definition, Meaning and objectives of Budgetary control, Advantages and disadvantages of Budgetary Control, Types of Budget, Preparation of flexible budget and cash budget.

### Unit 4: Marginal Costing & Standard Costing

(20 Hours)

Definition and Meaning of Marginal Cost and Marginal Costing, importance and Limitations of Marginal Costing, Contribution, P/V Ratio, Break Event Point, Margin of Safety, Definition and Meaning of Standard Costing, Advantages and Limitations of Standard Costing ,Variance Analysis – Material and labour Variances only

### Unit 5: Management Audit

(8 Hours)

Concept and Process of Audit, Essentials of Audit, Cost Audit its Objectives and Advantages, Management Audit its Objective and Advantages, Contents of Management Audit Reports.

### Reference Books :

1. I.M. Pandey, Management Accounting
2. S.P.Jain and Narong., Advanced cost Accounting
3. S.N.Maheshwari, Cost Accounting.
3. Prabhu Dev , Cost Accounting, Himalaya Publication
4. Paul S Kr , Management Accounting. New Central Book Agency, Calcutta
5. Rebert N Anthony., Management Accounting D B taraporewala Sons, Bombay.

**Online Resources:**

1. Companies Annual Reports
2. Money control
3. SEBI and RBI Official Websites
4. NSE and BSE Official Websites

**MOOCs:**

- <https://swayam.gov.in/> :Accounting for Managerial Decisions  
<https://alison.com/>: Fundamentals of Financial Accounting

**Course Code 205**  
BBA- Sem - II (CBCS 2018)  
**Business Statistics**

Credits : 4

**UE + IA: 60:40**

Course Type : Core

**Course Objectives:**

- i) To familiarize the students with the basic statistical tools and their application in business decision-making.
- ii) To develop the quantitative skills of the students so as to make them skilled at understanding data, comparing two or more data sets and predicting business data etc.
- iii) To make the learner familiar with the processes needed to develop, report, and analyze business data.

**Learning Outcomes:**

- i) Students will be able to solve problems in Statistics using appropriate concepts
- ii) Students will be able to effectively apply the statistical tools for business applications

**Unit 1: Descriptive statistics – Measures of Central Tendency and Dispersion** **12 Hrs**

Arithmetic mean, median, Mode, G.M. Quartiles deciles, percentiles  
Absolute and relative measures of dispersion, Range, quartile deviation, mean deviation, standard deviation, variance.

**Unit 2: Correlation Analysis** **12Hrs**

Meaning of correlation, types of correlation, Methods of studying correlation, scatter diagram, Karl Pearson's coefficient, Rank Correlation

**Unit 3: Regression Analysis** **12Hrs**

Meaning and applications, Lines of regression, regression coefficients, Business applications  
Distinction between Correlation and regression

**Unit 4: Probability** **12Hrs**

Basic Concepts in probability, definition of probability, random experiment, sample space, independent events, mutually exclusive events, conditional probability, Expected Value and Variance –  $E(X)$  and  $V(X)$ , Bayes' Theorem

**Unit 5: Association of Attributes** **12Hrs**

Introduction, Meaning and importance, Yule's Coefficient of association and interpretation

**Teaching Methodology**

- Lectures, tutorial and Field Work.
- Field work on collection of data through surveys and presentation of data using EXCEL to be carried out by students under the guidance of faculty.

**Reference Books :**

1. Dr. P Hazarika, Business Statistics, S. Chand & Co.

2. Bharadwaj, Business Statistics.
3. S.C. Gupta., Fundamentals of statistics
4. J. V. Tatke , Business Statistics
5. David L Eldredge., Business Statistics. South Western Thomson. USA
6. Amir D Aczel , Business Statistics. (Tata McGraw –Hill)

**Online Resources:**

<https://www.edx.org/course/subject/data-analysis-statistics>

<https://www.class-central.com › Subjects › Mathematics>

**Moocs:**

<https://swayam.gov.in/> :

<https://alison.com/>

[Statistics for International Business \(Coursera\)](#)

[Inferential Statistics \(Coursera\)](#)

[Basic Statistics \(Coursera\)](#)

[Statistical Reasoning for Public Health 1: Estimation, Inference, & Interpretation \(Coursera\)](#)

[Statistics in Education for Mere Mortals \(Canvas.net\)](#)

<https://alison.com/courses/math?locale=en&page=1&type>

**BACHELOR OF BUSINESS ADMINISTRATION  
OPEN COURSES SEMESTER II**

Course Code 206

BBA- Sem - II (CBCS 2018)

**Community Work – Swachh Bharat Abhiyan**

**Credits : 2**

**CCA : 50 marks**

**Course Type : Generic / Open Elective**

**Course Objectives:**

- i) This course aims to expose the students to Swachh Bharat Abhiyan initiative of the government.

**Learning Outcomes:**

Students will be able to understand the details about the Swachh Bharat Abhiyan and its impact on society.

**Unit 1:**

**5 hrs**

History, meaning, Goals of Cleanliness initiatives

**Unit 2:**

**10 hrs**

Initiators of cleanliness drive in India. Sant Ghadage Baba, Mahatam Gandhi, Efforts taken towards the Swachh Bharat Abhiyan, Swachh Bharat Mission.

**UNIT 3:**

**15 hrs**

Impact of Cleanliness initiatives. Social Awareness, Case Studies

**COMMUNITY HOURS:**

Internship of 15 days (100 hours) to be undertaken

Submit a report on a particular type of community involvement undertaken

**References:**

[www.swachhbharaturban.in/](http://www.swachhbharaturban.in/)

[swachhbharatmission.gov.in](http://swachhbharatmission.gov.in)

Course Code 206  
BBA- Sem - II (CBCS 2018)

**Smart Cities**

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

**Course Objectives:**

to give exposure to tools and techniques applicable for planning, controlling & monitoring of Smart Infrastructure and Cities. This subject would also enable to develop insight for managing project risks, uncertainties and complexities of smart cities project.

**Learning Outcomes:**

Students will get an understanding of road map for Planning Smart Cities and benchmarking their performance for Indian context

**Unit 1:**

**6 hrs**

Introduction to Smart Cities, •Introduction to "City Planning", Understanding Smart Cities

**Unit 2 :**

**12 hrs**

Dimensions of Smart Cities, Global Experience of Smart Cities, Smart Cities –Global Standards and Performance, Benchmarks, Practice Codes, India "100 Smart Cities" Policy and Mission

**Unit 3 :**

**12 hrs**

- Smart City Planning and Development
- Financing Smart Cities Development
- Governance of Smart Cities, Case Studies on Smart Cities

**Reference :**

[smartcities.gov.in](http://smartcities.gov.in)

<https://internetofthingsagenda.techtarget.com/definition/smart-city>



Course Code 206  
BBA- Sem - II (CBCS 2018)

**Sectoral Analysis**

Credits : 2

CCA : 50 marks

Course Type : Generic / Open Elective

**Course Objectives:**

- To expose the students to the different sectors of the economy
- To enable the students to understand the importance and contribution of the sectors to business, economy and global environment
- To expose the students towards rural problems To awaken sense of responsibility amongst students towards senior citizens

**Learning Outcomes:**

Students will get exposure to the different sectors of the economy and their contribution to the national development.

**Unit 1 :**

Introduction to the sectors of the economy

**8 hours**

**Units 2:**

Detailed view of the IT, Manufacturing, Agriculture, Banking Insurance, Service Sector, Retail etc

**12 hours**

**Unit 3:**

Project work on detailed analysis of any one sector – national and global scenario

**10 hours**

**Reference Books :**

1. S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House)
2. Y.K. Bhushan ,Fundamental Of Business Organization & Management – (S Chand Publishers)
3. Basu, C. R.; *Business Organization And Management*, Tata Mcgraw Hill, Publishing House, New Delhi, 1998
4. Business World

**BHARATI VIDYAPEETH  
DEEMED TO BE UNIVERSITY**

**PUNE, INDIA**

**FACULTY OF MANAGEMENT STUDIES**

**Board of Studies in Computer Applications**

**Bachelor of Computer Applications Programme**

**(Under Choice Based Credit System)**

**To be effective from 2018-19**

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE**  
**FACULTY OF MANAGEMENT STUDIES**  
**Board of Studies in Computer Applications and Systems Studies**  
**Bachelor of Computer applications Programme**  
**(Under Choice Based Credit System)**  
**To be effective from 2018-19 at Part I**

**1. INTRODUCTION:**

The BCA Programme is a full time 150 Credits program offered by Bharati Vidyapeeth (Deemed to be University), Pune and conducted at its management institutes in Delhi, Karad, Kolhapur, Pune, Sangli, and Solapur. All the six institutes have excellent faculty, Laboratories, Library, and other facilities to provide proper learning environment. The University is reaccredited by NAAC with an 'A+' grade. The expectations and requirements of the Software Industry, immediately and in the near future, are visualized while designing the BCA programme. This effort is reflected in the Vision and Mission statements of the BCA programme. Of course, the statements also embody the spirit of the vision of Late Dr. Patangraoji Kadam, the Founder of Bharati Vidyapeeth and Chancellor, Bharati Vidyapeeth University which is to usher in “Social Transformation through Dynamic Education.”

**2. VISION STATEMENT OF BCA PROGRAMME:**

To create high caliber solution architects and innovators for software development.

**3. MISSION STATEMENT OF BCA PROGRAMME:**

To teach 'things, not just words', 'how to think', and 'how to self-learn'.

**4. OBJECTIVES OF BCA PROGRAMME:**

The main objectives of BCA Programme are to prepare the youth to take up positions as system analysts, system engineers, software engineers and programmers. Accordingly the course curriculum aims at developing 'systems thinking' 'abstract thinking', 'skills to analyze and synthesize', and 'skills to apply knowledge', through 'extensive problem solving sessions', 'hands on practice under various hardware/software environments' and 'three projects'. In addition, 'social interaction skills', 'communication skills', 'life skills', 'entrepreneurial skills', and 'research skills' which are necessary for career growth and for leading quality life are also imparted.

**5. LEARNING OUTCOMES FROM THE BCA PROGRAMME:**

At the end of the course the student should be able to:

- (a) Analyze problems and design effective and efficient software solutions.
- (b) Develop software under latest Application Development Environments.

- (c) Learn new technologies with ease and be productive at all times.
- (d) Read, write, and contribute to technical literature.
- (e) Work in teams.
- (f) Be a good citizen in all respects.

**6. ELIGIBILITY FOR ADMISSION TO THIS PROGRAMME:**

Admission to the course is open to any candidate who has passed (10+2) or equivalent examination of any recognized board.

Subject to the above condition, the final admission is based solely on the merit at the All India entrance test (BU-MAT) conducted by Bharati Vidyapeeth (Deemed to be University, Pune).

**7 DURATION OF THE PROGRAMME:**

The duration of this course is three years divided in to six semesters or a minimum of 150 credits whichever is later. The medium of instruction and examination will be only English.

**8 SCHEME OF EXAMINATION:**

For some courses there is Internal Assessment (IA) conducted by the respective institutes as well as a University Examination (UE) at the End-of-the Term. UE will be conducted out of 60 marks and IA will be conducted for 40 marks then these are converted to grade points and grades as per the Table I. For courses having only Continuous Assessment (CA) the respective institutes will evaluate the students in varieties of ways, three or four times, during the term for a total of 100 marks. Then the marks will be converted to grade points and grades using the Table I.

**9 STANDARD OF PASSING:**

For all courses, both UE and IA constitute separate heads of passing (HoP). In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA. A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table:

<b>Range of Marks (%)</b>	<b>Grade</b>	<b>Grade Point</b>
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively. GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

#### **10 Award of Honours:**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} < 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} < 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} < 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} < 55$

$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} < 50$
CGPA below 5.0	F	Fail	Marks below 40

**RULES OF ATKT:**

1. A student is allowed to carry backlog of any number of subjects upto Semester IV.
2. A student must pass Part I (Semester I and II) to appear for Semester V.

## SEMESTER-WISE COURSE STRUCTURE FOR BCA

(To be effective from July 2018)

### SEMESTER I

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
101	Fundamentals of Information Technology	4	3	1	-	40	60
102	Algorithm and program Design	4	3	1	-	40	60
103	C Programming – I	4	3	1	-	40	60
104	Business organization system	4	3	1	-	40	60
105	Business Mathematics	4	3	1	-	40	60
106	Lab on MS-Office Suite	2	-	-	4	40	60
107	Lab on C Programming – I	2	-	-	4	40	60
108	<b>General course-I:</b> Community Work I / Career & Life Skills / Waste Management	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>17</b>	<b>5</b>	<b>8</b>	<b>330</b>	<b>420</b>

### SEMESTER II

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
201	Computer Organization and Architecture	4	3	1	-	40	60
202	DBMS I	4	3	1	-	40	60
203	C Programming - II	4	3	1	-	40	60
204	Financial Accounting	4	3	1	-	40	60
205	Principles of Management	4	3	1	-	40	60
206	Lab on C Programming - II	2	-	-	4	40	60
207	Environmental Studies	2	2	-	-	40	60
208	<b>General Course II :</b> Community Work II (Swacchh Bharat Abhiyan) / Sectoral Analysis / Smart Cities	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>19</b>	<b>5</b>	<b>4</b>	<b>330</b>	<b>420</b>

### SEMESTER III

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
301	Operating Systems	4	3	1		40	60
302	Software Engineering	4	3	1		40	60
303	DBMS II	4	3	1		40	60
304	Statistics	4	3	1		40	60
305	Multimedia Technology	4	3	1		40	60
306	Lab on Oracle and Multimedia	2	-	-	4	40	60
307	Lab on Linux Operating System	2	-	-	4	40	60
308	<b>General Course III :</b> Community Work III / Start up management / Agro Tourism	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>17</b>	<b>5</b>	<b>8</b>	<b>330</b>	<b>420</b>

### SEMESTER IV

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
401	Computer Networks	4	3	1	-	40	60
402	Software Testing	4	3	1	-	40	60
403	Java Programming	4	3	1	-	40	60
404	Operations Research	4	3	1	-	40	60
405	Entrepreneurship Development	4	3	1	-	40	60
406	Lab on Java	2	-	-	4	40	60
407	Minor Project - I	2	2	-	-	0	100
408	<b>General Course IV:</b> Community work IV / Basics of Taxation / Meditation & Yoga	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>19</b>	<b>5</b>	<b>4</b>	<b>290</b>	<b>460</b>



### SEMESTER V

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
501	Introduction to the Internet Technologies	4	3	1	-	40	60
502	Object Oriented Analysis and Design	4	3	1	-	40	60
503	C# Programming	4	3	1	-	40	60
504	Graph Theory	4	3	1	-	40	60
505	Elective I	4	3	1	-	40	60
506	Lab on Internet Technology and C# Programming	2	-	-	4	40	60
507	Minor Project II	2	2	-	-	0	100
508	<b>General Course V:</b> Social Media Management / Road Safety and Management / Event Management	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>19</b>	<b>5</b>	<b>4</b>	<b>290</b>	<b>460</b>

### SEMESTER VI

Course Number	Course Title	Credits	Hours / Week			IA Marks	EoTE Marks
			L	T	P		
601	Data warehousing and Data Mining	4	3	1		40	60
602	Web Programming	4	3	1		40	60
603	Software project Management	4	3	1		40	60
604	Business Analytics	4	3	1		40	60
605	Elective II	4	3	1		40	60
606	Lab on Web programming	2	-	-	4	40	60
607	Major Project	2	2	-	-	0	100
608	<b>General Course VI:</b> Business Ethics / Basics of Hospitality Management / Aptitude	1	2	-	-	50	0
<b>Total</b>		<b>25</b>	<b>19</b>	<b>5</b>	<b>4</b>	<b>290</b>	<b>460</b>

**Electives:**

<b>Elective No.</b>	<b>Elective Group</b>	<b>Course No</b>	<b>Course Name</b>
01	<b>Information Security</b>	505-1-A	Information Security Concepts
		605-1-B	Information Security Administration
02	<b>Big Data</b>	505-2-A	Introduction to Big Data
		605-2-B	HADOOP
03	<b>Information Systems</b>	505-3-A	E-Commerce
		605-3-B	Knowledge Management

**Practical Examinations:**

For courses Nos. 106,107, 206, 306, 307,406, 506 and 606 there will be practical examination.

# SEMESTER I

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>101</b>	<b>Fundamentals of Information Technology</b>	<b>3+1+0 = 4C</b>	<b>2018-19</b>
<p><b>Course Objective:</b>  The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics</p>			
<p><b>Expected Outcome :</b>  At the end of this course, student should be able to  (a) Understand basic concepts and terminology of information technology.  (b) Have a basic understanding of personal computers and their operations.  (c) Be able to identify issues related to information security.</p>			
<p><b>References (Books, Websites etc) :</b>  How to solve computer – Dromey  Computer Fundamentals by P. K. Sinha,</p>			
<p><b>Suggested MOOC :</b>  Please refer these websites for MOOCS:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			
<b>Course Plan</b>			
<b>Unit</b>	<b>Contents</b>		
1	<p><b>Introduction to Computers:</b>  Definition, .Basics of Computer, Characteristics of computers, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer.</p>		
2	<p><b>Computer Arithmetic:</b>  Binary, Binary Arithmetic, Number System: Positional &amp; Non Positional, Binary, Octal, Decimal, Hexadecimal, Converting from one number system to another , 1's Complements, 2's Complements, Computer Codes, Rules and laws of Boolean algebra, Basic Gates (NOT, AND &amp; OR)</p>		
3	<p><b>Input Output Devices:</b>  Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.</p>		

4	<p><b>Storage Fundamentals:</b>  Primary Vs Secondary Storage, Data storage &amp; retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Disks. Flash Drives, DVD, Blue-Ray disc.</p>
5	<p><b>Software:</b>  Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages &amp; disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w, Algorithms and Flow Charts.</p>
6	<p><b>Data Communication:</b>  Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking. Internet – Web Browsers, Web servers, Internet Protocol, Hyper text Transfer Protocol, Business Data Processing: Introduction, data storage hierarchy, Method of organizing data, File Types, File Organization, File Utilities.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
102	<b>Algorithm and Program Design</b>	3+1+0 = 4C	2018-19
<p><b>Course Objective:</b> To understand good principles of algorithm design, elementary analysis of algorithms, and fundamental data structures. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures.</p>			
<p><b>Expected Outcome:</b> This is a first course in data structures and algorithm design. Students will:</p> <ul style="list-style-type: none"> <li>• learn good principles of algorithm design;</li> <li>• learn how to analyze algorithms and estimate their worst-case and average-case behaviour (in easy cases);</li> <li>• become familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles;</li> </ul>			
<p><b>References (Books, Websites etc) :</b> 1. Dromey R. G. : How to Solve it by a Computer. 2. Sartaj Sahni: Data Structure, Algorithms and Applications in C++ (Ch II).</p>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction:</b> Concept, of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo - Code and Flow - Charts, Tracing of Algorithms Such as Swapping, Counting, Finding the Sum, Product, maximum, minimum, of a list of numbers.</p>		
2	<p><b>Concept of Structured Programming and Procedure Oriented Programming:</b> Introduction, Concept, Basic Control Structure, Benefits of Structured Programming and Procedure Oriented Programming</p>		
3	<p><b>Design of Algorithm:</b> Design of algorithm for problem such as Evaluation of polynomial, Sum of first n factorials, Finding nth term of Fibonacci sequence, Finding largest and second largest of list, Determining nth root of a number, compute, GCD and Base Conversion</p>		
4	<p><b>Problem Analysis and Design 1:</b> Problem Analysis and Design of Algorithms for problems such as (1) Swapping (2) Counting (3) Finding the Sum, Product, maximum, minimum of a finite list of numbers, and (4) Simple variations of the above problem realization that, there may be alternative algorithm and that one algorithm may be better (in some sense) than the other.</p>		

5	<b>Problem Analysis and Design2:</b> Problem Analysis Design of Algorithms for problems such as (1) Evaluation of a polynomial (2) Sum of first n factorials (3) Finding the nth term of a Fibonacci sequence, (4) Finding the largest and second largest of a finite list, (5) Evaluating in finite series and variations of these problems, (6) Determining nth root of a number.
6	<b>Concept of Array, Sort and Search Technique:</b> Introduction of Array, Array manipulation such as removing the duplicates, Partitioning of an array, listing of prime numbers, finding prime factor of a number, The problem of search and Merge, Linear, Binary search algorithms, The Problem of Sorting, Selection, Insertion and Bubble

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>103</b>	<b>C Programming - I</b>	<b>3+1+0 = 4C</b>	<b>2018-19</b>
<b>Course Objective:</b>			
This is a first course in programming. The objective of this paper is to teach the Programming Language C. However, the process of learning a computer language will also be emphasized. Emphasis is also on semantics and problem solving.			
<b>Expected Outcome:</b>			
At the end of the course a student should be able:			
<ul style="list-style-type: none"> <li>• To solve a given problem using programming/algorithm</li> <li>• Understand and use C libraries,</li> <li>• Trace the given C program manually</li> <li>• Effectively use of Arrays and functions</li> <li>• Write C program for simple applications of real life using structures and Unions.</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ol style="list-style-type: none"> <li>1. Let us C - Y.Kanetkar, BPB Publications</li> <li>2. Programming in C - Gottfried B.S., TMH</li> <li>3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI</li> <li>4. Programming in ANSI C - Balaguruswami, TMH</li> <li>5. C- The Complete Reference - H.Sohildt, TMH</li> <li>6. A Structured Programming Approach using C – B.A. Forouzan &amp; R.F. Gillberg, THOMSON Indian Edition</li> <li>7. Computer fundamentals and programming in C – Pradip Dey &amp; Manas Ghosh, OXFORD</li> </ol>			
<b>Suggested MOOC :</b>			
Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to C language</b> Origins of C, Character Set of C, C Tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of variables, Declaration of variables as constant, Operators, Types of operators, Precedence and associativity, Expression, Type conversions in expressions, Input and Output functions - printf(), scanf(), getchar(), putchar(), Formatted input and formatted output.		
2	<b>Decision Control and looping</b> Introduction, Control Statements- Sequential, Selection, Iteration Statements, Branching structure- if statement, if-else statement, Nested if-else statement, else if Ladder, Conditional operator, switch statement, Loop control structures- while loop, do-while loop, for loop, Nested for loop, Jump statements-break, continue, goto		
3	<b>Functions</b> Introduction, Purpose of function, Function declaration/ Function prototype, Function definition, Function call, return statement, Function parameters, Types of functions, Call		



	by value , Storage classes, Recursion, Examples on recursive function
4	<p><b>Arrays and Strings</b></p> <p>Introduction to one-dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements, Arrays and functions, Introduction to two-dimensional Array, Definition, Declaration, Initialization, Accessing and displaying array elements, Introductions to Strings, Definition, Declaration, Initialization, Input, output statements for strings, Standard library functions, Implementations with standard library functions</p>
5	<p><b>Structures and union</b></p> <p>Introduction to structure, Defining a structure, Declaring structure variables, Accessing structure members, nested structure, Array of structure, Array within structure, Introduction to union, Definition, Declaration, Differentiate between structure and union</p>
6	<p><b>Pointers</b></p> <p>Introduction to pointer, Definition, Declaring and Initializing pointer variable, Indirection operator and address of operator, Accessing variable through its pointer, Pointer arithmetic, Dynamic memory allocation, Pointers &amp; Functions, Pointers &amp; Array, Pointers &amp; Structures</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>104</b>	<b>Business Organization System</b>	<b>3-1-0 = 4C</b>	<b>2018-19</b>
<p><b>Course Objective:</b> To acquaint students with fundamentals of Business Organization and management systems as a body of knowledge.</p>			
<p><b>Expected Outcome :</b> 1. Students shall know about business and structure 2. Students shall know about various forms of business 3. Students will have sound knowledge about overall business environment.</p>			
<p>References (Books, Websites etc) :</p> <p><b>Reference Books:</b> S.A. Sherlekar ,Modern Business Organization and Management – (Himalaya Publishing House) Y.K. Bhushan ,Fundamental of Business Organization &amp; Management – (S Chand Publishers) Basu, C. R.; <i>Business Organization and Management</i>, Tata McGraw Hill, Publishing House, New Delhi, 1998 B S Moshal, J P Mahajan, J S Gujral, Business Organization and Management –. Galgotia Publishing Co, New Delhi Redmond James, Robert Trager , Media Organization and Management –, Biztantra, New Delhi</p>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www. edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a></p>			
<p>Laboratory Experiments:</p>			
1	<p><b>Nature of Business</b> Concept of Business – Meaning, Definition, Nature and Scope, Characteristics of Business. Business as an Economic Activity. Objectives of Business. Structure of Business (Classification of Business Activities. Requisites for Success in Modern Business.</p>		
2	<p><b>Evolution of Business</b> Beginning and development of Commerce, Evolution of Industry, Industrial Revolution, Beginning and growth of Indian Business, Industrialization in India.</p>		
3	<p><b>Forms of Business Ownership</b> Introduction to various forms – Factors affecting choices of an deal form of ownership, features Merits and Demerits of Sole Proprietorship – Joint Hindu Family Business – Partnership – Joint Stock Company – Co-operative Organisation, Public Enterprises.</p>		
4	<p><b>Formation of a Company</b> Stages in formation and incorporation of a company (e Promotion – incorporation and registration – Capital Subscription – Commencement of Business. - Documents of a Company i.e. Memorandum of Association – Articles of Association – Prospectus.</p>		

5	<p><b>Establishment of Business Enterprise</b>  Various factors to be considered while starting a new Business enterprise i.e. identification of Business Opportunity – Market Assessment – Suppliers – Technology – Location – Human Resource – Finance etc. Small and Medium Enterprises – Meaning Characteristics and objectives. Role of Support Organisation such as Trade Associations and Chambers of Commerce.</p>
6	<p><b>Organization of Trade</b>  Channels of Distribution – Meaning, Functions and types. Internal Trade – Wholesale and Retail  External Trade – Import and Export. Role and importance of support services to Business such as Transport Insurance etc. Business Combinations – Mergers and Acquisitions. Franchising. Business Process Outsourcing. Multinationals – Concept and role of MNCs</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
105	<b>Business Mathematics</b>	3+1+0 =4C	2018-19
<b>Course Objective:</b>			
To give general idea about mathematics and its application in Business			
<b>Expected Outcome:</b>			
The students will be able to solve small business problems by using the concepts of Business Mathematics			
<b>References (Books, Websites etc) :</b>			
Discrete Mathematics & its Applications by Kenneth Rosen			
<b>Suggested MOOC :</b>			
Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Set Theory :</b> Definition of a set, Representation of elements of sets, Methods of representing sets , types of sets, operations on sets , cardinality of a set, Principle of Inclusion and Exclusion , Venn Diagram , Proof by using Venn diagram		
2	<b>Functions and Relations :</b> Definition of Function, Types of Functions ,Composite Function, Relation definition, representation of relations		
3	<b>Logic:</b> Propositions, Logic Operations-Negation, Disjunction, Conjunction, Conditional and Biconditional, Truth Tables of compound propositions, Translating English sentences in to logical statements and vice versa, Logic gates and circuits		
4	<b>Matrices:</b> Matrix Definition, General Form, Representation of matrix in computers, Types of matrices, Operations on matrices: Addition, Subtraction and Multiplication, transpose , row / column transformations , Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices		
5	<b>Permutations and Combinations:</b> Concept- Permutation, Combination, Sum and Product rules, problems on Permutation and combination (with wording atleast, atmost, neither nor, any one etc.)		
6	<b>Probability:</b> Concept and problem solving, general probability, conditional probability, partitions, Bayes Theorm		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
106	Lab on MS-Office Suite	2-0-4 = 4C	2018-19
<p><b>Course Objective:</b> The objective of this course is to help the student gain proficiency in text editing and formatting, spreadsheet and database management, and presentation preparation. An additional objective of the course is for the student to gain basic knowledge of modern-day computing technology.</p>			
<p><b>Expected Outcome :</b> Upon completion of this course students will be able to:</p> <ul style="list-style-type: none"> <li>• Demonstrate an advanced knowledge of the Word Processing package, MS Office and a knowledge of how to design &amp; create effective and structured documents like technical reports, letters, brochures, etc.,</li> <li>• Demonstrate the skills in the appropriate use of various features of the spread sheet package MS Excel and also to create useful spreadsheet applications like tabulated statements, balance sheets, statistical charts, business statements, etc.</li> <li>• Demonstrate the skills in making an effective presentation with audio and video effects using the MS Excel package</li> <li>• Draw graphical pictures, flow charts, block diagrams etc., using the drawing tools available in MS Word or MS Power Point and incorporate them into documents and presentations.</li> </ul>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Course Plan</b>			
Unit	<b>Information Technology Essentials, Windows and Internet Explorer:</b>		
1	Verify the components of a typical computer system, Explore, maintain files, and customize the Windows operating system, Review using the Internet Explorer.		
2	<p><b>MS Word:</b> Introduction: Introduction to MS Word, Menus, Shortcuts, Document types Working with Documents:</p> <ol style="list-style-type: none"> <li>a) Opening Files – New &amp; Existing, Saving Files</li> <li>b) Formatting page and Setting Margins</li> <li>c) Converting files to different formats : Importing, Exporting , Sending files to others</li> <li>d) Editing text documents : Inserting , Deleting ,Cut, Copy, paste , Undo, Redo , Find, Search, Replace</li> <li>e) Using Toolbars, Ruler, Icons and help</li> </ol> <p>Formatting Documents:</p> <ol style="list-style-type: none"> <li>a) Setting Font Styles: Font selection – style, size, color etc., Type face – Bold Italic, underline, Case settings, Highlighting, Special symbols</li> <li>b) Setting Paragraph style: Alignments, Indents, Line space, Margins and Bullets</li> </ol>		

	<p>and Numbering</p> <p>c) Setting Page Style: Formatting, Border &amp; Shading, Columns, Header &amp; footer, Setting Footnotes, Inserting manual Page break, Column break and line break, Creating sections and frames, Inserting Clip arts, inserting pictures and other files, Anchoring &amp; Wrapping</p> <p>d) Setting Document Styles: Table of Contents, Index, Page Numbering, data &amp; Time, Author etc., Creating Master Documents</p> <p>Creating Tables: Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, Formula</p> <p>Drawing: Inserting Pictures/Files etc., Drawing Pictures, Formatting &amp; Editing pictures, Grouping and ordering, Rotating</p> <p>Tools: Word Completion, Spell Checks, Macros, Mail merge, Templates, Using Wizards, Tracking, Changes, Security</p>
3	<p><b>MS Power Point:</b></p> <p>Introduction: Opening new Presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts</p> <p>Creating a presentation: Setting presentation style, Adding Text to the presentation</p> <p>Formatting a presentation: Adding style, Color, gradient fills, Arranging objects, Adding Header &amp; Footer, Slide background, Slide layout</p> <p>Adding Graphics to the presentation: Inserting pictures, movies, tables, etc into the presentation, Drawing Pictures using Draw</p> <p>Adding effects to the presentation: Setting Animation &amp; transition effect, Adding audio and video</p> <p>Printing Handouts and Generating standalone presentation viewer</p>
4	<p><b>MS Excel:</b></p> <p>Introduction: Spreadsheet &amp; its Applications, Opening spreadsheet, Menus &amp; Toolbars &amp; icons, Shortcuts, Using help</p> <p>Working with Spreadsheets: Opening a File, Saving Files, Setting Margins, Converting files to different formats: Importing, Exporting and Sending files to others</p> <p>Spreadsheet addressing: Rows, Columns &amp; Cells, Referring cells and Selecting cells</p> <p>Entering and Editing Data:</p>

	<p>Entering Data, Cut, Copy, paste, Undo, Redo, Find, Search &amp; Replace, Filling continuous rows, columns, Inserting -Data, cells, column, rows &amp; sheets, Manual breaks</p> <p>Computing data :  Setting Formula, Finding total in a column or row, Mathematical Operations(Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formula</p> <p>Formatting Spreadsheets:  Formatting – Cell, row, column &amp; Sheet:  Alignment, Font, Border &amp; shading, highlighting values Hiding/Locking Cells</p> <p>Worksheet :  Sheet Name , Row &amp; Column Headers, Row Height, Column Width, Visibility – Row, Column, Sheet , worksheet Security</p> <p>Formatting – worksheet:  Sheet Formatting &amp; style - background, color, Borders &amp; shading, Anchoring objects, Formatting layout for Graphics, Clipart etc.,</p> <p>Working with sheets :  Sorting, Filtering, Validation, Consolidation, Subtotal , Creating Charts, Selecting charts, Formatting charts, label, scaling etc.,</p> <p>Using Tools:  Error Checking, Spell Checks, Macros, Formula Auditing, Creating &amp; using Templates, Tracking changes, customization, printing worksheet</p>
5	<p><b>Working with Excel Functions:</b>  Concept of Functions, Commonly used functions: Sum, Max,Min, Average, Count, Today, Now, Datedif, Countif, CountA, CountBlank, Round, RoundUp, RoundDown, ABS, Sign, Ceiling, Floor, Trim, Value, Clean, sqrt, if, sumif</p>
6	<p><b>MS Access:</b>  What is an Access Database, Opening a Database File, Create Table, Create and modify fields of tables, Construct simple queries, Saving and Running Queries</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
107	<b>Lab on C Programming I</b>	<b>0-0-4- = 2 C</b>	<b>2018</b>
<b>Course Objective :</b>			
This is companion course of C Programming I			
<b>Syllabus Broad Units:</b>			
This Companion course of C programming; Practical aspects of C programming towards problem solving is covered.			
<b>Expected Outcome :</b>			
The students will develop adequate programming skills with respect to following			
<ol style="list-style-type: none"> <li>1. Implement a real world problem using basic constructs of C language.</li> <li>2. Develop an application using Decision making and looping</li> <li>3. Make use of proper operators to solve problem.</li> <li>4. Make use of Arrays and pointers efficiently and handling strings.</li> <li>5. Comprehend the dynamic memory allocation and pointers in C.</li> <li>6. Able to define new data types using enum, structures and typedef.</li> </ol>			
<b>References (Books, Websites etc) :</b>			
<ol style="list-style-type: none"> <li>1. Let us C - Y.Kanetkar, BPB Publications</li> <li>2. Programming in C - Gottfried B.S., TMH</li> <li>3. The 'C' programming language - B.W.Kernighan, D.M.Ritchie, PHI</li> <li>4. Programming in ANSI C - Balaguruswami, TMH</li> <li>5. C- The Complete Reference - H.Sohildt, TMH</li> <li>6. A Structured Programming Approach using C – B.A. Forouzan &amp; R.F. Gillberg, THOMSON Indian Edition</li> <li>7. Computer fundamentals and programming in C – Pradip Dey &amp; Manas Ghosh, OXFORD</li> </ol>			

### Outline of Lab on C programming – I

Sr. No	Programming Exercises
1	Compilation and Executing programs Arithmetic operations Use of Symbolic constants Demonstrating the following gcc options -o, -c, -D, -l, -I, -g, -E Programs to demonstrate use of operators and Input/ output <i>gcc or an equivalent compiler is assumed.</i>
2	Program to demonstrate the following – Branching



	<ul style="list-style-type: none"> <li>- Nested Branching</li> <li>- Looping</li> <li>- Selection</li> </ul>
<b>3</b>	<p>Working with functions</p> <ul style="list-style-type: none"> <li>- Writing function prototype and definition</li> <li>- Using functions to solve problems (Calling a function )</li> <li>- Using recursion</li> <li>- Storage classes - Using register, extern and static</li> </ul>
<b>4</b>	<p>Arrays and Strings</p> <p>1D - Linear Search, Sort</p> <p>2D - Matrix operations</p> <p>Strings: program to do operations on string using library and user defined functions</p> <p>Finding length of string, String concatenation, removing extra spaces, get substring, check whether second string is part of another, converting string to lowercase, uppercase etc.</p>
<b>5</b>	<p>Structures</p> <p>Making use of structures to define new types(user defined types)</p> <p>Arrays of structure, display all elements of array and sorting of them.</p>
<b>6</b>	<p>Pointers,</p> <p>Programs to demonstrate working of pointer; need of pointer</p> <p>Pointer as parameter to function</p> <p>Comparison of pointer with arrays and using pointer to refer an array</p> <p>Creating pointer dynamically by using dynamic memory allocation</p> <p>Array of Pointers, Ragged Arrays, Function pointer</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
<b>108</b>	<b>Community Work</b>	<b>2-0-0 =1 C</b>	<b>2018-19</b>
<b>Course Objective:</b> This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc (I) To expose the students towards social reality and role of community development for social upliftment and well being (II) To involve students in community work through active involvement and participation			
<b>Expected Outcome:</b> Students will be able to know the community needs and understand their role ito contribute meaningfully towards community development			
<b>Course Plan</b>			
<b>Unit</b>	<b>Contents</b>		
1	History, meaning, Goals, values, functions, role and process of community work. Professional and voluntary community work. Attitudes, roles and skills of a community worker .		
2	Social concerns in India: poverty, unemployment, population, problems faced by women – dowry, domestic violence, etc. Social problems - terrorism, corruption, caste conflict, drug abuse, AIDS, ETC.		
3	Types of community work. Caring for needy, helping the poor, fundraising drives-organizing.		
	<b>COMMUNITY HOURS:</b> Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken.		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
<b>108</b>	<b>Career &amp; Life Skills</b>	<b>2-0-0 =1 C</b>	<b>2018-19</b>
<b>Course Objective:</b> <ol style="list-style-type: none"> <li>To help students make well-informed, thoughtful decisions regarding your future as adults.</li> <li>To develop behaviours and attitudes that help students contribute to the community in a positive manner.</li> <li>Give you skills and knowledge to contribute to the well-being and respect of the self and others</li> </ol>			
<b>Expected Outcome:</b> Students will be able to understand self potential and ways to enhance capabilities.			
<b>References (Books, Websites etc) :</b> <i>LifeChoices Series: - LifeChoices: Careers, Healthy &amp; Well, Relationships, Venturing Out</i>			
<b>Online Resources:</b> <ol style="list-style-type: none"> <li>the life-changing magic of tidying up: the japanese art of decluttering and organizing - marie kondo</li> <li>how to organize (just about) everything: more than 500 step-by-step instructions for everything from organizing your closets to planning a wedding to creating a flawless filing system – peter walsh</li> </ol> Mindset: the new psychology of success -carol s. Dweck			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Unit 1: Introduction to Life Management</b> Life management-definition, scope and application, concept of emotions, self belief, setting realistic goals, understanding system		
2	<b>Unit 2: Developing Emotional Potential and Physical Potential</b> Improving thinking skills, improving study skills, planning education Eating habits, healthy foods, staying healthy, changing habits-the self change model		
3	<b>Developing Your Intellectual Potent</b> Effective communication, effective listening, effective speaking ,getting along with others, functioning in groups, how to delegate. Definition-stress, handling change and stress, managing time, managing money, formulation of career plan, bring it all together		
4	<b>Career and Life Choices</b> Managing personal, lifelong career development. <b>Resource Choices...</b> Making responsible decisions in the use of finances and other resources that reflect personal values and goals as well as a commitment to self and others. <b>Personal Choices...</b> Understand the emotional/psychological, intellectual, social, spiritual, and physical dimensions of health and how these dimensions of health work together to contribute to personal well-being.		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
<b>108</b>	<b>Waste Management</b>	<b>2-0-0 =1 C</b>	<b>2018-19</b>
<p><b>Course Objective:</b> To expose students to the issue of waste and waste management tools and techniques applicable for waste disposal and management.</p>			
<p><b>Expected Outcome:</b> After completion of the course students</p> <ul style="list-style-type: none"> <li>• will be able to understand solid waste sources, health and environmental issues related to solid waste management.</li> <li>• will get knowledge about Sources, handling and control of Biomedical, Chemical, Nuclear and e-wastes.</li> </ul> <p>will be able to understand the issues regarding waste disposal and management and will become aware of Environment and health impacts due to solid waste mismanagement</p>			
<p><b>References (Books, Websites etc) :</b></p> <ol style="list-style-type: none"> <li>1. D. Bhide and B.B. Sundaresan, “Solid Waste Management – Collection, Processing and disposal” Mudrashilpa Offset Printers, Nagpur, 2001.</li> <li>2. Biomedical waste (Management and Handling) Rules, 1998.</li> <li>3. <a href="#">George Tchobanoglous</a>, <a href="#">Hilary Theisen</a>, <a href="#">Rolf Eliassen</a>; Solid Wastes: Engineering Principles and Management Issues; McGraw-Hill.</li> <li>4. Manual on Municipal Solid Waste Management, New Delhi, Controller of Publications.</li> <li>5. Freeman H.M. (1988) Standard Handbook of Hazardous Waste Treatment and Disposal, New York, McGraw-Hill.</li> <li>6. Constitutional Law of India – J.N. Pandey 1997 (31st Edn.) Central Law Agency Allahabad.</li> <li>7. <a href="#">Diganta Bhusan Das</a> , <a href="#">Diganta Bhusan Das</a>; Solid Waste Management: Principles and Practice</li> <li>8. George Techobanoglous et al, ”Integrated Solid Waste Management” McGraw - Hill, 1993.</li> <li>9. A Study of Waste Management Systems in Pune Municipality Corporation, Rajendra Jagtap, Ph.D Thesis, Bharati Vidyapeeth University, Pune</li> </ol>			
<p><b>Online Resources:</b></p> <ol style="list-style-type: none"> <li>1. <a href="http://www.moef.nic.in/legis/hsm/mswmhr.html">http://www.moef.nic.in/legis/hsm/mswmhr.html</a></li> <li>2. <a href="http://en.wikipedia.org/wiki/waste_management">en.wikipedia.org/wiki/waste_management</a></li> <li>3. <a href="http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf">http://www.cyen.org/innovaeditor/assets/Solid%20waste%20management.pdf</a></li> <li>4. <a href="http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514-solid-waste-management-and-recycling">http://www.ilo.org/oshenc/part-vii/environmental-pollution-control/item/514-solid-waste-management-and-recycling</a></li> <li>5. <a href="http://www.houstontx.gov/solidwaste">www.houstontx.gov/solidwaste</a></li> <li>6. <a href="http://www.epa.gov/tribalmsw/">www.epa.gov/tribalmsw/</a></li> <li>7. <a href="http://www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf">www.unc.edu/courses/2009spring/.../SolidWasteIndiaReview2008.pdf</a></li> <li>8. <a href="http://www.digitalbookindex.org/_search/search010environmenwasterefusea.asp">http://www.digitalbookindex.org/_search/search010environmenwasterefusea.asp</a> (e-books)</li> </ol>			
<b>Course Plan</b>			
Unit	Contents		

1	<p><b>Solid Waste Management- Introduction to waste Management</b> Introduction, Meaning, Solid waste including municipal, hospital and industrial solid waste; health and environmental issues related to solid waste management. Provisions in Indian Penal Code for Environmental protection.</p>
2	<p><b>Biomedical, Chemical, Nuclear and e-wastes</b> Biomedical wastes – Types – Management and handling – control of biomedical wastes, Chemical wastes – Sources –Environmental effects – Need for control – Health and environmental effects. Nuclear waste – Management of nuclear wastes, e-waste- sources and management.</p>
3	<p><b>Waste reduction at source</b> Treatment and disposal techniques for solid wastes–composting, vermin-composting, autoclaving, microwaving, incineration, non- incineration, Thermal techniques, use of refuse derived fuels, land-filling. <b>Reduce Reuse and Recycling Techniques:</b> Need for the concept-Variou Types - Handmade Paper production –Reuse of materials-Recycle of material</p>

# SEMESTER II

## Semester II

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>201</b>	<b>Computer Organization and Architecture</b>	<b>3-1-0 = 4C</b>	<b>2018-19</b>
<p><b>Course Objective:</b> Main objective of this paper is to learn structure and functioning of various hardware components of digital computer. Also study the interactions and communication among these hardware components.</p>			
<p><b>Expected Outcome :</b> At the end of this course, student should be able to understand</p> <ul style="list-style-type: none"> <li>• Simple machine architecture and the reduced instruction set computers.</li> <li>• Memory control, direct memory access, interrupts, and memory organization</li> <li>• Basic data flow through the CPU (interfacing, bus control logic, and internal communications).</li> <li>• Number systems, instruction sets, addressing modes, and data/instruction formats.</li> </ul>			
<p><b>References (Books, Websites etc) :</b> M Morris Mano Computer systems Architecture third edition Prentice Hall of India Publication</p>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a></p>			
Course Plan			
Unit	Contents		
1	<p><b>Introduction To Digital Computer:</b> Data Representation – Data Types – Complements – Arithmetic Operations – Representations – Fixed –Point, Floating – Point , Decimal Fixed – Point – Binary Codes- Logic Gates, Boolean Algebra, Map Simplification – Combinational Circuits: Half-Adder, Full Adder- Flip Flops - Sequential Circuits</p>		
2	<p><b>Introduction To Digital Components And Micro Operations:</b> ICs – Decoders – Multiplexers – Registers – Shift Registers – Binary Counters – Memory Unit – Register Transfer Language – Register Transfer – Bus And Memory Transfers – Arithmetic, Logic And Shift Micro Operations , Arithmetic Logic Shift Unit.</p>		
3	<p><b>Computer organization:</b> Instruction Codes – Computer Registers – Computer Instructions – Timing And Control – Instruction Cycle – Memory Reference Instructions – I/O And Interrupt – Machine Language – Assembly Language – Assembler.</p>		
4	<p><b>Memory Organization:</b> Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management.</p>		
5	<p><b>Central Processing Unit:</b> General Register Organization – Control Word – Stack Organization – Instruction Format – Addressing Modes – Data Transfer And Manipulation – Program Control, RISC</p>		

6

**Input – Output Organization:**

Peripheral Devices – Input-Output Interface – Asynchronous Data Transfer – Modes Of Transfer – Priority Interrupt – DMA – IOP – Serial Communication.



Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>202</b>	<b>Database Management System</b>	<b>3-1-0 = 4C</b>	<b>2018-19</b>
<p><b>Course Objective:</b>  This is a foundational course on Data Modeling. The course aims to impart knowledge of the concepts related to database and operations on databases. It also gives the idea how database is managed in various environments with emphasis on security measures as implemented in database management systems.</p>			
<p><b>Expected Outcome :</b>  At the end of the course, student should be able to  A) Understand the concepts of database and techniques for its management.  B) Different Data Models at Conceptual and Logical level.  C) Differentiate between the role of DBA and Data Architect  D) Understanding Data Security standards and Methods</p>			
<p><b>References (Books, Websites etc) :</b>  1) Database System Concepts By Henry korth and A. Silberschatz  2) Database Systems Concepts, Designs and Application by Shio Kumar Singh, Pearson  3) Database Management Systems by Debabrata Sahoo ,Tata Macgraw Hill</p>			
<p><b>Suggested MOOC :</b>  Please refer these websites for MOOCS:  NPTEL / Swayam  www. edx.com  www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction of Database Management System:</b>  Difference between Data, Information, Data Processing &amp; Data Management. File Oriented Approach, Database oriented approach to Data Management, Need for DBMS, Characteristic of Database, Database Architecture: Levels of Abstraction, Database schema and instances, 3 tier architecture of DBMS, Data Independence. Database users, Types of Database System. Database Languages, DBMS interfaces.</p>		
2	<p><b>Data Modeling:</b>  Data Models, Logical Data Modeling: Hierarchical Data Model, Network Data Model, Relational Data Model, Advantages and Disadvantages of Logical Data Modeling. Conceptual Data Modeling: Entity Relationship Model, Entities, Attributes, Types of Attributes, Relationships, Degree of relationship Set, Mapping Cardinalities, Keys, ER Diagram Notations, Roles Participation: Total and Partial, Strong and Weak Entity Set. Case studies on ERD.</p>		
3	<p><b>Normalization:</b>  Keys: Composite, Candidate, Primary, Secondary, Foreign, Super key, CODD's Rules, Mapping conceptual model into Relational Model. Functional Dependencies, Decomposition, Lossy and Lossless Decomposition, Dependency Preserving Decomposition Advantages and Disadvantages of Normalization, Normal Forms (1NF, 2NF, 3NF,) Case Studies on Normalization.</p>		

4	<p><b>File Structures and Data Administration:</b>  File Organization, Overview of Physical Storage Media, Magnetic Disk, RAID, Tertiary Storage, Storage Access, Data Dictionary Storage, Organization of File (Sequential, Clustering), Indexing and Hashing, Basic Concepts, indices, B+ Tree index file, B- tree index file, Static hashing, Dynamic Hashing, Data administration, Role and Responsibility of DBA</p>
5	<p><b>Transaction and Concurrency Control</b>  Multiprogramming and Multiprocessing, Basic Database access operations, Concept of transaction, transaction state, ACID properties, Schedules, Serializability of schedules., Concurrency Control, lock based protocols, timestamp based protocols, Multiple granularity, Multiple Version Techniques, Deadlock and its handling, Wait-Die and Wound-Wait, Deadlock prevention without using timestamps, Deadlock detection and time outs</p>
6	<p><b>Database Recovery and security Management:</b>  Database Recovery, Types of Failures, and Data access. Recovery and atomicity, Recovery Techniques Algorithms: Log Based Recovery, Check points, Shadow Paging, Recovery with concurrent transactions</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>203</b>	<b>C Programming - II</b>	<b>3-1-0 = 4C</b>	<b>2018-19</b>
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To understand file handling in C.</li> <li>To develop skills to analyze the problem given and to design &amp; develop an efficient solution to given problem</li> <li>To develop capability to choose appropriate data structures for given problems</li> <li>To imbibe programming skills &amp; thereby making industry ready</li> </ul>			
<b>Expected Outcome:</b> After undergoing this course, student will <ol style="list-style-type: none"> <li>Have thorough knowledge about data structures</li> <li>Ability to design&amp; develop program using linear data structures&amp; non linear data structures for solving problems</li> <li>Ability to choose appropriate data structures for problem solving</li> <li>Ability to use combination of these data structures for problem solving.</li> </ol>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C</li> <li>Basavraj S Anami, Shanmukhappa Angadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.</li> <li>Andrew Tenanbaum, Thomson, 2005, Data Structures with C.Robert Kruse &amp; Bruce Leung, Data Structures &amp; Program Design in C, Pearson Education,</li> </ol>			
<b>Suggested MOOC :</b> Data structures and Algorithms, Prof. Sudarshan Iyengar, IITRopar, 8 weeks, Rerun Feb 05, 2018 <a href="https://onlinecourses.nptel.ac.in/noc16_cs06">https://onlinecourses.nptel.ac.in/noc16_cs06</a> at NEPTEL			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Elementary Data Structures:</b> Basic concepts such as data object, array, and record; Operations and relations on data objects; definition of data structure; Built-in data types as examples of data structures; concept of abstract data type; notation to specify an abstract data type; concepts of pre-conditions and post-conditions; Implementation of an ADT in a language; Specification and implementation of simple data structures such as Integer, Rational, Currency, Date, Temperature, distance, Pay, Marks, Grade_card etc.		
2	<b>Linear Data Structures:</b> ( Representation in Memory and operations like insertion, deletion and traversal) – one and multidimensional array, Pointer arrays, single link list, circular link list, double link list		
3	<b>Particular Linear Data Structures:</b> Representation in Memory and operations like insertion, deletion and traversal) - Stacks: Applications: implementation of recursion, factorial calculation, queues, circular queue, deque;		

4	<b>File Handling:</b> Creation, reading writing in a file. Pattern Matching and Extraction of data from a file. Reading and writing from files.
5	<b>Hierarchical data structures :</b> General trees and related concepts; depth first and breadth first traversal of trees; n-ary trees and important properties of n-ary trees; binary trees and their properties; binary tree traversal algorithms.
6	<b>The problem of search and Sorting :</b> Linear and binary search and their efficiency; Hash tables, The standard sort algorithms (Bubble/insertion/selection) and their efficiencies; Merge sort and quick sort algorithms and their efficiencies.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
<b>204</b>	<b>Financial Accounting</b>	<b>3-1-0 = 4C</b>	<b>2018-19</b>
<b>Course Objective:</b>			
<ol style="list-style-type: none"> <li>To impart basic accounting knowledge</li> <li>To lay a foundation for further study of accounting at higher level</li> <li>To enable the students to understand basic accounting principles, practice and its applications in modern business activities.</li> </ol>			
<b>Expected Outcome :</b>			
<ul style="list-style-type: none"> <li>The knowledge of accounting and its principles at basic level.</li> <li>Practical's in Tally and Excel for Financial Accounting assignments</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ol style="list-style-type: none"> <li>Dr. S. N. Maheshwari , Financial Accounting For Management: (Vikas Publishing House)</li> <li>Robert Anthony, David Hawkins, Business Accounting. (Tata McGraw –Hill)</li> <li>M.G.Patkar, Book-Keeping &amp; Accountancy. Std XI( FYJC) Commerce</li> <li>Anil Chowdhry , Fundamentals of Accounting &amp; Financial Analysis (PearsonEducation)</li> <li>M.E.Thukaram Rao, Accounting for Managers.( New Age International Publishers)</li> </ol>			
<b>Suggested MOOC :</b>			
Please refer these websites for MOOCS:			
NPTEL / Swayam			
www. edx.com			
www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction:</b> Need for Accounting, Meaning and definition of book keeping, System of Book keeping. Financial Accounting-definition, Scope and objectives. Accounting v/s Book Keeping. Limitations of Financial Accounting, End users of financial statement.		
2	<b>Accounting Principles, Concepts and Conventions:</b> Accounting Principles-definition and importance, Accounting Concepts and Conventions, Branches of accounting.		
3	<b>Journal and ledger:</b> Journal-importance and utility, classification of accounts, journalizing of transactions. Ledger- meaning and utility, posting and balancing of account		
4	<b>Subsidiary Books And Trial Balance:</b> Cash book, purchase book, sales book. Trial Balance- meaning and purpose, preparation of a trial balance.		
5	<b>Preparation of final accounts:</b> Preparation of Trading and Profit & Loss Account and Balance Sheet of sole proprietary business.		
6	<b>Computerized Accounting:</b> Computers and Financial application, Accounting Software packages. (Orientation level)		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
205	<b>Principles of Management</b>	3+1+0 = 4C	2018-19
<b>Course Objective:</b> To understand the concepts in Management and to develop the skills related to practice of management.			
<b>Expected Outcome:</b> To understand the functions and processes of business management.			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>1. Heinz Wehrich &amp; Harold Koontz , Principles and Practice of Management</li> <li>2. Tripathi &amp; Reddy , Principles of Management</li> <li>3. Dr. L.M.Prasad, Principles of Management</li> <li>4. Richard Daft., Management. Thomson South Western Publishers, Australia</li> </ol>			
<b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Management:</b> Definitions and Meaning of Management, Characteristics of Management, Management Vs. Administration, Levels of Management, Functions of management, Scope and Importance of Management, Henry Fayol' s contribution to Management, Fredrick Taylor's contribution to Scientific Management, Social Responsibility of Management.		
2	<b>Planning:</b> Meaning, Steps in planning process, Nature of planning , Types of plans, Mission and Objectives, Process of setting Objectives, Management by Objectives, Decision making - process.		
3	<b>Organizing:</b> Meaning, Process of Organizing, Organization Structure, Forms of Organization		
4	<b>Staffing:</b> Recruitment and its Sources, Selection process, Payment of Wages and Salaries, Incentives - Types, Motivation - Positive and Negative motivation.		
5	<b>Directing:</b> Defining Leadership, Types of leadership. Authority & Responsibility, Delegation of Authority, Decentralization - Determinants of decentralization, Distinction between Delegation and Decentralization.		
6	<b>Controlling:</b> Meaning, Characteristics of Control, Process of Controlling, Modern methods of controlling, Requirements for Effective Control, Relationship between Planning & Controlling. Use of IT in Controlling. Zero Based Budgeting and Management audit.		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
206	<b>Lab on C Programming -II</b>	0-0-4 = 2C	2018-19
<b>Course Objective :</b>			
This is companion course of C Programming II			
<b>Syllabus Broad Units:</b>			
This Companion course of C programming II; Practical aspects of C programming towards problem solving is covered.			
<b>Expected Outcome :</b>			
The students will develop adequate programming skills with respect to following			
<ol style="list-style-type: none"> <li>1. Define basic data structures such as Date, Currency and Rational; and using it.</li> <li>2. Defining and using and updating Linear data structures : arrays and Linked List</li> <li>3. Should define data types such as stack, queue and List</li> <li>4. Able to read and write data into files.</li> <li>5. Able to define hierarchical data types; manipulate and use it.</li> <li>6. Able to understand searching and sorting mechanism and use various algorithms on it.</li> </ol>			
<b>References (Books, Websites etc) :</b>			
<ol style="list-style-type: none"> <li>1. Behrouz A. Forouzan and Richard F. Gilberg , 2nd Edition, Thomson, 2003, Computer Science A Structured Programming Approach Using C</li> <li>2. Basavraj S Anami, Shanmukhappa Angadi, Sunil Kumar S Manvi, PHI Publications, 2010. A Holistic approach to learning C.</li> <li>3. Andrew Tenanbaum, Thomson, 2005, Data Structures with C. Robert Kruse &amp; Bruce Leung, Data Structures &amp; Program Design in C, Pearson Education,</li> </ol>			

### Lab on C programming -II

Sr. No	Programming Exercises
1	Elementary Data Structures <ul style="list-style-type: none"> <li>- Write a program having functionality of one dimension and two dimension arrays with use of simple data types such as Integer, Float, Date etc.</li> <li>- Write a program wherein mathematical calculations involves such as average, percentage calculation, Factorial calculation and Matrix multiplication</li> <li>- Write program for structure implementation for array and pointers.</li> <li>- Create a object of the class to achieve various functionalities of accounting such as Net Pay calculation, Tax deduction, Gross pay etc.</li> </ul>
2	Linear Data Structures <ul style="list-style-type: none"> <li>- Demonstrate various functionalities for Link list, Circular link list and double link list with the reference of array and pointer.</li> </ul>

	<ul style="list-style-type: none"> <li>- Write a C program to insert and delete string / integer data from specific place of linked list.</li> <li>- Search a specific string/ integer in a given data set also find how many time it occurs or repeats in a set given</li> </ul>
<b>3</b>	<p>Particular Linear Data Structures</p> <ul style="list-style-type: none"> <li>- Write program for implementation of recursion</li> <li>- Demonstrate Insertion, Deletion and Searching functionalities with their nomenclatural for – <ul style="list-style-type: none"> <li>o Stack</li> <li>o Queues</li> <li>o Circular Queues</li> </ul> </li> <li>- Do necessary assumption for implementation of it</li> </ul>
<b>4</b>	<p>File Handling</p> <ul style="list-style-type: none"> <li>- Program to create and write data into files</li> <li>- Program to read data from files.</li> <li>- Programs on pattern matching on data of files and using this pattern matching at the time of reading and writing data into file</li> </ul>
<b>5</b>	<p>Hierarchical data structures</p> <ul style="list-style-type: none"> <li>- Programs for defining data structure to represent a tree. Creating tree and adding data/nodes into it.</li> <li>- Programs to traverse trees: DFS, BFS and other</li> <li>- Deleting and nodes in tree</li> </ul>
<b>6</b>	<p>The problem of search and Sorting</p> <ul style="list-style-type: none"> <li>- Programs to use linear/sequential searching and binary searching</li> <li>- Programs to implement standard sorting algorithms with efficiency measurement</li> <li>- Reading data form and using it with various sorting algorithms</li> </ul>



Course Number	Course Name	L-T-P- Credits	Year of Introduction
207	Environment Studies	2-0-0 = 2C	2018-19
<b>Course Objective:</b> To Understand and the nature and function of the natural environment affecting society.			
<b>Expected Outcome :</b> Understand the importance of Environment in the life of living things.			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>• Agrawal K.C.:Environmental Biology:Nidhi Publishers Ltd(2001)</li> <li>• Bharucha Erach: The Biodiversity of India: Mapin Publishing Pvt. Ltd.</li> <li>• Jadhav H and Bhosale V.M.: Environmental Protection and Laws: Himalaya Publishing House.</li> <li>• Miller T.G. Jr.: Environmental Science: Wadsworth Publishing Co.</li> </ul>			
Suggested MOOC :			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>The multidisciplinary nature of environment studies:</b> Definition, scope and importance-need of public awareness.</p> <p><b>Natural Resources:</b> <b>Renewable and non-renewable resources:</b> <b>Forest resources:</b> Use and over- exploitation, deforestation. Case studies. Timber extraction, mining, dams and their effects on forest and tribal people.</p> <p><b>Water resources:</b> Use and over-utilization of surface and groundwater, floods, droughts, conflicts over water, dams- benefit and Problems.</p> <p><b>Mineral Resources:</b> Use and exploitation ‘environmental effects of extracting and using mineral resources, case studies.</p> <p><b>Food resources:</b> World food problems, changes caused by agriculture. Fertilizer-pesticide problems, water logging, salinity, case studies.</p> <p><b>Energy resources:</b> Growing energy needs, renewable and non-renewable energy resources, use of alternative energy sources.</p> <p><b>Land resources:</b> Land as resources, land degradation, man induced landslides, desertification. Role of individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles</p>		
2	<p><b>Ecosystem:</b> Concept of ecosystem, structure and function of an ecosystem, producers, consumers and decomposers .Energy flow in the ecosystem, Ecological succession, food chains, food webs and ecological pyramids, introduction, types, characteristics features structure and function of the following ecosystem, forest ecosystem ,grassland ecosystem, Desert ecosystem, Aquatic ecosystems, ponds, stream, lakes, rivers, estuaries.</p>		
3	<p><b>Biodiversity and its conservations:</b> Introduction, Definition: genetic, species and ecosystem diversity, Biogeographically classification of India, value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option vales, India as a mega diversity nation, Hot-Spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, Man wildlife</p>		

	conflicts, Endangered and endemic species of India, Conservation of biodiversity: In situ and Ex-situ conservation of biodiversity.
4	<p><b>Environmental Pollution:</b>  Definition- Causes, effects and control measures of:-Air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, and nuclear hazards .Soil waste management: cause, effects and control measures of urban and industrial waste. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquakes, cyclone and landslide.</p>
5	<p><b>Social issues and Environment:</b>  From unsustainable to sustainable development, urban/problems related to energy, water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns Case Studies, Environment ethics: Issues and possible solutions ,wasteland reclamation, Consumerism and waste products, Environment protection Act, Air(presentation and Control of Pollution)Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.</p>
6	<p><b>Human Population and the Environment:</b>  Population growth, variation among nations, population explosion-Family Welfare Programme. Environment and Human health. Human Rights Value Education. HIV/AIDS Women and Child Welfare. Role of Information Technology in Environment and human health.</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
208	Community Work – Swachh Bharat Abhiyan	2-0-0 =1 C	2018-19
<b>Course Objective:</b> This course aims to expose the students to Swachh Bharat Abhiyan initiative of the government.			
<b>Expected Outcome :</b> Students will be able to understand the details about the Swachh Bharat Abhiyan and its impact on society.			
<b>References (Books, Websites etc) :</b> <a href="http://www.swachhbharaturban.in/">www.swachhbharaturban.in/</a> swachhbharatmission.gov.in			
<b>Course Plan</b>			
Unit	Contents		
1	History, meaning, Goals of Cleanliness initiatives		
2	Initiators of cleanliness drive in India. Sant Ghadage Baba, Mahatam Gandhi, Efforts taken towards the Swachh Bharat Abhiyan, Swachh Bharat Mission		
3	Impact of Cleanliness initiatives. Social Awareness, Case Studies.		
	COMMUNITY HOURS: Internship of 15 days (100 hours) to be undertaken Submit a report on a particular type of community involvement undertaken		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
<b>208</b>	<b>Sectoral Analysis</b>	<b>2-0-0 =1 C</b>	<b>2018-19</b>
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>• To expose the students to the different sectors of the economy</li> <li>• To enable the students to understand the importance and contribution of the sectors to business, economy and global environment</li> <li>• To expose the students towards rural problems To awaken sense of responsibility amongst students towards senior citizens</li> </ul>			
<b>Expected Outcome :</b> Students will get exposure to the different sectors of the economy and their contribution to the national development.			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>1. S.A. Sherlekar ,Modern Business Organization And Management – (Himalaya Publishing House)</li> <li>2. Y.K. Bhushan ,Fundamental Of Business Organization &amp; Management – (S Chand Publishers)</li> <li>3. Basu, C. R.; <i>Business Organization And Management</i>, Tata Mcgraw Hill, Publishing House, New Delhi, 1998</li> <li>4. Business World</li> </ol>			
<b>Course Plan</b>			
Unit	Contents		
1	Introduction to the sectors of the economy		
2	Detailed view of the IT, Manufacturing, Agriculture, Banking Insurance, Service Sector, Retail		
3	Project work on detailed analysis of any one sector – national and global scenario		

Course Number	Course Name	L-T-P-Credits	Year of Introduction
208	Smart Cities	2-0-0 =1 C	2018-19
<b>Course Objective:</b> To give exposure to tools and techniques applicable for planning, controlling & monitoring of Smart Infrastructure and Cities. This subject would also enable to develop insight for managing project risks, uncertainties and complexities of smart cities project.			
<b>Expected Outcome :</b> Students will get an understanding of road map for Planning Smart Cities and benchmarking their performance for Indian context.			
<b>References (Books, Websites etc) :</b>			
<b>Suggested MOOC :</b>			
<b>Course Plan</b>			
Unit	Contents		
1	Introduction to Smart Cities, •Introduction to "City Planning", Understanding Smart Cities		
2	Dimensions of Smart Cities, Global Experience of Smart Cities, Smart Cities –Global Standards and Performance, Benchmarks, Practice Codes, India "100 Smart Cities" Policy and Mission		
3	<ul style="list-style-type: none"> <li>•Smart City Planning and Development</li> <li>•Financing Smart Cities Development</li> <li>•Governance of Smart Cities, Case Studies on Smart Cities</li> </ul>		

# SEMESTER III

Course Number	Course Name	L-T-P- Credits	Year of Introduction
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301	Operating Systems	3L-1T-0P=4C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To provide an understanding of the major operating system components</li> <li>To provide coverage of basic computer system organization</li> <li>The overall aim of this course is to provide a general understanding of how a computer works. This includes aspects of the underlying hardware as well as structure and key functions of the operating system.</li> </ul>			
<b>Expected Outcome :</b> At the end of this course, student should be able to <ul style="list-style-type: none"> <li>Explain the concepts of process, address space and file</li> <li>Compare and contrast various CPU scheduling algorithms</li> <li>Understand functioning and working of Windows as well as Unix Operating System</li> </ul>			
<b>Prerequisite:</b> Students should have basic knowledge of working on an operating system			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>Operating systems design and implementation by Andrew Tanenbaum and Albert Woodhull</li> <li>Operating systems concept and design by Milan Milenkovic</li> <li>Operating system Concepts by Silberschulz, Abraham and Galvin, peter raer</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
Course Plan			
Unit	Contents		
1	<b>Introduction to Operating System:</b> Definition and concept of OS, History of OS, Importance and function of Operating system. Types of OS-Batch System, timesharing, Multitasking, multiprogramming, multiprocessing, online operating system, real time, distributed operating system. Views-command language users view, system call users view, structure of OS- simple, monolithic system and layered system, client server model. User operating-system interface: command line interface, GUI, system calls.  <b>Case Study:</b> Unix History, General Structure of Unix, The shell of Unix operating system, The shell of Unix operating system		
2	<b>Process Management:</b> Process concept, Process Control Block, process states and its transitions, context switch, OS services for Process management, scheduling and types of schedulers, scheduling algorithm-First come first served, shortest job first, shortest remaining time next, time slice scheduling, priority based scheduling, multilevel queue, multilevel queue with feedback  <b>Case Study:</b> Process management in Unix		
3	<b>Storage Management:</b> Basic concept of storage management, logical and physical address space, swapping, contiguous allocation, non-contiguous allocation, fragmentation, segmentation, paging, demand paging, virtual memory, page replacement algorithms- FIFO, Optimal page		

	replacement algorithm, least recently page replacement algorithm, clock page replacement algorithm, design issue of paging, thrashing,
<b>4</b>	<p><b>Inter-process communication and synchronization:</b>  Need, Mutual Exclusion, Semaphore, Busy-wait Implementation, characteristics of semaphore, queuing implementation of semaphore, producer consumer problem, critical region and conditional critical area. What is deadlock? Conditions to occur the deadlock, deadlock prevention, deadlock avoidance- banker's algorithm. resource request, resource release.</p>
<b>5</b>	<p><b>File Systems:</b>  Files-basic concept, file attributes, operations, file types, file structure, access methods, Directory- structure-single level directory system, two level directory system, hierarchical directory system, directory operations, protection, security, allocation method.</p> <p><b>Case Study: Unix File Management and Security</b></p>
<b>6</b>	<p><b>Input/output System:</b>  Principles of I/O hardware, I/O devices, device controller, DMA, Principles of I/O software-goals, interrupt handler, device driver.  Mass storage structure-disk structure, disk scheduling (FCFS, SSTF, SCAN, LOOK, C-SCAN, C-LOOK)</p> <p><b>Case Study: Input output management in Unix</b></p>



Course Number	Course Name	L-T-P- Credits	Year of Introduction
302	Software Engineering	3L-1T-0P = 4C	2018
<b>Course Objective:</b> To introduce the current methodologies involved in the development and maintenance of Software over its entire life cycle.			
<b>Learning Outcome : At the end of this course, student should be able to</b> <ul style="list-style-type: none"> <li>Understand life cycle models, Requirement elicitation techniques, understand the concept of Analysis and Design of software.</li> <li>Develop SRS as per any of the existing standards.</li> <li>Implement software engineering concepts in software development to develop quality software.</li> </ul>			
<b>Pre-requisites:</b> Preliminary knowledge of computer, their operations and applications.			
<b>References (Books, Websites etc):</b> <ul style="list-style-type: none"> <li>SOFTWARE ENGINEERING A PRACTITIONERS APPROACH seventh edition BY Roger S. Pressman McGraw Hill International Edition.</li> <li>Software Engineering by Sommerville, Pearson Education, 7th edition</li> <li>Software Engineering by K.K. Aggarwal &amp; Yogesh Singh, New Age International Publishers.</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOCS: NPTEL / Swayam <a href="http://www.edx.com">www.edx.com</a> <a href="http://www.coursera.com">www.coursera.com</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Software Engineering:</b> Software, Program vs Software, software characteristics, Definition of Software Engineering, importance, principles of software engineering, Difference between software engineering and software programming, Members involved in software development.		
2	<b>Software process and Feasibility study:</b> Need of Feasibility study, types of Feasibility study, Cost Benefit Analysis. General software development life cycle with all phases. Overview of software models (Waterfall, Prototyping, and Spiral and Rapid Application Development model).		
3	<b>Requirement Engineering Concepts and Methods:</b> What is Requirement Engineering, Types of requirements, Requirement elicitation techniques- Traditional methods and Modern methods, Verification and validation process. Principles of Requirement Specification, Software Requirement Specification document Outline Characteristics of good SRS: - correct, complete, unambiguous, consistent, modifiable, traceable, Understandable		
4	<b>Analysis and Structured System Design tools:</b> <b>Analysis and Design Tools :</b> Entity-Relationship Diagrams, Decision Tree and Decision Table , Data Flow Diagrams (DFD) , Data Dictionary , Elements of DD		

	<p>Advantage of DD , Pseudo code , Input And Output Design</p> <p><b>Structured System Design:</b>  Modules Concepts and Types of Modules Structured Chart , Qualities of Good Design , Coupling, Types of Coupling , Cohesion, Types of Cohesion, CASE STUDIES (Based on Above Topic)</p>
5	<p><b>Software Testing and Software Quality Assurance</b></p> <p><b>Software Testing:</b>  Definition, Test characteristics, Types of testing: Black-Box Testing , White-Box Testing ,Unit testing , Integration testing, Validation, Verification.</p> <p><b>Quality concept:</b>  (Quality, quality control, quality assurance, cost of quality), SQA activities, SQA plan. Formal Technical review: Review meeting, review reporting and review guidelines  Software Configuration Management: - What is configuration management, Baseline, Software Configuration items, SCM process- Identification of objects, Version control and Change control.</p>
6	<p><b>Software Maintenance:</b>  What is software maintenance? Problems during software maintenance.</p> <p><b>Categories of Software Maintenance:</b> Corrective maintenance, Adaptive maintenance, Perfective maintenance, and preventive maintenance. Cost of Maintenance, Maintenance Activities.</p> <p><b>Maintenance Process and Models:</b>  Maintenance processes, Fix Model, Iterative Enhancement Model, Reuse Oriented Model, Boehm Model, and Taute’s Models.</p>

Course Number	Course Name	L – T – P Credits	Year of Introduction
303	DBMS – II	3L – 1T – 0P=4C	2018
<p><b>Course Objectives:</b> The main objective is to teach the concepts related to database its techniques and operations. SQL (Structured Query Language) is introduced in this subject. This helps creates strong foundation for application of data design.</p>			
<p><b>Expected Outcome:</b> At the end of this course, the student should be able to:</p> <ul style="list-style-type: none"> <li>• Creating tables, and queries using SQL</li> <li>• Applying SQL Operators and SQL Functions in the created tables in SQL;</li> <li>• Writing and solving complex queries based on joins, sub queries</li> <li>• Writing PL/SQL blocks, objects</li> </ul>			
<p><b>Text Books:</b> Ivan Bayross. SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition BPB Publications</p>			
<p><b>Suggested MOOC:</b> Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Syllabus</b>			
1.	<p><b>Introduction to Oracle and SQL:</b> Introduction to Oracle: History, Features, Versions of Oracle, Oracle File Management, Spool command <b>SQL:</b> Defining a database in SQL, Components of SQL: DDL, DML, DCL, DQL, SQL query Rules, Data types, Keywords, Delimiters, Literals. DDL Commands – Defining a database in SQL, Creating table, changing table definition, removing table. DML Commands- Inserting, updating, deleting data. DQL Commands: Select Statement with all options. Renaming table, Describe Command, Distinct Clause, Sorting Data in a Table. Data Constraints: Primary key, Foreign Key, NOT NULL, UNIQUE, CHECK constraint.</p>		
2.	<p><b>Operators:</b> Arithmetic, Logical, Relational, Range Searching, Pattern Matching, IN &amp; NOT IN Predicate, all, % any, exists, not exists clauses, Set Operations: Union, Union All, Minus, Intersect.</p>		
3.	<p><b>Joins and Oracle Functions:</b> Join Concept. Simple join, equi join, non equi join, Self join, Outer join, Sub queries, Aggregate Functions, Numeric Functions, String Functions, Conversion</p>		

	functions, Date conversion functions, and Date functions.
<b>4.</b>	<p><b>Database Objects:</b></p> <p><b>Index:</b> Creating index, simple index, composite index, unique index, dropping indexes, multiple indexes on table</p> <p><b>Sequence:</b> Creating sequence, altering sequence, dropping sequence.</p> <p><b>Views:</b> Concept, creation, usage</p> <p><b>Objects:</b> declaring and initializing objects in SQL, Manipulating object in PL/SQL</p>
<b>5.</b>	<p><b>Introduction to PL/SQL programming:</b></p> <p>Introduction, Advantages, PL/SQL Block, PL/SQL Execution Environment, PL/SQL Character set, Literals, Data types, Variables, Constants, Displaying User Message on screen, Conditional Control in PL/SQL, Iterative Control Structure: While Loop, For Loop, Goto Statement</p>
<b>6.</b>	<p><b>Advanced Programming Techniques of PL/SQL:</b></p> <p><b>Cursors:</b></p> <p>Introduction, Types of Cursors: Implicit Cursor, Explicit Cursors, Parameterized cursors, Programs on cursors</p> <p><b>Triggers:</b></p> <p>Introduction, Use of triggers, Types of Triggers, Creating triggers, Examples on Triggers</p> <p><b>Stored Procedures / Functions:</b></p> <p>Introduction, How oracle executes procedures/ functions, Advantages, How to create Procedures &amp; Functions, Examples</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
304	Statistics	3L-1T-0P=4C	2018
<b>Course Objective:</b>			
The main objective is to introduce basic concepts of statistics to the students and make them competent in collecting and analyzing the data by using statistical techniques			
<b>Expected Outcome :</b> At the end of this course, student is expected to			
<ul style="list-style-type: none"> <li>• Tabulate the raw data by using frequency distribution and represent the data graphically.</li> <li>• Analyse the data by using measures of central tendency and dispersion</li> <li>• Estimate the value of dependent variable</li> <li>• Generate the relationship between two variables in the form of degree or equation</li> </ul>			
<b>Prerequisite:</b>			
Students should have basic knowledge of use of calculator and research attitude			
<b>References:</b>			
1) Fundamentals of Statistics , S.C. Gupta , Himalaya Publishing House (5th Edition)			
2) Business Statistics , S.P. Gupta, M.P. Gupta –Sultan Chand & Sons, New Delhi (16 <sup>th</sup> Edition)			
<b>Suggested MOOC:</b>			
Please refer these websites for MOOCS:			
NPTEL / Swayam			
www.edx.com			
<a href="http://www.coursera.com">www.coursera.com</a>			
<b>Course Plan</b>			
Unit	Contents		
<b>1</b>	<b>Introduction to Statistics:</b> Definition of Statistics, Importance of Statistics, Scope of statistics : Economics, Computer Science, Business and Management, limitations of Statistics .		
<b>2</b>	<b>Data Collection and representation:</b> Primary and Secondary data, Sources of Data collection, Tabular Representation of data: Ungrouped and grouped frequency distribution, Graphical representation of data: Simple bar, subdivided bar, percentage bar diagram, pie diagram, histogram, frequency polygon, ogive curves.		
<b>3</b>	<b>Measures of central tendency:</b> a) <b>Mean:</b> Definition, problems on mean for listed data items, discrete distribution and continuous distribution, merits and demerits b) <b>Median:</b> Definition, problems on median for listed data items, discrete distribution and continuous distribution, merits and demerits c) <b>Mode:</b> Definition, problems on mode for listed data items, discrete distribution and continuous distribution, merits and demerits.		
<b>4</b>	<b>Measures of Dispersion:</b> <b>a)Range:</b> Definition, problems on range for listed data items, discrete distribution and continuous distribution, merits and demerits of range <b>b)Mean Deviation:</b> Definition, problems on mean deviation about mean for listed data items, discrete distribution and continuous distribution, merits and demerits		

	<p><b>c) Standard Deviation:</b> Definition, problems on standard deviation for listed data items, discrete distribution and continuous distribution, merits and demerits.</p> <p><b>d) Deciles, percentiles, quartiles</b></p>
<b>5</b>	<p><b>Regression and Correlation:</b></p> <p>a) <b>Regression:</b> Definition, regression equations, regression coefficients, problems on finding regression equations and estimations</p> <p>b) <b>Correlation:</b> Definition, Karl Pearson's correlation coefficient, Spearman's Rank correlation with correction factor</p>
<b>6</b>	<p><b>Time series analysis:</b></p> <p>Components of Time series Analysis , Fitting a straight line <math>y=ax+b</math>, fitting a curve <math>y=ax^2+bx+c</math>, 3 yearly and 5 yearly moving averages</p>

Course Number	Course Name	L-T-P-Credits	Year of Introduction
305	Multimedia Technology	3L-1T-0P=4C	2018
<b>Course Objective:</b>			
The main objective of this course is to know the concept of multimedia by students. To know different software tools used in multimedia technology. To know multimedia computing.			
<b>Expected Outcome:</b> After learning this course, student will be able			
<ul style="list-style-type: none"> <li>▪ To understand about various interactive multimedia devices, the basic concept about images and image formats.</li> <li>▪ To understand different software tools used in multimedia.</li> </ul>			
<b>Reference Books:</b>			
<ul style="list-style-type: none"> <li>• Principles of Multimedia – Ranjan Parekh, Publisher: Tata McGraw Hills</li> <li>• Multimedia: Making It Work (8th Edition) – by Tay Vaughan, Publisher: Tata McGraw Hills.</li> <li>• Multimedia Communications: Applications, Networks, Protocols and Standards - Fred Halsall, Publisher: Pearson Education.</li> </ul>			
<b>Suggested MOOC:</b>			
<ol style="list-style-type: none"> <li>1) <a href="http://www.openlearning.com">www.openlearning.com</a></li> <li>2) <a href="http://www.mooc-list.com">www.mooc-list.com</a></li> <li>3) <a href="http://www.coursera.org">www.coursera.org</a></li> </ol>			
<b>Course Plan</b>			
Unit	Contents		
1	What is multimedia? History of Multimedia, Steps for Creating multimedia presentation, Delivering multimedia, Where to Use multimedia? (Business, Schools, Home, and Public Places), Multimedia authoring tools, types of multimedia authoring tools, features of multimedia authoring tools.		
2	Storage technology, Magnetic media (Hard disk, RAID), Optical Media (CD Storage, CD standards), DVD (Size and capacity of DVD, DVD video, DVD audio).		
3	Using text in multimedia, text types, designing with text, Hypertext and Hypermedia, Characteristics of Hypertext and Hypermedia. Using image in multimedia, image color models, Dithering, Image file formats, Macintosh formats, Windows formats, Cross-platform formats.		
4	What is sound? Characteristics of Sound, Digital Audio, MIDI audio, MIDI Vs Digital audio, Audio file formats, Copyright issues. Principles of animation, Animation techniques, Animation file formats, Making animation (A Rolling Ball, A Bouncing Ball), Creating animated scene.		
5	Working of video, Video signal formats (Component Video, Composite Video and S-Video), Digital Video, Digital Video Standards (EDTV, CCIR Recommendations), HD Video and HDTV.		

6	Multimedia communications, Multimedia information representation, Multimedia networks, Multimedia applications, Media types, Communication modes, network types, Multipoint conferencing, Network QOS.
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Course Number	Course Name	L – T – P Credits	Year of Introduction
306	Lab on Oracle and Multimedia	0L-0T-4P=2C	2018

**Course Objectives:**

The main objective is to teach the concepts related to SQL (Structured Query Language) and multimedia. The different SQL commands to be introduced. It helps to the students in writing SQL queries and its implementations. It basically helps to design and develop database structure. This is foundational course for building up database and processing through different queries.

**Expected Outcome:**

At the end of this course, the student should be able to:

- Creating tables, and queries using SQL
- Applying SQL Operators and SQL Functions in the created tables in SQL;
- Writing and solving complex queries based on joins, sub queries
- Writing PL/SQL blocks, objects
- Creating multimedia file
- Understanding the use of multimedia in web sites

**Text Books:**

Ivan Bayross. SQL, PL/SQL The Programming Language of Oracle 3rd Revised Edition BPB Publications

**Suggested MOOC:**

In house on [www.bharatividyaapeeth.edu](http://www.bharatividyaapeeth.edu)

**Part A: Lab on Oracle**

Q. No.	Question																																								
1	<p>Create following tables in your user with specified constraints.</p> <p><u>Client Master</u></p> <table border="1"> <thead> <tr> <th>Column Name</th> <th>Data Type</th> <th>Size</th> <th>Constraints</th> </tr> </thead> <tbody> <tr> <td>ClientNo</td> <td>VARCHAR2</td> <td>6</td> <td>PRIMARY KEY, First Letter must start with 'C'</td> </tr> <tr> <td>Name</td> <td>VARCHAR2</td> <td>20</td> <td>NOT NULL</td> </tr> <tr> <td>Address</td> <td>VARCHAR2</td> <td>30</td> <td></td> </tr> <tr> <td>City</td> <td>VARCHAR2</td> <td>15</td> <td></td> </tr> <tr> <td>State</td> <td>VARCHAR2</td> <td>15</td> <td></td> </tr> <tr> <td>PinCode</td> <td>NUMBER</td> <td>6</td> <td></td> </tr> <tr> <td>Bal_Due</td> <td>NUMBER</td> <td>10,2</td> <td></td> </tr> </tbody> </table> <p><u>Product Master</u></p> <table border="1"> <thead> <tr> <th>Column Name</th> <th>Data Type</th> <th>Size</th> <th>Constraints</th> </tr> </thead> <tbody> <tr> <td>ProductNo</td> <td>VARCHAR2</td> <td>6</td> <td>PRIMARY KEY, First Letter must start with 'P'</td> </tr> </tbody> </table>	Column Name	Data Type	Size	Constraints	ClientNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'C'	Name	VARCHAR2	20	NOT NULL	Address	VARCHAR2	30		City	VARCHAR2	15		State	VARCHAR2	15		PinCode	NUMBER	6		Bal_Due	NUMBER	10,2		Column Name	Data Type	Size	Constraints	ProductNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'P'
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ProductNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'P'																																						

Description	VARCHAR2	20	NOT NULL
ProfitPercent	NUMBER	2,2	NOT NULL
UnitMeasure	VARCHAR2	10	NOT NULL
QtyOnHand	NUMBER	8	NOT NULL
ReOrderLevel	NUMBER	8	NOT NULL
SellPrice	NUMBER	8,2	NOT NULL, Cannot be 0
CostPrice	NUMBER	8,2	NOT NULL, Cannot be 0

SalesMan Master

Column Name	Data Type	Size	Constraints
SalesManNo	VARCHAR2	6	PRIMARY KEY, First Letter must start with 'S'
Name	VARCHAR2	20	NOT NULL
Address	VARCHAR2	30	
City	VARCHAR2	20	
State	VARCHAR2	20	
SalsAmt	NUMBER	8,2	NOT NULL Cannot be 0
Target	NUMBER	6,2	NOT NULL, Cannot be 0
YtdSales	NUMBER	6,2	NOT NULL, Cannot be 0

2

**Insert following records into a related table.**

Data for Client\_Master

ClientNo	Name	City	PinCode	State	Bal_Due
C00001	Ivan Bayross	Bombay	400054	Maharashtra	15000
C00002	Vandan Saitwal	Madras	780001	Tamil Nadu	0
C00003	Pramada Jaguste	Bombay	400057	Maharashtra	5000
C00004	Basu Navindagi	Bombay	400056	Maharashtra	0
C00005	Ravi Sreedharan	Delhi	100001	Delhi	2000
C00006	Rukmini	Bombay	400050	Maharashtra	0

Data for Product\_Master

ProductNo	Description	ProfitPercent	UOM	QtyOnHand	ReOrderLevel	SellPrice	CostPrice
P00001	1.44 Floppies	5	Piece	100	20	525	500
P03453	Monitors	6	Piece	10	3	12000	11280
P06734	Mouse	5	Piece	20	5	1050	1000
P07865	1.22 Floppies	5	Piece	100	20	525	500
P07868	Keyboards	2	Piece	10	3	3150	3050
P07885	CD Drive	2.5	Piece	10	3	5250	5100
P07965	540 HDD	4	Piece	10	3	8400	8000
P07975	1.44 Drive	5	Piece	10	3	1050	1000
P08865	1.22 Drive	5	Piece	2	3	1050	1000

	Data for Salesman_Master																																																																												
	<table border="1"> <thead> <tr> <th>SalesMan No</th> <th>Name</th> <th>Address</th> <th>City</th> <th>PinCode</th> <th>SalAmt</th> <th>Target</th> <th>YtdSales</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>S00001</td> <td>Kiran</td> <td>A/14, Warli</td> <td>Bombay</td> <td>400002</td> <td>3000</td> <td>100</td> <td>50</td> <td>Good</td> </tr> <tr> <td>S00002</td> <td>Manish</td> <td>65, Nariman</td> <td>Bombay</td> <td>400001</td> <td>3000</td> <td>200</td> <td>100</td> <td>Good</td> </tr> <tr> <td>S00003</td> <td>Ravi</td> <td>P-7, Bandra</td> <td>Bombay</td> <td>400032</td> <td>3000</td> <td>200</td> <td>100</td> <td>Good</td> </tr> <tr> <td>S00004</td> <td>Ashish</td> <td>A/5, Juhu</td> <td>Bombay</td> <td>400044</td> <td>3500</td> <td>200</td> <td>150</td> <td>Good</td> </tr> </tbody> </table>	SalesMan No	Name	Address	City	PinCode	SalAmt	Target	YtdSales	Remarks	S00001	Kiran	A/14, Warli	Bombay	400002	3000	100	50	Good	S00002	Manish	65, Nariman	Bombay	400001	3000	200	100	Good	S00003	Ravi	P-7, Bandra	Bombay	400032	3000	200	100	Good	S00004	Ashish	A/5, Juhu	Bombay	400044	3500	200	150	Good																															
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3	Describe all tables. Retrieve all records.																																																																												
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ChallanDate	DATE		
BilledYN	CAHR	1	Values IN('Y','N'), Default 'N'

Challan Details

Column Name	Data Type	Size	Constraints
ChallanNo	VARCHAR 2	6	PRIMARY KEY, FOREIGN KEY referencing Challan_Header
ProductNo	VARCHAR 2	6	FOREIGN KEY referencing Product_Master
QtyDispatched	NUMBER	4,2	NOT NULL

5

**Insert following records into a related table.**

Data for Sales\_Order

SalesOrder No	SalesOrder Date	ClientNo	DelyTy pe	BilledY N	SalesMan No	DelyDate	Orde rStat us
O19001	12-Jan-96	C00001	F	N	S00001	20-Jan-96	IP
O19002	25-Jan	C00002	P	N	S00002	27-Jan-96	C
O46865	18-Feb-96	C00003	F	Y	S00003	20-Feb-96	F
O19003	3-Apr-96	C00001	F	Y	S00001	7-Apr-96	F
O46866	20-May-96	C00004	P	N	S00002	22-May-96	C
O10008	24-May-96	C00005	F	N	S00004	26-May-96	IP

Data for Sales\_Order\_Details

SalesOrderNo	ProductNo	QtyOrdered	QtyDispatched	ProductRate
O19001	P00001	4	4	525
O19001	P07965	2	1	8400
O19001	P07885	2	1	5250
O19002	P00001	10	0	525
O46865	P07868	3	3	3150
O46865	P07885	3	1	5250
O46865	P00001	10	10	525
O46865	P03453	4	4	1050
O19003	P03453	2	2	1050
O19003	P06734	1	1	12000
O46866	P07965	1	0	8400
O46866	P07975	1	0	1050
O10008	P00001	10	5	525
O10008	P07975	5	3	1050

Data for Challan\_Header

ChallanNo	SalesOrderNo	ChallanDate	BilledYN
CH9001	O19001	12-Dec-95	Y

	<table border="1"> <tr> <td>CH6865</td> <td>O46865</td> <td>12-Nov-95</td> <td>Y</td> </tr> <tr> <td>CH3965</td> <td>O10008</td> <td>12-Oct-95</td> <td>Y</td> </tr> </table> <p>Data for Challan_Details</p> <table border="1"> <thead> <tr> <th>ChallanNo</th> <th>ProductNo</th> <th>QtyDispatched</th> </tr> </thead> <tbody> <tr> <td>CH9001</td> <td>P00001</td> <td>4</td> </tr> <tr> <td>CH9001</td> <td>P07965</td> <td>1</td> </tr> <tr> <td>CH9001</td> <td>P07885</td> <td>1</td> </tr> <tr> <td>CH6865</td> <td>P07868</td> <td>3</td> </tr> <tr> <td>CH6865</td> <td>P03453</td> <td>4</td> </tr> <tr> <td>CH6865</td> <td>P00001</td> <td>10</td> </tr> <tr> <td>CH3965</td> <td>P00001</td> <td>5</td> </tr> <tr> <td>CH3965</td> <td>P07975</td> <td>2</td> </tr> </tbody> </table>	CH6865	O46865	12-Nov-95	Y	CH3965	O10008	12-Oct-95	Y	ChallanNo	ProductNo	QtyDispatched	CH9001	P00001	4	CH9001	P07965	1	CH9001	P07885	1	CH6865	P07868	3	CH6865	P03453	4	CH6865	P00001	10	CH3965	P00001	5	CH3965	P07975	2
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6	<p><b>Describe all tables.</b></p> <p><b>Retrieve all records.</b></p>																																			
7	<p>Based on above created tables Write down following queries.  <u>Selection, Renaming, Logical Operators and Pattern Matching</u></p> <ol style="list-style-type: none"> <li>Select ProductNo, Description and compute <math>Sell\_Price * 0.05</math> and <math>Sell\_Price * 1.05</math> for each row retrieved. Rename the columns Increase and New Price respectively.</li> <li>Select client information like client no, name, address, city for all clients in 'BOMBAY' or 'DELHI'.</li> <li>Select ProductNo, Description, and Profit Percent where Profit Percent is between 10 and 30 both inclusive.</li> <li>Select supplier name where the second letter of name is 'r' or 'h'.</li> <li>Select supplier name, city where name is 3-character long and the first two characters are 'ja'.</li> </ol>																																			
8	<p>Based on above created tables Write down following queries.  <u>Grouping</u></p> <ol style="list-style-type: none"> <li>Select Product No with description and total qty_ordered for each product.</li> <li>Select Product No and description for which total qty_ordered of the products 'P00001', 'P03453'.</li> </ol>																																			
9	<p>Based on above created tables Write down following queries.  <u>Manipulating Date</u></p> <p>Display the information like SalesOrderNo, ClientNo, SalesOrderDate for all the orders placed by the client in the ascending order of date. The SalesOrderDate should be displayed in 'DD/MM/YY' format.</p>																																			
10	<p>Based on above created tables Write down following queries.  <u>Joins</u></p> <ol style="list-style-type: none"> <li>Display the information like SalesOrderNo, ClientName, SalesOrderDate for all the orders placed by the client in the ascending order of date. The SalesOrderDate should be displayed in 'DD/MM/YY' format.</li> <li>Select ProductNo, Description and total qty_ordered for each product.</li> </ol>																																			
11.	<p>Based on above created tables Write down following queries.</p>																																			

	Print the information of the client_Master, product_master, sales_order table in the following format fro all records: {Description} worth Rs. {total sales for the product} was ordered in the month of {s_order_date}																												
12.	Based on above created tables Write down following queries. Find the list of clients who stay in city 'Bombay' or city 'Madras' or city 'Delhi'.																												
13.	Based on above created tables Write down following queries. <u>Using UNION, INTERSECT and MINUS Clause</u> a) Select all clients and the salesman in the city of 'Bombay'. b) Select salesman name in 'Bombay' who has at least one client located at 'Bombay'. c) Select all the productno of non-moving items in the product_master table. d) Select the productno, description, qty_on_hand, cost_price of non-moving items in the product_master table.																												
14.	Based on above created tables Write down following queries. a) Retrieve the list of names and the cities of all the clients. b) List the various products available from the product_master table. c) Find the names of the clients having 'a' as the second letter in their names. d) Find the list of clients who stay in city 'Bombay' or city 'Madras' or city 'Delhi'. e) Print the list of clients whose bal_due greater than values 10000. f) Display the Order Information for Clients 'C00002' and 'C00001'. g) Find the products whose selling price is more than 1500 and also find the new selling price as original selling price * 15.  h) List the products in sorted order of their description. i) Calculate the average price of all the products. j) Determine the maximum and minimum products prices. Rename the titles as 'Max-Price' and 'Min-Price' respectively. k) Count the number of products having price greater than or equal to 1500. l) Find all the products whose Qty_On_Hand is less than Re_Order_Level. m) Change the Sales_Order_Date of Client_No 'C00001' to 24/07/96. n) Change the cost price of '1.22 Floppy Drive' to Rs. 950.00. o) Delete all records having delivery date before 10 <sup>th</sup> July' 96																												
15.	<b>Exercise following functions using DUAL Table.</b> <ul style="list-style-type: none"> <li>• <u>Number Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. ABS ()</td> <td>2. MOD (m, n)</td> <td>3. POWER (m, n)</td> <td>4. ROUND (n, m)</td> </tr> <tr> <td>5. SIGN (n)</td> <td>6. SQRT (n)</td> <td>7. TRUNC (n, m)</td> <td>8. GREATEST ()</td> </tr> <tr> <td>9. LEAST ()</td> <td></td> <td></td> <td></td> </tr> </table> </li> <li>• <u>Aggregate Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. AVG ()</td> <td>2. MIN ()</td> <td>3. COUNT (*)</td> <td>4. COUNT (expr)</td> </tr> <tr> <td>5. MAX ()</td> <td>6. SUM ()</td> <td></td> <td></td> </tr> </table> </li> <li>• <u>Character Functions</u> <table style="width: 100%; border: none;"> <tr> <td>1. ASCII ()</td> <td>2. CHR ()</td> <td>3. INITCAP ()</td> <td>4. INSTR ()</td> </tr> <tr> <td>5. LENGTH ()</td> <td>6. LOSER ()</td> <td>7. UPPER ()</td> <td>8.LTRIM ()</td> </tr> </table> </li> </ul>	1. ABS ()	2. MOD (m, n)	3. POWER (m, n)	4. ROUND (n, m)	5. SIGN (n)	6. SQRT (n)	7. TRUNC (n, m)	8. GREATEST ()	9. LEAST ()				1. AVG ()	2. MIN ()	3. COUNT (*)	4. COUNT (expr)	5. MAX ()	6. SUM ()			1. ASCII ()	2. CHR ()	3. INITCAP ()	4. INSTR ()	5. LENGTH ()	6. LOSER ()	7. UPPER ()	8.LTRIM ()
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	<p>9. RTRIM ()                      10. LPAD ()                      11. RPAD ()                      12. SOUNDEX ()</p> <ul style="list-style-type: none"> <li>• <u>Date Functions</u> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">1. ADD_MONTHS ()</td> <td style="width: 50%;">4. LAST_DATE ()</td> </tr> <tr> <td>2. MONTHS_BETWEEN ()</td> <td>5. NEXT_DATE ()</td> </tr> <tr> <td>3. TRUNC ()</td> <td>6. SYSDATE ()</td> </tr> </table> </li> </ul>	1. ADD_MONTHS ()	4. LAST_DATE ()	2. MONTHS_BETWEEN ()	5. NEXT_DATE ()	3. TRUNC ()	6. SYSDATE ()
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16.	<p><b>Granting and Revoking Privileges to/from user</b></p> <ol style="list-style-type: none"> <li>a) Grant all privileges on the table product_master to the user Pradeep.</li> <li>b) Grant SELECT and UPDATE privilege on table client_master to Neeta.</li> <li>c) Grant all privileges on the table client_master to the user Ivan with grant option.</li> <li>d) Select all records from product_master table belonging to Sunita.</li> <li>e) Revoke DELETE privilege on supplier_master from Florian.</li> <li>f) Revoke the remaining privileges on supplier_master that were granted to Florian.</li> </ol>						
17.	<p><b>Writing PL/SQL Block</b></p> <ol style="list-style-type: none"> <li>a) Write a PL/SQL Block to generate any n odd and even numbers.</li> <li>b) List the contents of product_master.</li> <li>c) Write a PL/SQL Block that inverse the string or number. [if given number is 8973 then its inverse is 3798]. If the price of the product 'P00001' is &lt; 4000 then change the price to 4000. The price change is recorded in the old_price table along with product_no and the date on which price was changed last.</li> <li>d) Write a PL/SQL block that processes an order for "540 HDD". [Check the availability of the product, if yes update its value.]</li> </ol>						
18.	<p><b>Writing CURSORS</b></p> <ol style="list-style-type: none"> <li>1. Write a PL/SQL block that updates the acctmast table and sets the balance depending upon the account is debited or credited. The updation should be done only for those values that are not processed i.e. the processed flag is 'N' in the accttrans table. acctmast (acctno*, name, balance) accttrans (acctno, trndate, debt_crdt, amount, processed)</li> <li>2. The HRD manager has decided to raise the salary of employees by 0.15. Write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in the employee table.</li> <li>3. The HRD manager has decided to raise the salary of employees working as "Programmers" by 0.25. Write a PL/SQL block to accept the employee number and update the salary of that employee. Display appropriate message based on the existence of the record in the employee table.</li> <li>4. Create following 2 tables item-mast (item-id*, description, bal-stock) item-trans (item-id, description, operation, qty, status) -&gt; the operations are for UPDATE – U, for INSERT –I, for DELETE –D Based on the value in the operation column of table item-trans the records for table item-mast is inserted, updated or deleted. On the basis of success/failure of insert, update and delete operation the status column in the table item-trans is updated with appropriate text indicating success or reason for failure.</li> </ol>						

	<p>Following are the 3-cases which are to be taken care of:</p> <ul style="list-style-type: none"> <li>• if operation = 'I' then the item-id against along with description and qty is inserted into the required columns of the table item-mast. If the insert is successful then the status field of item-trans table is updated to 'SUCCESSFUL' else 'ITEM ALREADY EXIST'.</li> <li>• if operation = 'D' then row from item-mast is deleted whose item-id is equal to the item-id in the table item-trans with the operation column having the value 'D'. If delete is successful then the status column of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'.</li> <li>• if operation = 'U' then the qty against this operation column is added to bal-stock column of the table item-mast where item-id of table item-mast is same as that of item-trans. if update is successful then the status of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'.</li> </ul> <p>Write a parameterized CURSOR that defines all the above cases.</p>
19.	<p><b>Writing TRIGGERS</b></p> <ol style="list-style-type: none"> <li>1. Create a transparent audit system for a table client-master. The system must keep track of the records that are being deleted or modified and when they have been deleted or modified.  client-master (client-no, name, city, state, pin, bal-due)  audit-client (client-no, name, bal, operation, o-date) <ul style="list-style-type: none"> <li>• operation: the operation performed on the client-master table</li> <li>• o-date: the date when the operation was performed.</li> </ul> </li> <li>2. Write a database triggers that checks that the qty-on-hand does not become negative.</li> </ol>
20	<p><b>Writing PROCEDURES</b></p> <p>Create following 2 tables  item-mast (item-id*, description, bal-stock)  item-trans (item-id, description, operation, qty, status)  -&gt; the operations are for UPDATE – U, for INSERT –I, for DELETE –D</p> <p>Base on the value in the operation column of table item-trans the records for table item-mast is inserted, updated or deleted. On the basis of success/failure of insert, update and delete operation the status column in the table item-trans is updated with appropriate text indicating success or reason for failure.</p> <p>Following are the 3-cases which are to be taken care of:</p> <ol style="list-style-type: none"> <li>i. if operation = 'I' then the item-id against along with description and qty is inserted into the required columns of the table item-mast. If the insert is successful then the status field of item-trans table is updated to 'SUCCESSFUL' else 'ITEM ALREADY EXIST'.</li> <li>ii. if operation = 'D' then row from item-mast is deleted whose item-id is equal to the item-id in the table item-trans with the operation column having the value 'D'. If delete is successful then the status column of item-trans table is updated to 'SUCCESSFUL' else 'ITEM DOES NOT EXIST'.</li> <li>iii. if operation = 'U' then the qty against this operation column is added to bal-stock column of the table item-mast where item-id of table item-mast is same as that of item-trans. if update is successful then the status of item-</li> </ol>



	<p>trans table is updated to ‘SUCCESSFUL’ else ‘ITEM DOES NOT EXIST’.</p> <p>Write a database procedure which will check for the existence of item-id in the table item-mast. The procedure must have one argument which receives a value for which a matching pattern for item-id in the table item-mast and another which will return value indicating whether a match has been found or not. The value returned by the procedure can be used to make a decision to perform further processing or not.</p>
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### Part B: Lab on Multimedia

Q.No.	Question
1	<p>Create a new document in a word processing application. Next, type in a line of text and copy the line five times. Now change each line into a different font. Recopy the entire set of lines three times. Finally, change the size of the first set to 10-point text, the second set to 18-point text, and the third set to 36-point text.</p> <p>a) Which of the smallest lines of text is most readable? b) Which line of text stands out the most?</p>
2	<p>Download three different images from a web site. One should be photographic, one should be a graphic (solid colors or gradients), and one should be a mix. Convert the images to 256 colors. Use the tools available to use different dithering patterns and palettes. Print out the files before and after reducing to 256 colors. Write the file sizes on each one.</p>
3	<p>Visit different web sites. Describe the use of colors for each in subjective terms. Is each site vibrant? childish? muted? subtle? Why? What cultural or other factors determined the color selection? Print out a page from each site, and write a paragraph describing the colors and images used in each one.</p>
4	<p>Open an image in an image-editing program capable of identifying colors. Select three different pixels in the image. Sample the color and write down its value in RGB, HSB, CMYK, and web (hexadecimal) color.</p>
5	<p>Visit three web sites that use sound (you may need to find Flash-based web sites). Where, when, and how is sound used? Does the sound fit the mood of the site? Is there background sound? Can the sounds be turned on and off? Document your findings.</p>
6	<p>Locate three web sites that offer “royalty-free” or “buyout” music. Such sites almost always allow visitors to listen to low-quality samples. What formats are the samples provided in? Listen to some of the samples. Try to identify which are synthesized and which are actual instruments playing the music. What are the license arrangements for using the music? Document your findings, noting the various lengths and formats the music is provided in.</p>
7	<p>Use a search engine to search on the words “animation” and “definition.” Create a document that provides many different definitions of the term animation. Describe the differences among definitions. Which elements make the most difference among them—type of motion, process used for creation, method of playback, or something else? What do all (or, at least, most) of the definitions have in common?</p>
8	<p>Conceptualize a brief animated sequence. Include a number of moving elements that move into and out of the frame. Consider where the key frames should be. How do the elements move? Do they get bigger or smaller? Do they rotate? Do they “deform” (change shape)?</p>

	Create a storyboard with sketches showing at least ten of the key frames.
9	Locate three web sites that include video clips. What format are they served in? Examine the HTML source code to discover what method of video delivery is used. Make a note of your findings.
10	Prepare five graphic images using paint or drawing program. Be sure to include a variety of colors and contrasts. Add text to the images. Use small text, large text, text with serifs, bold text, and text in contrasting and similar colors. Add drop shadows. Add boxes and other shapes to the images, in various weights.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
307	Lab on Linux Operating System	0L-0T-4P=2C	2018
<b>Course Objective:</b> The student would be able <ul style="list-style-type: none"> <li>To obtain knowledge of how to manage files in Linux system.</li> <li>To understand Linux commands and write shell programming.</li> <li>To grasp the concepts of User Management in Linux.</li> <li>To control the system running Ubuntu operating system.</li> </ul>			
<b>Expected Outcome :</b> The course is to provide the knowledge of the Linux Operating System. This course intends to teach various features that will help the students to use and learn the working of Ubuntu /Red Hat operating system			
<b>Prerequisite:</b> Students should have basic knowledge of working on an operating system. <ul style="list-style-type: none"> <li>Linux for beginners : An introduction to the linux operating system and command line</li> <li>Linux: the complete reference, sixth edition paperback by Richard Petersen, McGraw Hill education</li> <li>Unix shell Programming: by yashwant Kanitkar</li> <li>UNIX Concepts and Applications - by Sumitabha Das</li> </ul>			
<b>Course Plan</b>			
Unit	Contents		
1	Introduction to Linux Operating system, various flavors of Linux O.S., Learning to use and Install Linux, Booting Any one flavor of Linux like ubuntu, red hat etc, Starting up ,Logging in, Exploring the desktop ,Working with virtual desktops, Getting Everything up and running ,Viewing your hardware , Getting online Using an Ethernet Card ,Joining wireless network ,Configuring Email and instant messaging, Adding a Printer , Configuring a local printer, Configuring a network printer, Setting up digital imaging devices, Transferring photos from digital camera, Configuring scanner, Configuring Bluetooth.		
2	<b>General Purpose Utilities:</b> banner (display a blown-up message), cal (The calendar), date-display the system date, who-Login detail tty-knowing your terminal uname-know your machine name passwd-change your password lock-lock your terminal echo-display message bc-the calculator. who am i,- display login name		
3	<b>Navigating the file system:-</b> pwd-checking your current directory, cd-changing directories, mkdir-Making directories		

	<p>rmdir-moving directories  ls-listing files  <b>Handling Ordinary files:</b>  cat-displaying and creating files,  touch-creating empty file  cp-copying a file  rm-deleting files  mv-renaming files  more-paging output  lp-printing a fiile  file-know the file type  wc-line, word and character counting  split-splitting file in to multiple files  cmp-comparing two files  comm.-finding common  chmod-changing file permission  files searches using find command,  locate command, mount and unmount command. Understanding vi modes, Using vi to edit the file, Creating a new text file using vi, Searching through files.</p>
4	<p><b>Filters:</b>  pr- paginating files  head-displaying the beginning of a file,  tail- displaying the end of file  cut- slitting a file vertically  paste- pasting file  sort- ordering file  uniq- locating repeated line  nl- line numbering  tr-translating characters.  regular expressions and grep to find text  ps-process status  kill-terminate process  Other process related commands</p>
5	<p>sh command, pattern matching- the wild cards, escaping-the backslash(\), quoting, redirection, pipes, tees</p>
6	<p>What is Shell, Different types of shells, Shell as command processor, shell variables, creating command substitution, various shell scripts using functions, conditionals, loops, customizing environment</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	Community Work III	2L-0T-0P=2C	2018
<p><b>Course Objective:</b>  This course aims to expose the students to the societal issues and help them participate in the community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, nonprofit organization etc.</p> <ul style="list-style-type: none"> <li>To expose the students towards social reality and role of community development for social upliftment and well being</li> <li>To involve students in community work through active involvement and participation</li> </ul>			
<p><b>Expected Outcome :</b>  Students will be able to know the community needs and understand their role towards community development.</p>			
<p><b>Reference Books :</b></p> <ul style="list-style-type: none"> <li>An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014</li> <li>Community Development in Asia and The Pacific, Manohar S. Pawar, 2009</li> </ul>			
<p><b>Online Resources:</b>  <a href="https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf">https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf</a>  <a href="https://www.ahaprocess.com/solutions/community/events-resources/free-resources/">https://www.ahaprocess.com/solutions/community/events-resources/free-resources/</a></p>			
<p><b>Community Hours:</b>  Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken.</p>			
<p><b>MOOCs:</b>  <a href="https://alison.com/course/diploma-in-community-development">https://alison.com/course/diploma-in-community-development</a></p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Community work through Education:</b>  Teaching at Schools, Teaching at Orphanages, Teaching to poor children ,study the role of government in the education sector ,study the NGOs particularly working in education sector.</p>		
2	<p><b>Community Work for Slums:</b>  Learn the government facilities, NGOs which are working for the slums and try to connect any NGO.</p>		
3	<p><b>Community Work for Environment:</b>  Role of Govt. and NGOs which are working to save the environment, Initiatives like Clean your city drive, Cycle day, Awareness of Dry and wet waste classification, Tree Plantation Drive, Environment awareness activities etc.</p>		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	<b>Start-Up Management</b>	2L-0T-0P=2C	2018
<b>Course Objective:</b> The objectives of the course is <ul style="list-style-type: none"> <li>To Introduce to the students the idea of start ups and their role in the society and nation</li> <li>To impart knowledge about the organization and management of start ups</li> </ul>			
<b>Expected Outcome :</b> Students will be able to understand the role of start ups and case studies of well known start ups in India.			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>Khanka S. S. – Entrepreneurship Development, S. Chand.</li> <li>Burns, P. (2001). Entrepreneurship and small business. New Jersey:Palgrave.</li> <li>Mullins, J. (2004). New business road test. New Delhi: Prentice Hall.</li> </ul>			
<b>Online Resources:</b> <a href="https://www.entrepreneur.com/">https://www.entrepreneur.com/</a> <a href="https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business">https://www.shopkeep.com/blog/the-7-best-free-resources-for-planning-your-new-business</a>			
<b>MOOCs:</b> <a href="https://startupindia.upgrad.com/">https://startupindia.upgrad.com/</a> - Startup India Learning Programme Swayam			
<b>Course Plan</b>			
<b>Unit</b>	<b>Contents</b>		
1	Meaning of Start ups, Formation of a start up, idea generation for start ups, scaling up process.		
2	Managing a startup, Customer Development, Market Sizing, Lean Startups, Support by government for startups,		
3	Case Studies on well known startups.		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
308	Agro Tourism	2L-0T-0P=2C	2018
<b>Course Objective:</b> The objectives of the course are to familiarize students with principles and relationship between tourism and agricultural activities.			
<b>Expected Outcome :</b> Students will be able to obtain and diversify knowledge from tourism, rural tourism and their specific form agri-tourism.			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>• Talwar, Prakash. Travel and Tourism Management. Gyan Books Pvt., Ltd., Main Ansari Road, Darya Ganj, New Delhi- 110 002.</li> <li>• Bagri, S. C. Trends in Tourism Promotion 2003. International Books Distributors, 9/3, Rajpur Road, Dehradun-248 001 Uttarakhand (India).</li> </ul>			
<b>Online Resources:</b> <a href="http://www.agritourism.in">http://www.agritourism.in</a> <a href="http://www.ecoindia.com">http://www.ecoindia.com</a>			
<b>MOOCs:</b> <a href="https://www.mooc-list.com/tags/tourism">https://www.mooc-list.com/tags/tourism</a> <a href="https://www.coursera.org/">https://www.coursera.org/</a> <a href="https://swayam.gov.in/">https://swayam.gov.in/</a> <a href="https://alison.com/courses?query=agriculture+tourism">https://alison.com/courses?query=agriculture+tourism</a>			
Course Plan			
Unit	Contents		
1	Introduction, importance, scope, forms of agro-tourism, advantages and implementations, sustainability component, difficulties involved.		
2	Govt. policies and legislations in respect of tourism and agro-tourism and environment protection laws. Requirements for Agro-tourism Farm, forest, garden, fish tank/ponds, residential huts, etc. Introduction to Indian culture through agro tourism.		
3	Profiling the tourist for: age, sex, life cycle, education, employment, income, satisfaction and expectations, values, purpose of visit, accommodation, duration of stay, preferences and perceptions regarding area management, environmental concerns, involvement and responsibility, motivations, etc.		

# **SEMESTER IV**



Course Number	Course Name	L-T-P- Credits	Year of Introduction
401	Computer Networks	3L-1T- 0P = 4C	2018
<p><b>Course Objectives:</b> The key objective is to acquire a foundational understanding of computer network and communication technologies. Networking concepts will be illustrated using TCP/IP networks. To enable the learner with Network Technologies and applications of Network.</p>			
<p><b>Learning Outcomes:</b> At the end of this course, student should be able to</p> <ul style="list-style-type: none"> <li>• Students will acquire a good knowledge of the computer network, its architecture and operation.</li> <li>• Student will be able to pursue his study in advanced networking courses (This knowledge will help them to create base for the Network Electives to be studied in the next semesters).</li> <li>• Students will be able to follow trends of computer networks. So, students will get exposed to advanced network technologies like MANET, WSN, and 4G.</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>• 1.A.S. Tanenbaum, <b>Computer Networks</b> (4<sup>th</sup> ed.), Prentice-Hall of India, Latest Edition</li> <li>• 2.W.Behrouz Forouzan and S.C. Fegan, <b>Data Communication and Networking</b>, McGraw Hill, Latest Edition</li> </ul>			
<p><b>Other Books:</b></p> <ul style="list-style-type: none"> <li>• Network Essential Notes GSW MCSE Study Notes</li> <li>• Internetworking Technology Handbook CISCO System</li> <li>• Introduction to Networking and Data Communications Eugene Blanchard</li> <li>• Computer Networks and Internets with Internet Applications Douglas E. Comer</li> </ul>			
<p><b>Suggested MOOC :</b></p>			
<p><b>Course Plan</b></p>			
Unit	Contents		
1	<p><b>Introduction to Computer Networks:</b> What is Computer Network? Network Goals and Motivations, Application of Networks, Network Topologies, Classification of Networks, <b>Network software:</b> Network Protocols, Protocol Hierarchies, Design issues for the Layers, Connection Oriented and Connectionless Services, Service Primitives, Relation of services to Protocols, <b>Network Models:</b> The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model, A critique of OSI Model, A critique of TCP/IP Model, <b>Examples of some networks:</b> Internet, X.25, ISDN, Frame relay, ATM, Ethernet, Wireless Lans- (wi-fi)</p>		
2	<p><b>Data Transmission and Physical Layer:</b> <b>Signals:</b> Analog and Digital Signals, Data Rate, Transmission Impairment, Signal Measurement: Throughput, Propagation Speed and Time, Wavelength, Frequency, Bandwidth, Spectrum <b>Transmission Media&amp; its Characteristics:</b> Guided and Unguided Media, Synchronous and Asynchronous Transmission, Multiplexing: FDM, WDM, TDM, Switching: Circuit, Message and Packet Switching, <b>Mobile Telephone Systems:</b> 1G, 2G, And 3G</p>		

3	<p><b>Network Layer: Network Layer Design Issues; Routing Algorithms:</b> Static/ Dynamic , Direct/ Indirect, Shortest Path Routing, Flooding, Distance Vector Routing , Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, <b>Congestion Control Algorithms:</b> General Principal of Congestion Control, congestion prevention polices, Load shedding, Jitter Control, <b>IP Addressing:</b> IP- Protocol, IP-Address Classes (A, B, C, D, E), Broadcast address, Multicast address, Network Mask, Subnetting, Internet control Protocol-ICMP, IGMP, Mobile-IP, IPv6</p>
4	<p><b>Transport and Application Support Protocols,:</b> Transport service, Service Primitives, Internet, and Transport Protocols: TCP/UDP, Remote Procedure Calls, RTP, <b>Session Layer:</b> Token Concept <b>Presentation Layer:</b> Data Encryption and Data Security, Message Authentication, <b>Application Layer:</b> Domain Name Service, Telnet, FTP, SMTP, SNMP, MIME, POP, IMAP, WWW,HTTP</p>
5	<p><b>Advance Networks:</b> Concept of 4G Networks, Introduction of 802.16, 802.20, Bluetooth, Infrared, MANET, Sensor Networks. Technical Issues of Advanced Networks, <b>Mobile Ad-hoc Networks:</b> Introductory concepts, Destination-Sequenced Distance Vector protocol, Ad Hoc On-Demand Distance Vector protocol, <b>Wireless Sensor Networks:</b> Sensor networks overview: Introduction, applications, design issues, requirements.</p>
6	<p><b>Internet Basics:</b> Concept and Characteristics of Internet , Intranet, Extranet . Structure of Internet through Client Sever . Domain name , Website Development formats for Business Applications.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
402	Software Testing	3L-1T-0P=4C	2018
<p><b>Course Objective :</b>  The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics.</p>			
<p><b>Expected Outcome :</b>  At the end of this course, student should be able to:</p> <ul style="list-style-type: none"> <li>• Understand basic concepts and terminology of information technology.</li> <li>• Have a basic understanding of personal computers and their operations.</li> <li>• Be able to identify issues related to information security.</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>• Software Testing by Renu Rajani and Pradeep Oak</li> <li>• Software Engineering by Roger S. Pressman</li> <li>• Software Testing Principles And Practices by Srinivasan Desikan and Gopaldaswamy</li> <li>• Ramesh</li> </ul>			
<p><b>Suggested MOOC :</b>  Please refer these websites for MOOCS:  NPTEL / Swayam  www.edx.com  www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction to Software Concepts:</b>  Introduction, Definition and Characteristics of software, Importance of Software, Software types, Software components, Members involved in software development, Overview of SDLC.</p>		
2	<p><b>Introduction to Testing:</b>  What is testing, Why, When and How Testing, Importance of Testing. Testing goals and characteristics, Testing during planning stage, Testing during design stage, Testing during coding stage.</p>		

3	<p><b>Software Testing Lifecycle &amp; Software Testing Process:</b>  Overview of STLC, Principles of Verification and Validation, Techniques of verification (review, inspections, walkthroughs),  V testing model  Software development V &amp; V  Software acquisition V &amp; V  Software supply V &amp; V  <b>Software Testing Process:</b>  Testing process: a) Plan b) Develop c) Execute d) Manage  Conventional Software Architectures.</p>
4	<p><b>Software Testing Strategies:</b>  Test strategies for conventional software</p> <ul style="list-style-type: none"> <li>a) Unit Testing</li> <li>b) Integration Testing <ul style="list-style-type: none"> <li>i) Top-Down Integration</li> <li>ii) Bottom-Up Integration</li> <li>iii) Regression Testing</li> <li>iv) Smoke Testing</li> <li>v) Integration test documents</li> </ul> </li> <li>c) Validation Testing <ul style="list-style-type: none"> <li>a. Test Criteria</li> <li>b. Configuration Review</li> <li>c. Alpha and Beta Testing</li> </ul> </li> <li>a) System Testing <ul style="list-style-type: none"> <li>i) Recovery Testing</li> <li>ii) Security Testing</li> <li>iii) Stress Testing</li> <li>iv) Performance Testing</li> </ul> </li> </ul> <p>Difference between Testing and Debugging,  The Art of Debugging</p> <ul style="list-style-type: none"> <li>a) Debugging Process b) Debugging strategies c) Correcting the Error.</li> </ul>

5	<p><b>Software Testing Techniques:</b></p> <p>Overview of Black-Box and White-Box Testing, Methods of White-box Testing:</p> <ol style="list-style-type: none"> <li>a) Basis Path Testing       <ol style="list-style-type: none"> <li>i) Flow Graph Notation</li> <li>ii) Independent Program Paths</li> <li>iii) Deriving Test Cases</li> <li>iv) Graph Matrices</li> </ol> </li> <li>b) Control Structure Testing       <ol style="list-style-type: none"> <li>i) Conditional Testing</li> <li>ii) Data Flow Testing</li> <li>iii) Loop Testing           <ul style="list-style-type: none"> <li>• Simple Loops</li> <li>• Nested Loops</li> <li>• Concatenated Loop</li> </ul> </li> </ol> </li> </ol> <p>Methods of Black-Box Testing:</p> <ol style="list-style-type: none"> <li>a) Graph Based Testing</li> <li>b) Equivalence Partitioning</li> <li>c) Boundary Value Analysis</li> <li>d) Orthogonal Array Testing</li> </ol> <p>Testing of client/server Architectures, Testing Documentation and Help Facilities, Testing for Real-Time Systems:</p> <ol style="list-style-type: none"> <li>a) Task Testing</li> <li>b) Behavioral Testing</li> <li>c) Intertask Testing</li> <li>d) System Testing</li> </ol> <p>Testing Patterns:</p> <ol style="list-style-type: none"> <li>a) Pair Testing</li> <li>b) Separate Test Interface</li> <li>c) Scenario Testing</li> </ol>
6	<p><b>Risk Management:</b></p> <p>Introduction and Characteristics of Risks, Role of Testing in Risk Management, Types of Risks:</p> <ol style="list-style-type: none"> <li>a) Project Risks</li> <li>b) Technical Risks</li> <li>c) Business Risks</li> <li>d) Predictable Risks</li> <li>e) Unpredictable Risks</li> </ol>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
403	Java Programming	3L-1T-0P=4C	2018
<b>Course Objective :</b> The Objectives of the course is to introduce Object Oriented Programming using Java, Make student to use Java for implementing OO Concepts and also make them familiarize to use JDK and Java API for concurrent programming, input/output, Java data structures and GUI (AWT) programming using java.			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>• Design interfaces, abstract and concrete classes</li> <li>• Use concurrent programming, java Collections and utility classes</li> <li>• Able to achieve object persistence using object serialization.</li> <li>• Design applications using event driven programming.</li> <li>• Get the main features of Java Programming for Business Applications</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>• Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007</li> <li>• Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008</li> <li>• Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOCS: NPTEL / Swayam www. edx.com <a href="http://www.coursera.com">www.coursera.com</a>			
Course Plan			
Unit	Contents		
1	<b>Introduction to Java:</b> Features of Java, Java compiler, JVM, Garbage collection, Data types, concept of class and object, java naming conventions wrapper classes, control structures in java, arrays in java, array of objects.		
2	<b>Class and Object Concepts:</b> Concepts of OOP, Defining a class, creating objects from class, adding attributes and methods to the class, using constructors, Passing values to the functions – pass by value, pass by reference, Function overloading. Modifiers – public, private, protected, default, static, final, Concept of package, Introduction to Exception Handling.		
3	<b>Inheritance and Polymorphism:</b> Concept and importance of inheritance, is-a relationship, types of inheritance, Polymorphism – function overriding, dynamic method dispatch. Using abstract and final keywords with class declaration, Concept of interface and class.		

4	<p><b>Concurrent Programming :</b>  Concept of threads, lifecycle of threads, creating threads, Thread class, Runnable interface, Introduction to Tread Synchronization .</p>
5	<p><b>Java Input/Output:</b>  Concept of streams, types of streams – byte streams, character streams.  The Console: System.out, System.in, and System.err, InputStream class, OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams</p>
6	<p><b>Java Applets and GUI:</b>  Applet concept, creating basic applet, applet lifecycle, controlling applet content, introduction to AWT controls – Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc. ( Only AWT Component)</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
404	Operations Research	3L-1T-0P=4C	2018
<p><b>Course Objective :</b> Main objective of this paper is to learn historical development of O.R., need and characteristics of OR in business and management. Formulate a real-world problem as a mathematical programming model. To aware the students about the basic terms in operations research. Students will be able to formulate and solve optimization problems related to job/ work assignments.</p>			
<p><b>Expected Outcome :</b> At the end of this course, student should be able to understand:</p> <ul style="list-style-type: none"> <li>• Students will be able to describe characteristics and scope of OR.</li> <li>• Students will be able to define and formulate mathematical problems.</li> <li>• Students will be able to select optimal problems solving techniques for a given problem using LP.</li> <li>• Students will be able to formulate and solve transportation, travelling sales problems.</li> <li>• Students will be able to demonstrate and solve simple models of Game theory.</li> <li>• Students will be able to solve different problems related to Network.</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <ul style="list-style-type: none"> <li>○ Operations Research: An Introduction by Hamdy Taha, Pearson</li> <li>○ Operations Research by A M Natarajan, P Balasubramani, A Tamilarasi, Pearson Education Inc</li> <li>○ Operations Research by P Mariappan, Pearson</li> <li>○ Operations Research by H N wagner, Prentice hall.</li> <li>○ Optimization in Operations Research by Ronald Rardin, Pearson Education Inc.</li> <li>○ Operations Research by R. Paneerselvam, Prentice Hall of India Pvt. Ltd.</li> <li>○ Quantitative Techniques in Management by N D Vohra, Tata McGraw-Hill</li> </ul>			
Suggested MOOC : List of Open Source Software/learning website: <a href="http://www.nptel.ac.in/">www.nptel.ac.in/</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Basics of Operation Research :</b> Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research, limitations of OR.</p>		
2	<p><b>Linear Programming :</b> Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods: Simplex Method , Concept of slack, surplus &amp; artificial variables. Manual solutions of L.P.P. upto 3 iterations. Minimization &amp; Maximization Problems.</p> <p>Special Cases – i)Alternative solution (ii) Unbounded solutions (iii) Infeasible solutions to be shown graphically &amp; also by simplex method.</p>		



3	<p><b>Transportation Model :</b>  North-West Corner rule, Least-cost method, Vogel’s approximation method, Final Transportation cost using MODI method,  <b>Special cases :</b> i)Degeneracy in transportation problem, ii)unbalanced supply and demand, iii)profit maximization problem iv) prohibited transportation routes</p>
4	<p><b>Assignment Model:</b>  Hungarian method for solution, non square matrix, <b>Special Cases :</b>i) unbalanced problem ii)restriction on assignments iii)Maximization problem iv)alternate solution</p>
5	<p><b>Network Analysis :</b>  Terms used in network analysis, Network or arrow diagram, Fulkerson’s rule, Programme Evaluation and Review Technique (PERT), Critical path method (CPM), Time estimates for activities. Probability of completion of project. Determination of floats (total, free, independent &amp; interfering) , Crashing of Simple Networks.</p>
6	<p><b>Decision Theory And Decision Tree:</b>  Introduction, Decision under certainty, Decision under risk, Payoff table, Regret table, Decision making under uncertainty, Maximin &amp; Maximax criteria,Minimax Regret criterion, Laplace criterion, Hurwicz criterion, Expected Monetary Value criterion, Expected Value of Perfect Information (E.V.P. I), Expected Opportunity Loss (E.O.L.), Decision Tree, Simple examples</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
405	Entrepreneurship Development	3L-1T-0P=4C	2018
<b>Course Objectives :</b> To develop an understanding of entrepreneurship concepts To provide sufficient knowledge to students aspiring to be entrepreneurs To provide ways and means to start an enterprise			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>• Evolution, definition, characteristics, function and types of entrepreneurs.</li> <li>• Role of Entrepreneurship in Economic Development.</li> <li>• Business Opportunity Identification</li> <li>• Importance of Business plan</li> <li>• Support Agencies</li> <li>• Concept of Intellectual property rights</li> </ul>			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>• Dr. Dilip Sarwate, Entrepreneurship Development and Project Management, Everest Publishing house</li> <li>• Vasant Desai, Dynamics of Entrepreneurship development and Management, Himalaya Publishing House</li> <li>• David H Holt, Entrepreneurship and New Venture Creation, Prentice Hall</li> <li>• Paul Ajit Kumar, Paul, Entrepreneurship Development, Himalaya Publishing House Mumbai</li> <li>• Raj Shankar – “Entrepreneurship: Theory and Practice” – Vijay Nicole Imprints Pvt. Ltd.</li> <li>• S.S. Khanka – Entrepreneurial Development – S. Chand And Company Ltd., New Delhi – 1999</li> </ul> <b>Websites</b> <ul style="list-style-type: none"> <li>• <a href="http://www.startupindia.gov.in">www.startupindia.gov.in</a></li> <li>• <a href="http://www.india.gov.in">www.india.gov.in</a></li> <li>• <a href="http://www.makeinindia.com/home">http://www.makeinindia.com/home</a></li> </ul>			
<b>Suggested MOOC :</b> <b>Note:</b> <ol style="list-style-type: none"> <li>1. Case studies to be discussed on various aspects mentioned in the syllabus.</li> <li>2. Visiting/Interaction with successful local entrepreneurs should be done.</li> </ol>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Entrepreneurship :</b> Evolution, Concept and definition of an entrepreneur, Characteristics, function and types of entrepreneurs, Qualities of an Entrepreneur, Growth of Entrepreneurship in India, role of Entrepreneurship in Economic Development, Women Entrepreneurship in India		
2	<b>Business Opportunity Identification :</b> Search for Business Ideas, Market Assessment, Sources of Information, Environmental Analysis, Entrepreneurial opportunities in India, Business Opportunity identification and selection		

3	<p><b>Business Plan Preparation :</b>  Meaning of Business plan, Significance and Contents of a Business Plan, developing Business Plan, Presenting Business Plan, Elevator Pitch</p>
4	<p><b>Project Finance :</b>  Types of Finance, Sources of Finance, Venture Capital, Start-up and Make-in-India program, MUDRA</p>
5	<p><b>Support Agencies :</b>  Support to Entrepreneurs by DIC, SIDBI, SIDCO, SSIB, NSIC, SISI, Other Institutions etc. Entrepreneurship promotion by Government through various schemes.</p>
6	<p><b>Entrepreneurial Motivation and Development :</b>  Factors motivating entrepreneurs, Basic course contents of EDP's Evaluation of EDP's, Organizations involved in EDP's. Basics of Intellectual property rights</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
406	BCA-II-SEM-IV	2	2018
Course Objective :			
To develop logical abilities of students using Java Programming language			
Expected Outcome: Provide foundation for programming and Enable the students to analyze and efficiently solve the problems using Java Programming.			
References (Books, Websites etc) :			
<ul style="list-style-type: none"> <li>• Herbert Schildt, Java: The Complete Reference, McGraw-Hill Osborne Media; Seventh Edition, 2007</li> <li>• Cay S. Horstmann and Gary Cornell ,Core Java-Volume-I, Sun Core Series, Eighth Edition, 2008</li> <li>• Bruce Eckel , Thinking In Java – Printice Hall, Fourth Edition</li> </ul>			
Sr. No.	Contents		
1	Program to demonstrate the following: <ol style="list-style-type: none"> <li>1. Branching Statements</li> <li>2. Looping Statements</li> <li>3. Classes and objects</li> <li>4. Wrapper classes</li> <li>5. Arrays</li> <li>6. Array of objects.</li> </ol>		
2	Design Programs on following concepts: <ol style="list-style-type: none"> <li>1. Constructor</li> <li>2. Constructor Overloading</li> <li>3. Pass by value</li> <li>4. Method Overloading</li> <li>5. Package</li> <li>6. Exception Handling</li> </ol>		
3	Working with Inheritance and Interface: <ol style="list-style-type: none"> <li>1. Programs to demonstrate working of Inheritance, types of inheritance and Polymorphism – function overriding.</li> <li>2. Making use of abstract and final keywords with class declaration.</li> <li>3. Programs to demonstrate working of interface.</li> </ol>		
4	Design Programs on following concepts: <ol style="list-style-type: none"> <li>1. Thread class, Runnable interface and Tread Synchronization.</li> </ol>		
5	Program to demonstrate Java Input/Output : <ol style="list-style-type: none"> <li>1. Concept of streams, byte streams, character streams.</li> <li>2. The Console: System.out, System.in, and System.err</li> <li>3. Making use of InputStream class, OutputStream class, File class, FileInputStreams, File OutputStream, Reader class, Writer class, FileReader, FileWriter. Buffered streams – BufferedInputStream, BufferedOutputStream, BufferedReader, BufferedWriter. Object Streams</li> </ol>		
6	Working with Java Applets and GUI: <ol style="list-style-type: none"> <li>1. Design program to demonstrate Applet concept.</li> </ol>		

	2. Making use of AWT controls through programs– Button, Lable, TextField, TextArea, List, Checkbox and RadioButtons, Scrollbar, Menu etc.
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<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
407	Minor Project I	2 Credits	2018-19

**Course Objective :**

Student has to complete a Minor project work under the guidance of the faculty member in the institute. Students has to develop any software using C in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
408	Community Work-IV	2L-0T-0P=2C	2018
<p><b>Course Objective:</b>  This course aims to expose the students to social issues and help them Participate in community service through trips/events organized at institute, state level etc and also to Volunteer at events like fundraising activities, fairs, festivals, slums, nonprofit organization etc.</p> <ul style="list-style-type: none"> <li>To expose the students towards social reality and role of community development for social upliftment and well being</li> <li>To involve students in community work through active involvement and participation</li> </ul>			
<p><b>Expected Outcome :</b>  Students will be able to know the community needs and understand their role to contribute meaningfully towards community development.</p>			
<p><b>Reference Books :</b></p> <ol style="list-style-type: none"> <li>An Introduction to Community Development, Rhonda Phillips, Robert Pittman – 2014</li> <li>Community Development in Asia and The Pacific, Manohar S. Pawar, 2009,</li> </ol>			
<p><b>Online Resources:</b>  <a href="https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf">https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/tool-enterprise-directory.pdf</a>  <a href="https://www.ahaprocess.com/solutions/community/events-resources/free-resources/">https://www.ahaprocess.com/solutions/community/events-resources/free-resources/</a></p>			
<p><b>MOOCs:</b>  <a href="https://alison.com/course/diploma-in-community-development">https://alison.com/course/diploma-in-community-development</a></p>			
<p><b>COMMUNITY HOURS:</b>  Participate in community service trips/events organized at institute, state level etc , Volunteer at events like fundraising activities, fairs, festivals, slums, non profit organization etc , Submit a report on a particular type of community involvement undertaken</p>			
<b>Course Plan</b>			
Unit	Contents		
1	Community work in Food and Nutrition related social concerns ,role of government and NGOs in India		
2	Community work for old age people and its related social concerns, role of government and NGOs in India		
3	Community work for woman empowerment ,its related social concerns ,role of Govt. and NGOs in in India		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
408	Basics of Taxation	2L-0T-0P=2C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To provide a basic knowledge about direct tax system in India</li> <li>To provide a basic knowledge about indirect tax system in India.</li> <li>To upgrade with the latest amendments in taxation policy of India.</li> </ul>			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>Students will be able to have a basic knowledge about direct tax system in India</li> <li>Students will be able to have a basic knowledge about indirect tax system in India.</li> <li>Students will be upgraded and upskilled with the latest amendments in taxation policy of India.</li> </ul>			
<b>Reference Books :</b> <ol style="list-style-type: none"> <li>Shukla and Grewal: Advanced Accounts. (S. Chand &amp; Co. Ltd. New Delhi)</li> <li>Jain and Narang: Advanced Accounts.(Kalyani Publishers, Ludhiana)</li> <li>Sr. K. Paul: Accountancy, Volume-I and II.(New Central Book Agency, Kolkata)</li> <li>R. K. Lele and Jawaharlal: Accounting Theory (Himalaya Publishers)</li> <li>Dr. L. S. Porwal: Accounting Theory (Tata McGraw Hill).</li> <li>Robert Anthony, D.F.Hawkins&amp; K.A. Merchant: Accounting Text &amp; Cases (Tata McGrawHill)</li> </ol>			
<b>Online Resources:</b> <ol style="list-style-type: none"> <li><a href="https://incometaxindiaefiling.gov.in/">https://incometaxindiaefiling.gov.in/</a></li> <li><a href="https://www.taxmann.com/#">https://www.taxmann.com/#</a></li> <li><a href="http://www.gstcouncil.gov.in/">http://www.gstcouncil.gov.in/</a></li> </ol>			
<b>MOOCs:</b> Alison Swayam			
Course Plan			
Unit	Contents		
1	<b>Introduction :</b> Basic concepts: Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax; Permanent Account Number (PAN) Residential status; Scope of total income on the basis of residential status Exempted income under section 10		
2	<b>Direct and Indirect Tax:</b> Income from Salaries; Income from house property, Profits and gains of business or profession; Capital gains; Income from other sources, Deductions from gross total income; Rebates and reliefs Computation of total income of individuals and firms; Tax liability of an individual Indirect taxes.		
3	<b>Overview of GST:</b> Overview Of GST: Introduction to GST-Key Concepts – Taxes under GST – Central GST – State GST – Union Territory GST – Integrated GST - Cess		
Course Number	Course Name	L-T-P- Credits	Year of Introduction



408	YOGA - I	2L-0T-0P=2C	2018
<b>Course Objective:</b> <ul style="list-style-type: none"> <li>To introduce the practice of yoga and its benefits to students</li> <li>To impart practices of basic yogic kriyas</li> </ul>			
<b>Expected Outcome :</b> Students will be able to understand the advantages of Yoga and practice basic yog kriyas			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>Yoga – Asanas, Pranayam, Mudras, Kriya, Vivekananda Ashram</li> <li>Yoga – Sivanand Yog Vedanta Center</li> </ul>			
<b>Online Resources:</b> <a href="https://www.yogatoday.com/">https://www.yogatoday.com/</a> <a href="https://www.youtube.com/user/yogatoday">https://www.youtube.com/user/yogatoday</a> <a href="https://m.youtube.com/user/yogawithadriene/playlists">https://m.youtube.com/user/yogawithadriene/playlists</a>			
<b>MOOCs:</b> Swayam			
<b>Course Plan</b>			
<b>Unit</b>	<b>Contents</b>		
1	i) Origin of Yoga & its brief development. ii) Meaning of Yoga & its importance iii) Yoga as a Science of Art (Yoga Philosophy). iv) Meaning of meditation and its types and principles.		
2	i) Classification of Yoga/Types of Yoga ii) Hatha Yoga , Raja Yoga, Laya Yoga, Bhakti Yoga, Gyan Yoga, Karma Yoga. iii) Asthang Yoga.		
3	i) Principles of Yogic Practices. ii) Meaning of Asana, its types and principles. iii) Meaning of Pranayama, its types and principles. iv) Meaning of Kriya its types and principles. v) Yogic therapies and modern concept of Yoga vi) Naturopathy, Hydrotherapy, Electrotherapy, Messothrapy, Acupressure, acupuncture.		

# **SEMESTER V**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
501	Introduction to the Internet Technologies	3L-1T-0P = 4C	2018
<p><b>Course Objective :</b></p> <ul style="list-style-type: none"> <li>To teach the basic internet concepts and train them to develop internet applications.</li> <li>An overview of the HTML5 specification</li> <li>Practical knowledge to implement new HTML5 elements and attributes.</li> <li>Overview of Javascript</li> </ul>			
<p><b>Pre-requisites:</b> Preliminary knowledge of computer, their operations and applications.</p>			
<p><b>Expected Outcome :</b></p> <ul style="list-style-type: none"> <li>Describe and use client-side technologies of the World Wide Web: HTML5, CSS3, Javascript.</li> <li>To implement different constructs and programming techniques provided by Java Script.</li> </ul>			
<p><b>References (Books, Websites etc) :</b></p> <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>The Complete Reference HTML -Thomas A.Powell</li> <li>The ABC's of JavaScript –Lee Purcell &amp; May Jane Mara</li> <li>Internet Technology at work - Hofstetterfred</li> <li>Beginning HTML5 &amp; CSS3 - Christopher Murphy, Richard Clark &amp;oliStudholme</li> </ol> <p><b>Reference Books :</b></p> <ol style="list-style-type: none"> <li>Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGL –Bayross Ivan</li> <li>Internet Technology at work Hofstetterfred</li> <li>Web Design Technology-D.P. Nagpal- S. Chand Technical</li> <li>JavaScript Bible</li> </ol> <p><b>Reference Sites:</b></p> <ol style="list-style-type: none"> <li><a href="http://www.w3schools.com">www.w3schools.com</a></li> <li>www.devguru.com</li> </ol>			
<p><b>Suggested MOOC :</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Overview Of Internet And Intranet:</b> Understanding internet and its need, concept of intranet, difference between internet and intranet, a brief history, internet applications, Internet Service Providers (ISP) concept of client and server, concept of a web browser and web server, communicating on the internet, concept of domain- Physical domain, virtual domain,</p>		

	registering a domain, need of IP addressing, process to assign IP addresses, World Wide Web
2	<p><b>Introduction To HTML:</b>  <b>Introduction:</b> Overview of HTML, need of HTML, Use of HTML  <b>HTML Tags:</b> concept of Tag, types of HTML tags, structure of HTML program  <b>Text formatting through HTML:</b> Paragraph breaks, horizontal rules, heading style, line breaks, background and BGcolor attributes  <b>Emphasizing material in a web page:</b> Heading styles, drawing lines, text styles.  <b>Text styles and other text effects-</b>centering, spacing, controlling font size &amp; color  <b>Lists:</b> Using unordered, ordered, definition lists  <b>Adding Graphics To HTML Documents:</b> Using Image tag, attributes of Image tag, changing width &amp; height of image</p>
3	<p><b>Tables, Frames And Linking Documents:</b>  <b>Handling Tables:</b> To define header rows &amp; data rows, use of caption tag, changing height &amp; width of table, cellpadding, cellspacing, bgcolor, colspan, rowspan  <b>Linking Documents:</b> Concept of hyperlink, types of hyperlinks, linking to the beginning of document, linking to a particular location in a document, Images as hyperlinks  <b>Frames:</b> Introduction To frames, using frames &amp; frameset tags, named frames.  <b>Forms :</b> INPUT tag, TYPE Attribute : text, password, button, checkbox, radio button, image</p>
4	<p><b>Introduction to CSS:</b>  Introducing CSS, Types of style sheets: inline, embedded and external Style.  Working with CSS properties: text properties, color and background properties, border and shading, box and block properties, positioning with CSS, Various types of CSS selectors: universal, class, ID, child, descendent, adjacent sibling, attribute and query.</p>
5	<p><b>Introduction To HTML5 and CSS3:</b>  Features of HTML5 and CSS3 with few elements.</p>
6	<p><b>Introduction To JavaScript:</b>  <b>Introduction to scripting:</b> overview of Java Script, Advantages, Features of JavaScript, Client side java Script, writing JavaScript into HTML, First Hello World Program  <b>Basic JavaScript Techniques:</b> Data types, literals, variables and operators, Java Script arrays, dense array, operators, expressions  <b>Java Script Programming Construct:</b> Assignment, data declaration, if, switch, while, for, do while, label, break, Continue  <b>Functions and Objects-</b>Built-In Function and User defined function. User defined functions, function declaration, passing parameters, variable scope, return values, recursive functions, String, Date, Math Objects  <b>Dialog boxes</b> -Alert dialog box, prompt dialog box, confirm dialog box,  <b>Working with form-</b> Forms and Form elements and the associated events. Form validation.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
502	Object Oriented Analysis and Design	3L-1T-0P – 4C	2018
<b>Course Objective :</b>			
<ul style="list-style-type: none"> <li>To Understand concept of system design using UML.</li> <li>2. To understand system development through object oriented techniques.</li> </ul>			
<b>Expected Outcome :</b>			
At the end of course students will know –			
<ul style="list-style-type: none"> <li>Advantages of using OOP platforms for development.</li> <li>Process carried out while designing Object Oriented Systems.</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ul style="list-style-type: none"> <li>The Unified Modeling Language User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson.</li> <li>Object Oriented Software Engineering by Ivar Jacobson</li> <li>3. Software Engineering by Pressman</li> </ul>			
<b>Suggested MOOC : Refer NPTEL</b>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Object Oriented Concepts, Modeling and UML:</b> What is Object Orientation : (Introduction to class, object, inheritance, polymorphism), Model : Introduction of Modeling, Object Oriented Modeling , Object oriented system development: Function/data methods, Object oriented analysis, Object oriented construction, Object oriented testing		
2	<b>Iterative Development and UML:</b> Understanding requirements, Rational Unified process & RUP Phases – Inception, Elaboration, Construction, Transition UML : Designing Tool for OOAD : Introduction to UML, Overview of UML, Conceptual Model of UML, Diagrams in UML, Advantages of UML <b>Behavioral Modeling</b> Use Case Diagram : Realization of Use Cases, Finding Actors, Defining Relations among Use case, Writing Use Cases, Activity Diagram		
3	<b>Basic and Advanced Structural Modeling</b> Class Diagram : Identifying the elements of an object model, Identifying classes and objects, Specifying the attributes, Defining operations, Finalizing the object definition, Advanced class Modelling, Interface, Types and Roles <b>Diagrams Based on Classes :</b> State Chart Diagram, Package Diagram, Object Diagram		

4	<p><b>Interaction Modelling :</b></p> <p>Introduction to Interaction Diagrams, Need of Interaction Diagrams, Interaction Diagrams, Collaboration Diagram, Sequence Diagram</p>
5	<p><b>Architectural Modeling</b></p> <p>Component Diagram: Need of Component Diagram, Realization of Components, Relating Components.</p> <p>Deployment Diagram : Purpose of deployment diagram, Architecture of System, Different Architectures used for System, Representing Architecture using Deployment Diagram</p>
6	<p><b>Object Oriented Programming Styles</b></p> <p>Object Oriented Style with reference to Reusability and Extensibility, Robustness, 3 Programming in the Large, Discussion on case Studies e.g. Library Management System, Hospital Management System, . Online Shopping, Nukari.com website, Matrimonial website</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
503	C# Programming	3L-1T-0P-=4C	2018
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>• Learn the fundamentals of C# programming in Visual Studio.</li> <li>• To Use .Net Framework</li> <li>• To Handle Exceptions in C#</li> <li>• To implement Object oriented technology in C#</li> <li>• To operate with Arrays</li> <li>• To use Class Designer and Object Test Bench tools.</li> </ul>			
<b>Expected Outcome :</b> This COURSE focuses on building applications with a graphical user interface (GUI) for the Microsoft Windows operating system although GUI interfaces on other operating systems, and on the Web Topics include: event-driven programming, Win32 API, dialog boxes and standard GUI controls, dynamic link libraries, .NET Framework. The C# programming languages will be used to build applications.			
<b>Reference Books:</b> <ul style="list-style-type: none"> <li>• The Complete Visual C# Programmer's Guide</li> <li>• A Programmer's Introduction to C# 2.0, Third Edition</li> <li>• 3. C# and the .NET Platform, Second Edition</li> </ul>			
<b>Course Plan</b>			
UNIT	Contents		
1	<b>The .net Framework:</b> Introduction, common language runtime, common type system, common language specification, the base class library, the .net class library, Intermediate language, Just in time compilation, garbage collection, assemblies, web services, COM, localization		
2	<b>Introduction to C # :</b> Evaluation of C#, characteristics of C#, application of C#,difference between C++ and C#, difference between Java and C#.Introduction to C# environment : The .NET strategy, the origins of the .NET technology, the .NET framework, the common language runtime, framework base classes, user and programs interface, visual studio .NET, .NET languages, benefits of the .NET approach, C# and .NET. Data types, identifiers, variables, constants, C# statements, OOPs concept,array and strings, operators, control statements, type conversions, Mathematical functions.		
3	<b>Classes and Objects :</b> Basic principles of OOP's, class, objects, constructors, static members, static constructors, private constructors, copy constructors, destructors, member initialization, the this reference, nesting of classes, constant members, read only members, properties, indexers.Inheritance and polymorphism : overloading, inheritance, overriding, interfaces		
4	<b>Visual studio IDE features, introduction to Window forms, components, control:</b> textbox, label, linklabel, status bar, checkedlistbox, combobox, listbox, listview, radiobutton, button, panel, groupbox, dialog box, menu control, properties, methods, events of controls.		
5	<b>ADO.net:</b> the component model, creating database connection, database command, data repeater, connecting to data sources, choosing a .net data provider, manage a connection, building		

	command objects, executing commands, building datasets and datatables, data adapter
6	<b>Managing Console I/O operations :</b> Console class, console input, console output, formatted output, numeric formatting, standard numeric format, custom numeric format. Managing Errors and Exceptions : Types of errors, exceptions, syntax of exception handling code, multiple catch statement, the exception hierarchy, general catch handler, using final statement, nested try blocks, throwing our own exceptions, checked and unchecked operators, using exceptions for debugging.



Course Number	Course Name	L-T-P- Credits	Year of Introduction
504	Graph Theory	3L-1T-0P =4C	2018-19
<b>Course Objective :</b>			
The aims of this Graph theory is a delightful playground for the exploration of proof techniques in discrete mathematics and its results have applications in many areas of the computing ,social and natural science			
<b>Expected Outcome :</b>			
At the end of the course student should be able to:			
<ul style="list-style-type: none"> <li>• Use graphs as models in a variety of areas.</li> <li>• Formulate several real world problems in mathematical terms</li> </ul>			
<b>References (Books, Websites etc) :</b>			
Introduction to Graph theory - PHI by Douglas B.West			
Discrete Mathematics and its Applications Edition 6 <sup>th</sup> - Tata McGraw Hill by Kenneth H. Rosen			
<b>Suggested MOOC :</b>			
NPTEL			
<b>Course Plan</b>			
Unit	Contents		
<b>1</b>	<b>Fundamental Concepts :</b> Definition, Graph Models, Sub Graph, Decomposition and special Graphs, Connection in Graphs, Bipartite Graph, Degree, Directed Graph, Undirected Graph, weighted graph, Regular Graph, dual graph, Representing Graph in computer memory, <b>Examples</b>		
<b>2</b>	<b>Connectivity:</b> Walk, paths, trail, circuits, Connected Graph, Bridge, Isomorphism, Eulerian Circuits, Euler's path, Euler graph, Hamiltonian Graph and Graph Algorithm, Konigsberge Bridge problem, shortest path problems, city route,puzzle problem, Seating arrangement problem, Travelling salesman problem, <b>Examples</b>		
<b>3</b>	<b>Algorithms :</b> Fleury's algorithm, Warshall's algorithm, Floyde's algorithm, Dijkstra's algorithm, Depth-First Search/ Breadth First search in Directed Graph, <b>Examples</b>		
<b>4</b>	<b>Coloring of Graphs and planarity:</b> Vertex Coloring and upper bonds, Graph with Large Chromatic Number, 4 color theorem,Applications of graph coloring, Planar Graph, Euler's Formula, Homomorphism, Theorems, <b>Examples</b>		
<b>5</b>	<b>Trees and Distance:</b> Concept of Trees, Definition and properties of Trees, Application of Trees, Trees as Models, Game Trees, Tree Traversal, Infix and Postfix notation of arithmetic expression, Binary Trees and its Properties, Binary Search Trees, Spanning Tree, Minimum spanning Tree, Depth First search, Breadth –First search, Back tracking applications, Kruskal algorithm, Prims algorithm, Huffman's algorithm <b>Excercises</b>		
<b>6</b>	<b>Matchings :</b> Matching, Hall's Condition, MinMax Theorem, covers, Maximum Bipartite Matching, Weighted Bipartite Matching, Maximum Networks Flow, Examples		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
506	Lab on Internet Technology and C# Programming	3L-1T-0P=4C	2018-19
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>To teach the basic internet concepts and train them to develop internet applications.</li> <li>An overview of the HTML5 specification</li> <li>Practical knowledge to implement new HTML5 elements and attributes.</li> <li>Overview of Javascript</li> <li>Learn the fundamentals of C# programming in Visual Studio.</li> <li>To Use .Net Framework</li> <li>To Handle Exceptions in C#</li> <li>To implement Object oriented technology in C#</li> <li>To operate with Arrays</li> <li>To use Class Designer and Object Test Bench tools.</li> </ul>			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>Describe and use client-side technologies of the World Wide Web: HTML5, CSS3, Javascript.</li> <li>To implement different constructs and programming techniques provided by Java Script.</li> <li>This COURSE focuses on building applications with a graphical user interface (GUI) for the Microsoft Windows operating system although GUI interfaces on other operating systems, and on the Web Topics include: event-driven programming, Win32 API, dialog boxes and standard GUI controls, dynamic link libraries, .NET Framework. The C# programming languages will be used to build applications.</li> </ul>			
<b>References :</b> <ul style="list-style-type: none"> <li>Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGI –Bayross Ivan</li> <li>Internet Technology at work Hofstetterfred</li> <li>Web Design Technology-D.P. Nagpal- S. Chand Technical, JavaScript Bible</li> <li>The Complete Visual C# Programmer's Guide</li> <li>A Programmer's Introduction to C# 2.0, Third Edition</li> <li>3. C# and the .NET Platform, Second Edition</li> </ul>			
<b>Suggested MOOC :</b> Swayam			
<b>Course Plan</b>			
<b>Unit</b>	<b>Contents</b>		
<b>Internet Technology:</b>			
Design A webpage which have student's biodata with proper formatting and having student name as title.			
Design a form using HTML that accepts information about your qualification, extra curricular activities, achievements, skill sets, hobbies, and expectation for a particular job.			
Design a website for a class which shows student's list linked with their biodata pages			

Design a website for PNG jewelers, having images of different types of jewelries which are linked with the pages giving details about the items.

Design a Style sheet to give following effects  
The first letter of the paragraph should have 150% font size  
The first line of the paragraph should have purple as background color and white as the fore color.

Design a website for the college which lists all the faculties(ordered lists), courses (definition lists) every course explains details (fees, duration, intake capacity) as unordered list.

Design a website for Samsung products using frames having design as-

<logo>	<title>		
<Links to various products>	<images products>	of	<form to purchase the product>

Design a website for a college showing features of the university, college and list of different courses running in the institute. Course names have links with the pages having details of the courses having similar design using stylesheets.

Design a CSS(inline) that displays the regular text at the center with green as background color and white as fore color and should be bold, using class

Design a web page to display the following output

- List of subjects
    - Semester III
      - C++
      - Dot.Net
    - Semester IV
      - Java
      - Industrial Projects
- Internet Programming
- a. HTML
  - b. VBScript
  - c. Java Script
  - d. DHTML

Design a webpage which accepts users information with validations(name, std code(should not exceed 4 digits),landline number(no. of digits should be between 5 to 7), mobile number(exactly 10 digits),email(should have @ and .))

Write a HTML code to display timetable of your class.

Write a HTML code to display the mark sheet of entered seat number

Write an HTML code to accept the students's

Design a website which accepts a number from user and performs the selected operation(even/odd, prime/not prime, positive/negative)
Design a webpage which provides calculator facilities.
Design webpage which accepts no of lines and prints it in the form of triangular shaped pyramid.
Write JavaScript to display table of numbers 2-10 (use form and form elements)
Write a JavaScript code which contains “show” button. When user clicks on show button, first 10 terms of Fibonacci series will be displayed in text box on another HTML page. This page contains button “back”. With this button user can come back to original page.
Create a form having textboxes, radio button and check boxes and reset button. On clicking the reset button the entire form should be reset.
Design a webpage for a restaurant which accepts online order from user and shows the calculated total amount.
Accept login name and password from user and display biodata of the corresponding user.
Design a page for a user to create his login by accepting desired login name, password and confirm the password.
Accept data of a student wants to appear for entrance(name, marks at matriculation, higher secondary and graduation). Ask student to select the course he want to take admission. If the student scores above 55 at matriculation, above 60 at higher secondary and graduation then he is eligible for any course. If he has science degree or maths at 11th and 12th then only he is eligible for MCA.Design the form accordingly. Give the according message.
Design a webpage to conduct aptitude for maths. The test is objective, each question having 4 options. Let the students select the option. For every correct option he scores 2 marks and for every wrong answer he loose 1 mark. Calculate & show score of a student.
Design the registration form for a Web site and when the user clicks on Submit button the login form should be appeared on screen.
Create a purchase order form using Javascript.
Create a Java script code with show button. User click on show button, all string functions should be implemented.
Write JAVA script that finds occurrence of letter “m” in the string entered by user in textbox and replace it with “a” and write string to page.
Develop HTML form to accept mathematical expression in one textbox and display its result in another textbox after clicking on button showing mathematical operations.

<b>C#</b>	
SET-I	Basic Console Applications

	<ul style="list-style-type: none"> <li>• Write a C# Program to design simple calculator</li> <li>• Write a C# Program to Check whether the Entered Number is Even or Odd.</li> <li>• Write a C# Program to Swap 2 Numbers</li> <li>• Write a C# Program to Get a Number and Display the Sum of the Digits</li> <li>• Write a C# Program to Get a Number and Display the Number with its Reverse</li> <li>• Write a Program in C# to demonstrate Command line arguments processing</li> <li>• Write a Program in C# to demonstrate boxing and Unboxing.</li> </ul>
SET-II	Date and Time
	<ul style="list-style-type: none"> <li>• Write a C# Program to Display the Date in Various Formats</li> <li>• Write a C# Program to Check Whether the Entered Year is a Leap Year or Not</li> <li>• Write a C# Program to find difference between Two Dates</li> </ul>
SET-III	Classes
	<ul style="list-style-type: none"> <li>• Write a program to demonstrate abstract class and abstract methods in C#.</li> <li>• Find the sum of all the elements present in a jagged array of 3 inner arrays.</li> <li>• Write a program to demonstrate Operator overloading.</li> <li>• Demonstrate arrays of interface types (for runtime polymorphism) with a C# program.</li> </ul>
SET-IV	<ul style="list-style-type: none"> <li>• Consider the Database STUDENT consisting of following tables: Course (C_ID: int, C_Name: string)</li> <li>• Student (RollNo:int, S_Name: string, Address: string, C_ID: int, Admissiyear: int) Develop suitable windows application using C#.NET having following options: <ol style="list-style-type: none"> <li>1. Entering new course details.</li> <li>2. Entering new student details.</li> <li>3. Display the details of students (in a Grid) who belong to a particular course.</li> <li>4. Display the details of the students who have taken admission in a particular year</li> </ol> </li> <li>• write a program in C# to demonstrate error handling.</li> </ul>

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
507	Minor Project II	2 Credits	2018-19

**Course Objective :**

Student has to complete a Minor project work under the guidance of the faculty member in the institute. Students has to develop any software using Java in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Social Media Management	2L-0T-0P=2C	2018
<b>Course Objective:</b> This Course Teaches student to use social media strategically to create value for a client or organization.			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>Students will learn by doing assignments focusing on social media, post writing and publishing, management and measurement tools, a social media audit, editorial calendar and crises management.</li> <li>Students will master the skills necessary to become successful social media managers.</li> </ul>			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>Guy Kawasaki &amp; Peg Fitzpatrick, “The art of social media: power tips for power users</li> <li>Social media marketing all in one for dummies, Jan Zimmerman &amp; Deborah N</li> <li>Social media explained by Mark W. Schaefer</li> </ul>			
<b>Online resources</b> <a href="http://www.gov.pe.ca/photos/original/IPEI_ebiz_smmkt.pdf">http://www.gov.pe.ca/photos/original/IPEI_ebiz_smmkt.pdf</a> <a href="https://www.coursehero.com/file/10513028/Media-Management-Notes/">https://www.coursehero.com/file/10513028/Media-Management-Notes/</a>			
<b>MOOCs:</b> Swayam			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction To Social Media:</b> Introduction to Social Media, importance of social Media, History and evolution of Social Media, Managing Information, Aggregators. Facebook, Twitter, Instagram, LinkedIn, Youtube, Blogs.		
2	<b>Using Social Media:</b> Strategy Plan for Social Media Management, Touchpoint, Analysis Scheduling, Creating Content, Managing Content programmes, Planning Worksheet, Social media campaign.		
3	<b>Evaluating Social Media:</b> <ul style="list-style-type: none"> <li>Evaluation of Social Media Platforms</li> <li>Tools to manage and measure performance of social media content and campaigns</li> </ul> Handling critical issues in social media management and legal aspects of social media.		

4	<b>Setting-up own professional site</b> Content management, design, connectivity with social media
	<b>Assignments:</b> <ol style="list-style-type: none"><li>1.Explain atleast one social media management tool in detail.</li><li>2.Describe social media analytics tool in bried with example.</li><li>3.Detailed social media campmaign: The campaign can be any example presented in social media for Lead Generation. Describe the objectives for campaign, outline the tools, preapare budget for campaign.</li><li>4.Budget for social media plan: Based on the understanding of your client, prepare a budget for social media management. Include the individual cost of your tactis, your proposed social media campaign and social media tools. Include the total cost as a bottom line of your budget. Include the ROI of your plan and why that budget should be allocated to social media.</li></ol> <p>List different types of content to be used in creating brand by using social media campaigns. Describe merits and demerits of each type of content used in social media.</p>



Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Road Safety Management	2L-0T-0P=2C	2018
<p><b>Course Objective:</b> The vehicle population in India is growing at an exponential rate. This phenomenon is bringing in its wake a host of health related, environmental, safety and behavioral problems in the society. The problem is compounded due to absence of effective means of mass transportation system in most big cities in India.</p>			
<p><b>Reference Books :</b></p> <ul style="list-style-type: none"> <li>• Pratibha Shastri Ranade , Road Safety Management, ICFAI University</li> <li>• Vijay Vinayak Revankar, Road Safety – Vimleshwar Automobile Industry and Road Safety Community Forum</li> </ul>			
<p><b>MOOCs:</b> Alison</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction to Road Safety Management:</b> Importance and need of road safety management.</p>		
2	<p><b>Management of Traffic and Traffic Rules:</b> Use of traffic signals, signs by hand, knowledge/applications of automatic signals, parking rules, driving around, Traffic islands ,traffic joints, subways and flyovers. Signs of roads: meaning of yellow, green and red lights, zebra crossings, bus stops, use of road by physically disadvantaged persons, elderly persons, women and children, special right of way for ambulance, firefighting vehicles, school bus and V.I.P vehicles.</p>		
3	<p><b>Management of Road Mishaps and Accidents:</b> First aid to accident victims- First aid techniques, co-ordination with hospitals and other health centres for emergency treatment of accident victims, role of Insurance companies in providing relief to accidents victims, Management of Ambulance Services, Importance of voluntary blood donation in saving accident victims,Rehabilitation of persons affected by accidents. Qualities of a good Driver: Good health, tolerance, responsibility, knowledge of rules and laws, self confidence, politeness, familiarity with the vehicle and its maintenance requirements, self discipline.</p>		

Course Number	Course Name	L-T-P- Credits	Year of Introduction
508	Event Management	2L-0T-0P=2C	2018
<b>Course Objective:</b> The basic purpose and spirit of this course is to expose the students to hands-on experience of event management.			
<b>Expected Outcome :</b> The students are oriented to event management in order to strengthen their skills of planning, organizing and other such management functional skills.			
<b>Reference Books :</b> <ul style="list-style-type: none"> <li>• S. R. Singh, Event Management, HPH.</li> <li>• Alex Genadelik, Event Planning: Management &amp; Marketing For Successful Events: Become an event planning pro &amp; create a successful event series</li> </ul>			
Online Resources: <a href="https://blog.komodoplatform.com/notes-on-social-media-and-community-management-for-blockchain-cryptocurrency-and-ico-projects-4d0f328bdfb3">https://blog.komodoplatform.com/notes-on-social-media-and-community-management-for-blockchain-cryptocurrency-and-ico-projects-4d0f328bdfb3</a>			
<b>MOOCs:</b> Alison			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Event Management:</b> The concept of event. need and importance of events.		
2	<b>Types of Events :</b> Different types of event in Corporates, Social Programmes and Private Programmes. Following units are entirely based on practice part of the event management		
3	<b>Assessment of Events :</b> Post event assessment of any 05 programmes A student or a group of 03 students shall be assigned the event which has taken place in near past at any place and they shall make an inquiry into its success and effectiveness by rating them on the basis of appropriate parameters and shall submit the assignment to the respective teacher . Preparation of Learning Value report : A student shall prepare a report on what he learnt from the events and submit it to the concerned teacher. The report shall include mainly the description of occasion, the person involved and what guiding principles they have received from them.		

# **SEMESTER VI**

Course Number	Course Name	L-T-P- Credits	Year of Introduction
601	Data Warehousing And Data Mining	3L-1T-0P= 4C	2018
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>To introduce the basic concepts of Data Warehouse and Data Mining techniques.</li> <li>Examine the types of the data to be mined and apply preprocessing methods on raw data.</li> <li>Discover interesting patterns, analyse and estimate the accuracy of the algorithms.</li> </ul>			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>Process raw data to make it suitable for various data mining algorithms.</li> <li>Discover and measure interesting patterns from different kinds of databases.</li> <li>Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.</li> </ul>			
<b>References (Books, Websites etc) :</b> <ul style="list-style-type: none"> <li>Jiawei Han and Micheline Kamber , “Data Mining Concepts and Techniques” ELSEVIER</li> <li>M.Humphires, M.Hawkins, M.Dy,“Data Warehousing: Architecture and Implementation”, Pearson Education</li> <li>Kargupta, Joshi., “Data Mining: Next Generation Challenges and Future Directions”, Prentice Hall of India</li> </ul>			
<b>Suggested MOOC:</b> Please refer these websites for MOOCS: NPTEL / Swayam www.edx.com www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to Data warehousing:</b> Data Warehousing, Difference between operational database system and data warehouse, Data Warehouse Users, Benefits of Data Warehousing, Metadata, Classification of Metadata, and Importance of Metadata. Data Marts, Reasons for creating Data Marts, Building Data Marts: Top down Approach & Bottom up Approach, Data Warehouse Architecture, Two Tier Architecture, Three Tier Architecture. Data Warehouse Schema, Star, Snow Flake & Fact Constellation Schema. OLAP, Need for OLAP, OLAP Operations, OLAP Models.		
2	<b>Data Preprocessing:</b> Need, Objectives and Techniques, Descriptive data summarization, Data Cleaning, Data Integration, Data Transformation, Data Reduction.		
3	<b>Introduction to Data Mining:</b> Introduction, Need for Data Mining, KDD Process, Data Mining Architecture, Data		

	Mining Functionalities, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System
4	<b>Mining Frequent Items and Associations:</b> Frequent Item Set, Closed Item Set, Association Rule Mining, Market Basket Analysis, Classification of Association Rules, Apriori Algorithm
5	<b>Classification and Prediction:</b> Classification & Prediction, Issues regarding classification & Prediction, Comparing Classification Methods, Classification by Decision Tree Induction
6	<b>Clustering:</b> Introduction, Cluster Analysis, Need, Categorization of Major clustering methods. Types of Data in Cluster Analysis, Partitioning Methods: K-Means Method, K-Medoids Method, Applications of data mining in various sectors

Course Number	Course Name	L-T-P- Credits	Year of Introduction
602	Web Programming	3L-1T- 0P= 4C	2018-19
<b>Course Objective :</b>			
To make students able to design, develop the various types of web based applications.			
<b>Expected Outcome :</b>			
By using JavaScript, PHP and My SQL, at the end of the course student should be able to :			
<ul style="list-style-type: none"> <li>• Design web pages</li> <li>• Knowledge about different types of web sites</li> <li>• Navigation amongst web pages</li> <li>• Knowledge about presenting information on web interfaces</li> </ul>			
<b>References (Books, Websites etc) :</b>			
<ul style="list-style-type: none"> <li>• PHP and MySQL Web Development by Welling Thomson Fourth Edition, Pearson publication</li> <li>• Teach Yourself PHP, MySQL and Apache by Julie C. Meloni Pearson publication</li> </ul>			
<b>Suggested MOOC :</b>			
Please refer these websites for MOOCS:			
NPTEL / Swayam			
www.edx.com			
www.coursera.com			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction To PHP:</b> Installing and configuring PHP, Building blocks of PHP:PHP tags, variables, data types, operators, expressions, constants, Control Structures: conditional statements, loops, switch statement		
2	<b>Working With Functions And Arrays:</b> Working with functions: What is a function? Function declaration and definition, Calling function, user defined functions, variable scope, working with arrays: Creating, sorting and reordering arrays, PHP classes.		
3	<b>String Manipulation:</b> Working with strings, dates and time: Formatting, investigating and manipulating strings with PHP, using date and time functions in PHP, working with forms: Creating a simple input form. File Handling: Saving data, storing and retrieving Bob's order, processing files, opening file, writing to a file, closing a file, reading from a file, uses other useful file functions.		
4	<b>Working With Cookies And Sessions :</b> Working with cookies: Introducing cookies, setting and deleting cookies with PHP Working with session: starting a session, working with session variables, passing session IDs in the query string, destroying sessions and unsetting variables, using sessions		

5	<p><b>MYSQL :</b></p> <p>Creating web database: Using MySQL monitor, logging into MySQL, creating databases and users, setting users and privileges, column data types</p> <p>Working with MySQL database: Inserting data into database, retrieving data from the database, retrieving data with specific criteria, retrieving data from multiple tables, retrieving data in particular order, grouping and aggregate data, using sub queries, updating records, deleting records from databases, dropping table and database.</p>
6	<p><b>Accessing MYSQL Database From Web With PHP :</b></p> <p>Web database architecture, Querying database from the web: checking and filtering input data, setting up connection, Choosing database to use, querying database, retrieving the query result, disconnecting from the database.</p>

Course Number	Course Name	L-T-P- Credits	Year of Introduction
603	Software Project Management	3L-1T-0P= 4C	2018-19

**Course Objective :**

To provide basic project management skills with a strong emphasis on issues and problems associated with delivering successful IT projects. The course is designed to provide an understanding of the particular issues encountered in handling IT projects and to offer students methods, techniques and 'hands-on' experience in dealing with them.

**Expected Outcome :**

At the end of this course, student should be able to understand

- Understand and practice the process of project management and its application in delivering successful IT projects;
- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities;
- Identify the resources required for a project and to produce a work plan and resource schedule.

**References (Books, Websites etc) :**

- Information Technology Project Management: Kathy schwalbe, International student edition, THOMSON course Technology, 2003.
- B)Software project management : Bob Hughes and Mike Cottrell, Third edition, Tata McGraw-Hill
- Microsoft office Project 2003 Bible: Elaine Marmel, Wiley publishing Inc.
- **Software Requirement:** Microsoft project Tool.

**Suggested MOOC:**

Please refer these websites for MOOCS:

NPTEL / Swayam

[www.edx.com](http://www.edx.com)

[www.coursera.com](http://www.coursera.com)

**Course Plan**

Unit	Contents
1	<b>Introduction to project management:</b> Project, project management, Importance, characteristics of project how software projects are diff. than other projects, Problems with software projects, Phases: Initiation phase, planning phase, execution phase, monitoring and controlling phase, and closing phase. All parties involved in project, Role of Project Manager, Project management framework, Software tool for project management
2	<b>Project planning:</b> Integration management: What is integration management, plan development and execution, What is scope management, methods for selecting project, scope statement, Work Breakdown Structure, main steps in Project planning: identify project scope and



	objective, identify project infrastructure, analyze project characteristics, identify project products and activities, estimate effort for each activity, identify risk activity, allocate resources, review plan, execute plan. Use of software (Microsoft Project) to assist in project planning activities.
3	<b>Project scheduling:</b> Time management: importance of Project schedules, schedules and activities, sequencing and scheduling activities, Network Planning models, duration estimation and schedule development, Critical path analysis, PERT, Use of software( Microsoft project) to assist in project scheduling.
4	<b>Project cost management:</b> Importance and principles of project cost management, Resource planning, Attributes to be considered in cost estimation, factors affecting the cost, various costs involved in it. Traditional method: Estimation by analogy, Expert judgment, Parkinson, price to win, top down, bottom up. COCOMO Model, Function point analysis, Function point analysis, Cost control, Use of software( Microsoft project) to assist in cost management.
5	<b>Project quality management:</b> Quality of information technology project, Stages of software quality management, PMBOK, Quality standards, Tools and techniques for quality control.
6	<b>Project risk management:</b> The importance, Top risk in projects, Common sources of risk in IT projects, elements in risk mgt., Risk identification, Risk quantification, Risk response development and control, using software to assist in project risk management.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
604	Business Analytics	3L-1T-0P=4C	2018-19
<b>Course Objective :</b> <ul style="list-style-type: none"> <li>To gain an understanding of how decision makers use business analytics to formulate and solve business problems and to support Information System based decision making.</li> <li>To become familiar with the processes needed to develop, report, and analyze business data</li> </ul>			
<b>Expected Outcome :</b> At the end of this course, student should be able to understand <ul style="list-style-type: none"> <li>Identify and prioritize information &amp; data modelling.</li> <li>Identify and prioritize threats to information assets.</li> <li>Define an Geographical information system.</li> <li>Understand various types of Analytics and its significance.</li> <li>Understand text &amp; web mining</li> <li>Applications of business analytics</li> </ul>			
<b>References (Books, Websites etc) :</b> <ol style="list-style-type: none"> <li>Efraim Turban, Ramesh Sharda : Decision Support and Business Intelligence systems : PHI 8<sup>th</sup> Edition</li> </ol>			
<b>Suggested MOOC :</b> NPTEL, SWYAM			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Business Analytics &amp; Data Visualization:</b> Business Analytics (BA), Overview of Areas where Business Analytics is applied, OLAP, Reports & Queries, Multidimensionality, Advanced Business Analytics, Data Visualization, Geographical Information system, Real time Business Intelligence Automated Decision support, and Competitive Intelligence, BA & Web, Usage benefits & success		
2	<b>Visualization and Data Issues:</b> Organization of Source of Data, Importance of Data Quality, Dealing with Missing or incomplete data, data classification, Introduction to Data Mining, Data mining process, data mining tools XL MINER.		
3	<b>Data, Text &amp; Web Mining :</b> Data Mining concepts & applications, Data Mining Techniques & Tools, Data Mining Project Processes, Text Mining, Web Mining		
4	<b>Applications of Business Analytics :</b> Risk - Fraud Detection and Prediction, Recovery Management, Loss Risk Forecasting, Risk Profiling, Portfolio Stress Testing, Market share estimation and Sensitivity Analysis		
5	Loyalty Analytics, Customer Life Time Value, Propensity Analytics, Churn Analytics, Customer Analytics Customer Segmentation, Cross- Sell or Up sell Models		

6	Recruitment Analytics, Compensation Analytics, Talent Analytics, Training Analytics, Human Resource Retention Analytics, Workforce Analytics Project Work
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
606	Lab on Web Programming	0L-0T-4P=2C	2018-19

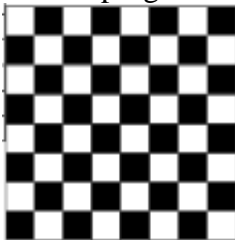
1. Write a Program for finding the biggest number in an array without using any array functions.
2. Write a program to square of a number.
3. Write a program to print Factorial of any number.
4. Write a program in PHP to print Fibonacci series.
5. Write a program to find whether a number is Armstrong or not.
6. Write a program to find HCF of two numbers
7. Write a program to demonstrate four built in functions.
8. Program to print the below format

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*****
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9. Write a program to make a chess:



10. Create the following form and based on the user selection print a message in the format given below:

Please select your favourite car

Nissan

Toyota

Mitsubishi

**Your favourite car is: Nissan**

11. Write a PHP script to accept personal details of student (rno, name, class) on first page. On second page accept marks of six subjects (out of 100). On third page print marklist (rno, name, class, marks, total, percentage)
12. Write a PHP file that will output a form containing 2 fields: username and password. Upon submission of the form, the code should check against the database to see whether the username-password pair was correct. If so, display a welcome message. If not,

display the message “Invalid username or password” followed by the same login form.

**13.** Write a PHP file that can be added to other PHP files using the include or require functions. This file should:

- a. Make a connection to a MySQL database, and log in with valid credentials. The connection resource should be stored in a variable with an appropriate name.
- b. Create a database TEST if it does not exist.
- c. Select the TEST database.
- d. Create a table USER exerciseusers if it does not exist with the following fields:
  - i. USERNAME VARCHAR(100) , PASSWORD\_HASH CHAR(40),  
PHONE VARCHAR(10)
- e. The USERNAME field should be designated as UNIQUE.
- f. If any of these operations cause an error, stop execution and print the error message

**14.** Design a web page that accepts inputs(username and password) and authenticate the username and password from a given database using PHP.

Note : Similar experiments can be designed.

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
607	Major Project	2 Credits	2018-19

**Course Objective :**

Student has to complete a Major project work under the guidance of the faculty member in the institute. Students has to develop any software using Web Development / Dot Net Framework in a group of 2 to 3. Each team has to give 4 minimum PPT presentation to the Project Guide during the semester. Final project viva will be conducted as per University Time Table.

Course Number	Course Name	L-T-P- Credits	Year of Introduction
608	Business Ethics	2L-0T-0P=2C	2018
<p><b>Course Objective:</b> The objective of this paper is to make the students more clear about the importance of ethics in business and practices of good corporate governance. It also talks about the corporate social responsibility</p>			
<p><b>Expected Outcome :</b> This course exposes the student to the issues of values and ethics in management so that decision making and decision execution are undertaken in a human manner, as this will add to the flexibility and dynamism of the corporate culture. The course will take the student from managerial ethics to organizational ethics and business sustainability.</p>			
<p><b>Reference Books :</b></p> <ul style="list-style-type: none"> <li>• Management by Values; Chakraborty S.K.; OxfordUniversity Press, Kolkata 2005.</li> <li>• Professional Ethics by R. Subramanian, Second Edition, OXFORD</li> <li>• Theory and Practice of Managerial Ethics; Jayashree S. Sadri S. and Dastoor D.S.; Jaico , Mumbai.</li> <li>• New Mantras in Corporate Corridors, Sharma Subash New age International Publishers, New Delhi 2007.</li> <li>• Business Ethics and Corporate Governance (towards excellence and sustainability); Sadri S., Jayashree. Himalaya Publishing Co. Mumbai 2011.</li> <li>• Managing from the Heart: Unfolding spirit in people and organization; Wakalu, Arun: Response Books, New Delhi</li> <li>• Manuel G Velasquez : Business ethics- concepts and cases Pearson.</li> <li>• Bhanumurthy K V: Ethics and Social Responsibility of Business, Pearson Education India.</li> </ul>			
<p><b>Online Resources:</b> <a href="https://managementhelp.org/businessethics/index.htm">https://managementhelp.org/businessethics/index.htm</a></p>			
<p><b>MOOCs:</b> <a href="https://www.edx.org/learn/business-ethics">https://www.edx.org/learn/business-ethics</a></p>			
Course Plan			
Unit	Contents		
1	Ethics – Meaning, and Nature of Ethics. Types of Ethics, Importance of Ethics. Business Ethics : Meaning, Nature and Importance of ethics in business, meaning of corporate social responsibility, Relation between corporate responsibility & Business Ethics.		
2	Concept of Morals, Values, Beliefs; Moral issues in business, Spirituality and Ethics; Influence of Major religions on ethics: Hinduism, Islam, Christianity, Buddhism, Sikhism, and Zoroastrianism. Influence of spirituality on ethics.		
3	Relationship between Business, Business Ethics & Business Development, Role of Business ethics in building a good society.		

	Case Studies on Business Ethics
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Course Number	Course Name	L-T-P- Credits	Year of Introduction
608	Basics of Hospitality Management	2L-0T-0P=2C	2018
<b>Course Objective:</b>			
<ul style="list-style-type: none"> <li>• Recognize scope and career in the hospitality industry.</li> <li>• 2. Identify the major segments and specialization of the industry and their operations.</li> </ul>			
<b>Reference Books :</b>			
<ul style="list-style-type: none"> <li>• Introduction to Hospitality Management, John R. Walker ,Pearson</li> <li>• Food and Beverage Service, D.R. Lillicrap,John A. Cousins &amp; <a href="#">Suzanne Weekes</a>, Book Power.</li> <li>• Food and Beverage Management, Bernard Davis , Sally Stone, Butterworth Heineman Ltd.</li> <li>• Hotel House Keeping and Management, Raghubalan, Oxford University Press.</li> <li>• Managing Front Office Operations, Michael Kasavanna, Richard Brooks , Charles Steadmon, AH&amp;LA.</li> </ul>			
<b>Online Resources:</b>			
www/youtube.com			
<b>MOOCs:</b>			
<a href="https://www.ifitt.org/hospitality-and-tourismmoocs/">https://www.ifitt.org/hospitality-and-tourismmoocs/</a>			
<b>Course Plan</b>			
Unit	Contents		
1	<b>Introduction to the Hospitality Industry:</b> <ol style="list-style-type: none"> <li>a. History and scope of the hospitality industry.</li> <li>b. Economic impact of the hospitality and tourism industries.</li> <li>c. Careers in the industry.</li> <li>d. Link between hospitality and travel and tourism.</li> <li>e. Major segments and specialization of the industry.</li> <li>f. medical tourism</li> </ol>		
2	<b>Recreation/Travel and Tourism:</b> <ol style="list-style-type: none"> <li>a. Operation of recreational facilities such as resorts, spas, theme parks, and clubs.</li> <li>b. Meetings, conventions, exhibitions, banquets, and other events.</li> <li>c. Travel agencies and concierge desks.</li> <li>d. Gaming entertainment industry.</li> </ol>		
3	<b>Operations:</b> <ol style="list-style-type: none"> <li>a. Leadership and management in the industry.</li> <li>b. Hospitality marketing.</li> <li>c. Human resources and risk management and safety procedures.</li> </ol>		

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
608	Aptitude	2L-0T-0P=2C	2018
<p>The objective of this paper is to increase the capabilities of the student required by the industry. As per the need of the industry, the students will be trained in the latest Mathematical, Statistical, Logical, Verbal Ability, Current Trends in IT etc by the industry experts.</p>			

**ELECTIVES:****Elective Group: (I) Information Security**

<b>Course Number</b>	<b>Course Name</b>	<b>L-T-P- Credits</b>	<b>Year of Introduction</b>
505-1-A	Information Security Concepts	3L+1T+0P=4C	2018
<b>Course Objective:</b> Introduce the learner to concepts involved in Information Security domain			
<b>Expected Outcome :</b> Theoretical understanding of Information Security Concepts			
<b>References (Books, Websites etc) :</b> CEH Study Guide - Sybex			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Information Security Concepts:</b> Confidentiality, Integrity and Availability of Information, Identification, Authentication and Authorization, Security Principles and Models		
2	<b>Physical Security:</b> Facility Requirement, Perimeter Security, Fire Protection, Fire Suppression, Power Protection, General Environmental Protection, Equipment Failure Protection		
3	<b>Network Security:</b> Secure Network design, Firewalls, WLAN Security, VPNs, Types and Sources of Network Threats		
4	<b>Operating System Security:</b> Windows, Linux/UNIX		
5	<b>Database Security:</b> MS SQL		
6	<b>Web Application Security:</b> Web Application Vulnerabilities, Secure Coding Techniques, Continuous Security Testing and Assessments		
7	<b>Compliance Standards :</b> IT Act, ISO 27001, ITIL Framework		

### Elective Group (I) Information Security

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-1-B	Information Security Administration	3L+1T+0P=4C	2018
<b>Course Objective:</b> Introduce the learner to concepts involving security administration			
<b>Expected Outcome :</b> Practical understanding of setting, managing and securing Information Systems			
<b>References (Books, Websites etc) :</b> Red Hat Linux Bible: Fedora and Enterprise Edition - by Christopher Negus			
<b>Suggested MOOC :</b> SWAYAM			
<b>Syllabus</b>			
Unit	Contents		
1	<b>Setup a Client:</b> Introduction to client-side devices, Setup, Manage and Secure a Desktop PC Setup, Manage and Secure a Mobile Device		
2	<b>Setup a LAN:</b> Introduction to LAN devices, Simulate a LAN, Setup, Manage and Secure a Local Area Network		
3	<b>Connect a LAN to the Internet:</b> Introduction to WAN devices, Setup, Manage and Secure a Connection to the Internet		
4	<b>Share an Internet Connection across a LAN:</b> Introduction to Internet Connection sharing, Introduction to NAT and PAT Setup, Manage and Secure a Proxy Server		
5	<b>Share resources over a LAN:</b> Setup, Manage and Secure a Print Server, Setup, Manage and Secure a File server		
6	<b>Host a Website:</b> Introduction to website hosting, Setup, Manage and Secure a Web Server		
7	<b>Setup support servers:</b> Setup, Manage and Secure a Mail Server, Setup, Manage and Secure a FTP Server, Setup, Manage and Secure a Boot Server, Setup, Manage and Secure a DNS Server		

## Elective Group II- Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-2-A	Introduction to Big Data	3L-1T-0P= 4C	2018
<p><b>Course Objective :</b> To introduce learner with Big Data Concept, decision making by doing analysis on the data and managing the data using Big Data Tools like Apache Hadoop, Pig and Hive. What are the problems of Big Data and how it can be solved by different tools.</p>			
<p><b>Pre-requisites:</b> Preliminary knowledge of computer, Data Mining, Data Warehousing Concepts.</p>			
<p><b>Expected Outcome :</b></p> <ul style="list-style-type: none"> <li>• Good knowledge of Big Data Concepts</li> <li>• Knowledge of Decision making using analysis on the Big Data</li> <li>• Introduction to Big data Tools like Hadoop and Weka.</li> </ul>			
<p><b>Reference Books :</b></p> <ol style="list-style-type: none"> <li>1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo</li> <li>2. Edureka lectures <b>Link:-</b> <a href="https://www.youtube.com/watch?v=A02SRdyoshM">https://www.youtube.com/watch?v=A02SRdyoshM</a></li> </ol>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction:</b> Big Data History, The Big Data Business Opportunity- Business Transformation Imperative, Big Data Business Model, Business Impact of Big Data</p>		
2	<p><b>Big Data In Organization:</b> Data Analytics Lifecycle, <b>Data Scientist Roles and Responsibilities</b> – Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize, New Organizational Roles, Liberating Organizational Creativity.</p>		
3	<p><b>Decision Theory And Strategy:</b> Business Intelligence Challenge, Big Data User Interface Ramifications, Human Challenge of Decision Making, <b>Strategy for Decision Making-</b> Big Data Strategy Document, Case Study.</p>		
4	<p><b>Value Creation Process:</b> Understanding Big Data Value Creation, Value Creation Drivers, <b>Michael Porter’s Value Creation Models-</b> Michael Porter’s Five Forces Analysis, Michael Porter’s Value Chain Analysis, Case Study.</p>		
5	<p><b>Big Data User Experience:</b> The Unintelligent User Experience, Understanding the Key Decisions to Build a Relevant User Experience, Using Big Data Analytics to Improve Customer Engagement, Uncovering and Leveraging Customer Insights, Big Data can Power a New Customer Experience.</p>		
6	<p><b>Big Data Use Cases:</b> <b>The Big Data Envisioning Process</b> –1. Research Business Initiatives, 2. Acquire and Analyze your Data, 3. Brainstorm New Ideas , 4. Prioritize Big Data Use Cases, 5. Document Next Steps, The Prioritization Process.</p>		

7

**Big Data Architecture:**

New Big Data Architecture, **Introducing Big Data Technologies** – Apache Hadoop, MapReduce, R, WEKA etc.

## Elective Group II Big Data

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-2-B	HADOOP	3L-1T-0P= 4C	2018
<b>Course Objective :</b> To introduce learner with HADOOP Tool for Business Intelligence, decision making by doing analysis on the data using HADOOP Tool and also managing the Big Data using HADOOP.			
<b>Pre-requisites:</b> Preliminary knowledge of computer, Big Data Analysis and Business Intelligence. Also students must know Core Java, C Programming and Data Structure Languages.			
<b>Expected Outcome :</b> <ul style="list-style-type: none"> <li>• Good knowledge of HADOOP Tool.</li> <li>• Knowledge of Decision making using HADOOP analysis on the Big Data</li> <li>• Hands-on Big Data tools- Hadoop, Pig, Hive, HBase</li> </ul>			
<b>Reference Books :</b> <ol style="list-style-type: none"> <li>1. Big Data- Understanding How Big Data Power Big Business –By Bill Schmarzo</li> <li>2. <a href="http://www.tutorialspoint.com">www.tutorialspoint.com</a></li> </ol>			
Course Plan			
Unit	Contents		
1	<b>BIG DATA Overview :</b> What is Big Data?, What Comes Under Big Data?, Benefits of Big Data, Big Data Technologies Operational vs. Analytical Systems, Big Data Challenges.		
2	<b>Introduction To HADOOP:</b> Hadoop Architecture, MapReduce, Hadoop Distributed File System, How Does Hadoop Work?, Advantages of Hadoop.		
3	<b>HDFS Overview:</b> Features of HDFS, HDFS Architecture, Starting HDFS, Listing Files in HDFS, Inserting Data into HDFS, Retrieving Data from HDFS, Shutting Down the HDFS.		
4	<b>MAPREDUCE:</b> What is MapReduce?, The Algorithm for MapReduce, Inputs and Outputs (Java Perspective), Analyze different use-cases where MapReduce is used, Differentiate between traditional way and MapReduce way.		
5	<b>Introduction To Hadoop Features:</b> New Big Data Architecture, Introducing HADOOP Features – Apache Hive, Apache HBase, Pig.		
6	<b>Multi Node Cluster:</b> Multi Node Cluster, Install Java, Creating User Account, Mapping the Nodes, Installing Hadoop, Configuring Hadoop, Start Hadoop Services, Adding New Data Node in the Hadoop Cluster, Removing New Data Node from the Hadoop Cluster.		
7	<b>Environment Setup:</b> Pre-installation Setup, Installing Java Downloading Hadoop Hadoop Operation Modes Installing Hadoop in Standalone Mode Installing Hadoop in Pseudo Distributed Mode Verifying Hadoop Installation, Implement basic Hadoop commands on terminal.		

### Elective Group: (III) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
505-3-1	E-Commerce	3L-1T-0P-4C	2018-19
<p><b>Course Objective :</b></p> <ul style="list-style-type: none"> <li>• To thoroughly understand the information technology for supporting E-commerce;</li> <li>• To understand the necessary infrastructure and functional components to develop Ecommerce systems;</li> <li>• To understand the design and application of E-commerce systems.</li> </ul>			
<p><b>Expected Outcome :</b></p> <p>Upon successful completion of the course students will be able to:</p> <ul style="list-style-type: none"> <li>• Recognize the impact of Information and Communication technologies, especially of the Internet in business operations</li> <li>• Recognize the fundamental principles of e-Business and e-Commerce</li> <li>• Use tools and services of the internet in the development of a virtual e-commerce site</li> </ul>			
<p><b>References :</b></p> <ul style="list-style-type: none"> <li>• E-commerce - C.S.V. Murthy, Himalaya Publishing House</li> <li>• E-commerce A Managerial Perspective - P.T. Joseph, Prentice Hall Of India</li> <li>• Frontiers of Electronics Commerce - Kalakota and Whinston, Pearson Education</li> </ul>			
<p><b>Suggested MOOC :</b> Swayam</p>			
<b>Course Plan</b>			
Unit	Contents		
1	<p><b>Introduction to E-Commerce:</b> Definition, E-commerce fundamentals, different types of E-commerce E-Commerce Infrastructure - The Internet and World Wide Web, Web system, Internet basics, Characteristics of Internet, Components of Internet – Uniform Resource Locators, Internet Protocol, Hypertext Transfer Protocol (HTTP), Internet Service Provider (ISP), Types of ISP, domain name, domain name types E-commerce vs Traditional Commerce, Networking Categories, Mobile Commerce</p>		
2	<p><b>Business Models for e-commerce:</b> Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business( B2B) <b>Electronic Data Interchange</b> Requirement of EDI, types of EDI, Advantages and Disadvantages of EDI</p>		
3	<p><b>E-commerce Payment System:</b> Limitations of traditional payment system, requirement of e-payment system, Internet payment systems - Credit card payment (e.g., SET protocol), E-cash, E-check, smart card, Electronic Funds Transfer, Digital Token Based E-Payment Systems, Modern Payment Systems, Steps for Electronic Payment, Payment Security, Net Banking</p>		



4	<p><b>Applications of E-Commerce:</b> E-commerce in banking, retailing, online publishing, online marketing, e-advertising, e-branding.</p>
5	<p><b>E-commerce Security:</b> Security issues, Privacy issues, Computer Security, security threats, security tools, Denial-of-Service attacks, Viruses, Unauthorized access to a computer network, Vulnerability of Internet Sites requirements, malicious code, intruders, attacking methods, Cryptography- encryption and decryption, public key encryption, private key cryptography, message digest, digital signature, digital certificate, firewalls, SSL. Firewall – Packet filtering, Application gateways.</p>
6	<p><b>Implementation of E-Commerce:</b> WWW.EBAY.COM - B2C Website – Registration, Growth of eBay, PayPal – New Trend in Making Payments Online, National Electronic Funds Transfer.</p>

### Elective Group: (III) Information Systems

Course Number	Course Name	L-T-P- Credits	Year of Introduction
605-3-B	Knowledge Management	3L+1T+0P=4C	2018
<p><b>Course Objective:</b> The objective of the course is to provide the basic skills of managing knowledge in organizations. Knowledge is an asset for retaining the competitive advantage of the organization. This course develops the capabilities of towards managing students to manage knowledge in organizations.</p>			
<p><b>Pre-requisites:</b> Knowledge about Information System and MIS with Implementation of MIS</p>			
<p><b>Expected Outcome :</b> After going through this course a student should be able to understand :</p> <ul style="list-style-type: none"> <li>• Will be able to understand the concepts of Knowledge and knowledge management .</li> <li>• Can be able to design and develop Knowledge management systems for Business applications .</li> <li>• Implementation of KM to various areas of Interest in Business Organizations .</li> </ul>			
<p><b>References (Books, Websites etc.):</b></p> <ol style="list-style-type: none"> <li>1. Madhukar Shukla:Competing Through Knowledge-Building a learning Organisation(Response Books, New Delhi.</li> <li>2. Tiwana, The Knowledge Management Toolkit: Practical Techniques for building a Knowledge Management Systmes, 2/e, Pearson Edu.</li> <li>3. Honey Cutt : “Knowledge Management Strategies”, PHI, New Delhi.</li> <li>4. A wad, KM, Pearson Edn, 2007.</li> <li>5. Barnes, Knowledge Management Systems, 1/e, Thomson 2006.</li> <li>6. Ikudiro Nonka &amp; Hirotaka Takeuchi, “ The Knowledge – Creating Company”, Oxford University Press, London.</li> </ol>			
<p><b>Suggested MOOC:</b> Please refer these websites for MOOC’s: NPTEL / Swayam www.edx.com <a href="http://www.coursera.com">www.coursera.com</a></p>			
<b>Syllabus</b>			
Unit	Contents		
1	<p><b>Introduction:</b> Definition, Scope and Significance of Knowledge Management , Difficulties of Knowledge Management, Techniques of KM – Implementation of KM, Organizational knowledge, Characteristics and Components of Organizational Knowledge</p>		
2	<p><b>Drivers of knowledge Management:</b> Pillars of knowledge Management, KM framework , Supply Chain of KM , Formulation of KM strategy.</p>		
3	<p><b>Technology and KM:</b> Technology components of KM – IT &amp; KM , Ecommerce and KM</p>		

4	<p><b>Total Quality Management and KM:</b> TQM and KM , Bench marking and KM.</p>
5	<p><b>Implementation of KM:</b> Discussion on Roadblocks to success, Implementing a KM programme , Critical Success Factors in KM , Implementation of KM</p>
6	<p><b>KM and Organizational Restructuring:</b> The Mystique of Learning, Organization:- Outcomes of learning, Learning and Change – Innovation, continuous Improvements, Corporate Transformation.</p>
7	<p><b>Case studies in Knowledge Management</b> Knowledge management in Health Care, Knowledge Management in Human Resource Management</p>

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**B. Tech. (Electrical) – 2014 Course**

**Sem- I**

Sr . No.	Name of Course	Teaching Scheme				Evaluation scheme						Credits	
		The ory Hrs/ wee k	Tuto rial Hrs/ wee k	Practi cal Hrs/ week	Tot al	Theory				Practi cal	Tot al	The ory	P R
						ES E	Continuous Assessment			TW			
							Attend ance	Assign ment	Un it Te st				
1	Engineeri ng Mathem atics – I	3	1	--	4	60	10	10	20	--	10 0	3	1
2	Fundame ntals of Civil Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
3	Engineeri ng Graphics	4	--	2	6	60	10	10	20	25	12 5	4	1
4	Engineeri ng Physics	4	--	2	6	60	10	10	20	25	12 5	4	1
5	Fundame ntals of Electrical Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
6	Professio nal skill develop ment- 1	2	--	--	2	30	--	20	--	--	50	2	--
7	Worksho p Technolo gy	--	--	2	2	--	--	--	--	50	50	--	1
	<b>Total</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>33 0</b>	<b>50</b>	<b>70</b>	<b>10 0</b>	<b>150</b>	<b>70 0</b>	<b>19</b>	<b>6</b>

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**B. Tech. (Electrical) – 2014 Course  
Sem- II**

Sr . N o.	Name of Course	Teaching Scheme				Evaluation scheme						Credits	
		The ory Hrs/ wee k	Tuto rial Hrs/ wee k	Practi cal Hrs/ week	Tot al	Theory			Practi cal	Tot al	The ory	P R	
						ES E	Continuous Assessment		TW				
							Attend ance	Assign ment					Un it Te st
8	Engineeri ng Mathem atics – II	3	1	--	4	60	10	10	20	--	10 0	3	1
9	Fundame ntals of Mechani cal Engineeri ng	3	--	2	5	60	10	10	20	25	12 5	3	1
10	Engineeri ng Mechani cs	4	--	2	6	60	10	10	20	25	12 5	4	1
11	Engineeri ng Chemistr y	4	--	2	6	60	10	10	20	25	12 5	4	1
12	Electrical and Electroni c Devices	3	--	2	5	60	10	10	20	25	12 5	3	1
13	Professio nal skill develop ment- 2	2	--	--	2	30	--	20	--	--	50	2	--
14	Fundame ntals of compute r program ming	--	--	2	2	--	--	--	--	50	50	--	1
	Total	19	1	10	30	33 0	50	70	10 0	150	70 0	19	6

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**ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

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**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**02: Fundamentals of Civil Engineering**

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
<b>Course Objectives:</b>					
To make student understand the scope and application of Civil Engineering					
<b>Course Outcomes:</b>					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.				
<b>UNIT - II</b>	<b>Surveying</b>				<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.				
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>				<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.				
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>				<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.				
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>				<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and				



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	sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
<b>Reference Books:</b>		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

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**ENGINEERING GRAPHICS**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted</b>
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.

Assignment 05 Problems on each unit in A3 size Drawing Book

**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.

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2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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**ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b> <b>Term Work: 25marks</b>	<b>Practical: 01</b>

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

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**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

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**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

**UNIT-VI**

**ARCHITECTURAL ACOUSTICS**

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

**QUANTUM MECHANICS**

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

**TERM WORK**

**Experiments**

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

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**Assignments**

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

***Reference Books:***

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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**02: Fundamentals of Electrical Engineering**

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>			
The Students should have			
1.	Mathematics		
2.	Physics		
<b>Course Objectives:</b>			
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.		
<b>Course Outcomes:</b>			
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems		
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks		
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries		
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer		
5.	Define basic terms of single phase and three phase ac circuits and supply systems		
6.	Know and use electrical safety rules		
<b>UNIT - I</b>	<b>Basic concepts</b>		<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems		
<b>UNIT - II</b>	<b>Network Theorems</b>		<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.		
<b>UNIT - III</b>	<b>Electrostatics</b>		<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.		



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<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency &amp; Regulation by direct load test.</p>	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	<p>AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar &amp; rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.</p>	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	<p>Basic layout of distribution system, Types of Wiring System &amp; Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.</p>	

**Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$  ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

**Text Books:**

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of

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India Pvt. Ltd	
<b>Reference Books:</b>	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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**Workshop Technology**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.

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**ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

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**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**FUNDAMENTALS OF MECHANICAL ENGINEERING**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted</b>
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

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UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p><b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p><b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

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**References-**

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition



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**10: Engineering Mechanics**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

**Course Pre-requisites:**

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

**Course Objectives:**

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

**Course Outcomes:**

**The student should be able to**

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves,	

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	Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>		
<b>A)</b> The term-work shall consist of minimum <b>Five</b> experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
<b>B)</b> The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.		
<b>Text Books:</b>		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
<b>Reference Books:</b>		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

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**ENGINEERING CHEMISTRY**

**Teaching Scheme:**  
**Lectures: 4Hrs/Week**  
**Practical: 2Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory: 04**  
**Practical: 01**  
**Term Work: 25marks**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process  
**(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography** : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.  
**Cement** : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.  
**(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.  
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.  
**(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.  
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.  
**(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions  
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.  
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.  
**(08 Hours)**

**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

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Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,  
Conformations :- conformations of ethane, conformations of n-butane

**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

**References / Text Books :**

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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<b>02: Electrical &amp; Electronic Devices</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Fundamentals of semiconductor physics	
<b>Course Objectives:</b>		
	This course introduces basic knowledge about electrical and electronics devices and measuring instruments .The course is designed for beginners to learn specifications, construction, characteristics and application circuits of It also introduces concepts of digital components	
<b>Course Outcomes:</b>		
1.	Classify different resistors, inductors and capacitors and select as per the application requirement.	
2.	Explain construction, characteristics, principle of operation of PMMC,MI, dynamometer type instruments and errors associated with them.	
3.	Describe and apply different methods of resistance measurement.	
4	Identify and describe electronic components, their circuits and electronic instruments (Diode, zener diode , LED, opto electronic device and CRO. Function generator, Digital mutimeter)	
5	Explain characteristics, principle of operation and applications of transistor and FET.	
6	Draw diagram and explain operation of transistor amplifiers , multivibrators and oscillators	
<b>UNIT - I</b>	<b>Electrical Components</b>	<b>(06 Hours)</b>
	Types of Resistors (Fixed, Variable, Precision-Carbon film, metal film, wire wound) ,their standard values, specifications and applications, Classification of capacitors based on dielectrics(Electrolytic, Ceramic, Polyester), their standard values, specifications and applications, Types of Inductors, Specifications & applications, Ferrite core, electromagnets	
<b>UNIT - II</b>	<b>Electrical Measuring Instruments</b>	<b>(06 Hours)</b>
	Static characteristics of an instrument, Accuracy, linearity, sensitivity, reproducibility, resolution, Types of errors, necessity of different torques in indicating instruments, recording instrument integrating instrument., Measurement of current and voltage : Construction, Principle of operation torque equation and sources of errors in PMMC, Moving Iron instrument, dynamometer type instrument, Extension of ranges using shunts and multipliers. Galvanometer: construction, principle of operation of D'Arsonval, vibration and ballistic galvanometer.	
<b>UNIT - III</b>	<b>Measurement of Resistance</b>	<b>(06 Hours)</b>
	Classification of resistances , measurement of Medium resistance ,	

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	ammeter voltmeter method , Wheatstone bridge, sensitivity of Wheatstone bridge, limitations of the method , measurement of low resistance .D.C. Potentiometer- Calibration of ammeter and voltmeter application, Kelvin bridge, Ohmmeter , measurement of high resistance , difficulties in measurement , use of guard circuit, direct deflection method , loss of charge method , earth tester and measurement of earth resistance, megger.	
<b>UNIT - IV</b>	<b>Basic Electronic Devices</b>	<b>(06 Hours)</b>
	Diode construction, characteristics , Half wave and full wave rectifier, filters, clipping and clamping circuits, zener diode, LED, seven segment display, photodiode , photo transistor ,opto coupler and optoisolator, DC regulated power supply, Series , Shunt regulator, line and load regulation, Three pin regulator ICs, Function Generator block diagram and working, front panel controls . Cathode Ray Oscilloscope block diagram and working, front panel controls, measurement of voltage and frequency , Digital multimeter block diagram and working	
<b>UNIT - V</b>	<b>BJT Circuits</b>	<b>(06 Hours)</b>
	Construction, characteristics and principle of operation of CE, CB, CC configuration, comparison, biasing circuits, DC operating point Transistor as an amplifier, current gain, $\alpha$ , $\beta$ relationships, voltage gain , other parameters ,Hybrid parameters ( for CE only), frequency response of amplifier . FET construction, characteristics, principle of operation, parameters, FET as an amplifier, Comparison of BJT and FET	
<b>UNIT - VI</b>	<b>Amplifiers &amp; Multivibrators</b>	<b>(06 Hours)</b>
	Multistage transistor amplifier- direct, RC coupled and transformer coupled , Classes of Power amplifiers , efficiency of operation, Feedback amplifiers , concept effect of feedback on gain Transistor Oscillators- Tuned collector, Colpitt's, Hartley, Wien Bridge , RC phase shift oscillator , Transistor as switch - Multivibrators - Astable, Mono stable , Bi-stable.	

**Term Work:**

The term work shall consists of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.

1. Study of data sheets & specifications of Electrical Components
2. Study of PMMC,MI & Dynamometer type electrical measuring instruments.
3. Measurement of low resistance by Kelvin's Double Bridge.
4. Measurement of resistance by Voltmeter –Ammeter method.
5. Measurement of earth resistance.
6. Study and use of Megger.
7. Use of cathode ray oscilloscope for voltage and frequency measurement

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8. Study of half wave, full wave rectifiers with and without filter.
9. To plot characteristics of CB/ CE configuration of transistor.
10. To plot characteristics of FET.
11. Frequency response of RC coupled amplifier.
12. Study of Multivibrators.

**Text Books:**

1. V K Mehta – “Principles of Electronics” S. Chand Publications
2. B L Theraja – “Electrical Technology”, Vol I & III, S. Chand Publications

**Reference Books:**

1. A.K.Sawhney - “Electrical measurements & measuring instruments” Dhanpatrai Publications
2. Allen Mottershed, - “Electronics Device and circuit an introduction” PHI Publications
3. Boylestad - “Electronics Devices Circuits & Theory”, PHI Publications.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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<b>02: Fundamentals of Computer Programming</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: -- Hours / Week	End Semester Examination: --	-- Credits
Practical: 02 Hours / Week	Continuous Assessment: --	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of operation of computer as a user	
2.	Basic arithmetic concepts	
3.	Possible awareness of use of software programming language for computation	
<b>Course Objectives:</b>		
	Understand programming fundamentals like algorithms, flow charts, computations, data types, looping, conditions, variables, branching, arrays, files and reporting using C++ with future application in solving mathematical, analytical and algorithm based engineering problem computations..	
<b>Course Outcomes:</b>		
1.	Knowledge of programming fundamentals, programming practices and its use in solving problems	
2.	Knowledge of software programming language C++	
3.	Hands on practical experience of usage of C++ programming for various operations	
<b>UNIT - I</b>	<b>INTRODUCTION TO COMPUTER FUNDAMENTALS</b>	<b>(06 Hours)</b>
	Introduction to: Operating Systems, System Folders, Graphical User Interface, Types of Users, Configuration, System Files, Programming Languages (High level, Assembly, Machine level, Scripting, Natural, 4GL and others), Concept of automation and use of computer programming, Modern Computer Hardware Accessories (Dongle, Wi-Fi, Bluetooth, others)	
<b>UNIT - II</b>	<b>INTRODUCTION TO PROGRAMMING FUNDAMENTALS</b>	<b>(06 Hours)</b>
	Algorithms, Flow-charts, Use and practice of Algorithms and Flow-charts (exchanging values, ascending / descending order, evaluation of series like sin(x) and others), editors, compilers, libraries, interpreters, pseudo code, programming planning, Good programming practices	
<b>UNIT - III</b>	<b>INTRODUCTION TO DATA TYPES AND COMPUTATIONS</b>	<b>(06 Hours)</b>
	Various data types (Integer, Boolean, Binary, Character, Floating, Image, Long, Short and others), data formats like date, time, currency, etc, constants, computations (arithmetic, trigonometric, scientific and others), Concept of structured programming, Iterations, Looping, Flow of programming	
<b>UNIT - IV</b>	<b>PROGRAMMING CONCEPTS USING C++</b>	<b>(06 Hours)</b>
	History of C++, Structured programming concepts, C++ programming basics, Keywords, Include and header files, Instructions, Operands, Data	



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	formatting, Basic programming for printing on console, Printing in file, Accepting inputs and managing input and output, Basic reporting	
<b>UNIT - V</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>(06 Hours)</b>
	Object Oriented Programming (OOPS) concepts, Class and objects, Abstraction, Encapsulation, Inheritance, Polymorphism, Functions and its types (inline, static, virtual, member), Parameter passing, Overloading, Constructors and Destructors, Access control	
<b>UNIT - VI</b>	<b>OBJECT ORIENTED PROGRAM DEVELOPMENT USING C++</b>	<b>(06 Hours)</b>
	Software development process, Files and file structure, Common errors and debugging, Introduction to arrays, Programming using OOPS concepts, Functions, Arrays, Calculations and reporting	
<b><u>Term Work:</u></b>		
<ol style="list-style-type: none"> <li>1. Draw algorithm, develop flow chart and write pseudo code for arranging input in ascending / descending order</li> <li>2. Develop flow-chart of a program using multiple data types, operations / calculations and printing the output in formatted manner (marks, grades and mark list printing)</li> <li>3. Develop a basic C/C++ program to accept user input, format the input and print the input</li> <li>4. Develop C/C++ program for experiment no. 1</li> <li>5. Develop C/C++ program for experiment no. 2</li> <li>6. Develop C/C++ program using functions and passing variables</li> <li>7. Develop C/C++ program for using input and output files and arrays</li> <li>8. Develop C/C++ program for printing report to console and output file using data from input file, user input and arrays with the use of functions</li> </ol>		
<b>Text Books:</b>		
1) Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw Hill Education, 2008		
2) Yeshwant Kanetkar, "Let Us C++", BPB Publications		
<b>Reference Books:</b>		
1) Robert Lafore, "Object Oriented Programming in C++", Techmedia Publications		
2) James P. Cahoon, Jack W. Davidson, "C++ Program Design", TMH Series		
3) Scott Meyers, "Effective C++", Addison-Wesley		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	--	
Unit Test -2	--	

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electrical) Sem – III (2014 Course)**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
15	Engineering Mathematics –III	3	--	1	60	20	10	10	--	--	100	4	--	4
16	Electrical Machines – I	4	2	-	60	20	10	10	50	--	150	4	1	5
17	Linear & Digital Integrated Circuits	3	2	-	60	20	10	10	--	50	150	3	1	4
18	Digital Computational Techniques	3	2	-	60	20	10	10	--	50	150	3	1	4
19	Electrical Measurements & Instrumentation	3	2	-	60	20	10	10	50	--	150	3	1	4
20	Professional skill development - 3	4	--	-	100	--	--	--	--	--	100	4	--	4
	<b>Total</b>	<b>21</b>	<b>8</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electrical) Sem – IV (2014 Course)**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
21	Power Electronics	3	2	--	60	20	10	10	--	50	150	3	1	4
22	Electrical Machines - II	4	2	--	60	20	10	10	50	--	150	4	1	5
23	Network Analysis	3	2	1	60	20	10	10	50	--	150	4	1	5
24	Generation, Transmission & Distribution	3	2	--	60	20	10	10	--	50	150	3	1	4
25	Electrical Engineering Materials	3	--	--	60	20	10	10	--	--	100	3	--	3
26	Professional skill development-4	4	--	--	100	--	--	--	--	--	50	4	--	4
	<b>Total</b>	<b>21</b>	<b>8</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Total Credits Sem – III : 25**

**Total Credits Sem – IV : 25**

## B.Tech (Electrical) – SEM-III

<b>Engineering Mathematics-III</b>		
<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
Students should have basic knowledge of:		
1.	Differential calculus	
2.	Integral calculus	
3.	Complex numbers	
4.	Vector algebra	
<b>Course Objectives:</b>		
	To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.	
<b>Course Outcomes:</b> At the end of the course , the students will be able to:		
1.	Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.	
2.	Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.	
3.	Apply theorems to compute the Laplace transform, inverse Laplace transforms.	
4	Solve difference equation by Z-transform.	
5	Calculate the gradients and directional derivatives of functions of several variables.	
6	Use Green's theorem to evaluate line integrals along simple closed contours on the plane.	
<b>UNIT - I</b>	<b>Linear Differential Equations (LDE)</b>	<b>(09 Hours)</b>
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.	
<b>UNIT - II</b>	<b>Complex Variables</b>	<b>(09 Hours)</b>
	Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem	
<b>UNIT - III</b>	<b>Transforms</b>	<b>(09 hours)</b>
	Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.	
<b>UNIT – IV</b>	<b>Laplace Transform (LT)</b>	<b>(09 hours)</b>
	Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.	
<b>UNIT - V</b>	<b>Vector Differential Calculus</b>	<b>(09 Hours)</b>

	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.	
<b>UNIT - VI</b>	<b>Vector Integral Calculus</b>	<b>(09 Hours)</b>
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.	
<b>Term Work:</b>		
1. Linear Differential Equations		
2. Complex Variables		
3. Transforms		
4. Laplace Transform		
5. Vector Differential Calculus		
6. Vector Integral Calculus		
<b>Text Books:</b>		
1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).		
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).		
<b>Reference Books:</b>		
1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).		
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).		
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)		
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).		
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

<b>Electrical Machines - I</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Practical : 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
	Basic of Machine, Magnetic theory, AC & DC Fundamentals	
<b>Course Objectives:</b>		
	To develop the students to identify, analyze & to understand the fundamentals, classification, application and selection of DC machine, Transformer & Induction Machines for a particular application as per the operational characteristics.	
<b>Course Outcomes:</b> The students will be able to		
1.	To draw equivalent circuit, phasor diagram and calculate the efficiency and regulation of single phase transformer	
2.	Identify the difference between the single phase and three transformers and also will Apply the concepts and application of the three phase transformer and also can analyze using the basics of additional terms & various connections of the three phase transformer.	
3.	Apply the concepts and application of Electromagnetic Laws, Energy balance.	
4.	Identify different parts, Describe the basics of machine, armature reaction, commutation, characteristics & applications of dc generators, dc motors	
5.	Apply the concepts and application of single phase induction motors and other small size motors.	
6.	Apply the concepts and application of advancements in DC machines & transformers.	
<b>UNIT – I</b>	<b>Single Phase Transformers</b>	<b>(06 Hours)</b>
	Introduction to Single phase transformer, Development of equivalent circuit, Approximate & Exact equivalent circuit, & Phasor diagram, Efficiency of a Transformer, Condition for maximum efficiency, All day efficiency of Transformer, single phase Autotransformer, saving in copper. Kapp regulation diagram, Back to back test, Open circuit and Short circuit tests on single phase Transformer, Routine and Type Test on single phase transformer as per IS, Parallel operation of single phase Transformer.	
<b>UNIT – II</b>	<b>Polyphase Transformers</b>	<b>(06 Hours)</b>
	Comparison between single three phase unit and three single phase units, standard connections & phasor groups, parallel operation of three phase transformers, Three winding transformers, On-Load Tap Changer. Concept of polarity & Polarity Test, open circuit and short circuit tests, Direct Load Test, Sumpner's test (Back to back), I.S. Specifications of transformers. Concept of routine and type tests. Testing of transformers as per I.S. specifications.	
<b>UNIT – III</b>	<b>Principles of Electromechanical Energy Conversion</b>	<b>(06 Hours)</b>
	Introduction, Basic Electromagnetic Laws, EMF induced in a coil rotating in a magnetic field, forces and torques in magnetic field systems, Energy balance, Energy in singly excited magnetic field systems, Determination of magnetic force and torque from Energy, Multiply excited magnetic field systems, Forces and torques in systems with permanent magnets, Dynamic equations	
<b>UNIT – IV</b>	<b>DC Machines</b>	<b>(06 Hours)</b>

	Basic principle of working, Construction, E.M.F. equation of D.C. generators. Process of commutation & types, causes of bad commutation and remedies, Basic principle of working of DC motor, Significance of Back e.m.f., Torque equation, Types, characteristics and applications of d.c. motors, Starting, reversing and armature voltage and field control method of speed control, Armature reaction, Losses, efficiency, condition for maximum efficiency and maximum power output. Testing of DC motor.	
<b>UNIT – V</b>	<b>Fractional Kilowatt Motors</b>	<b>(06 Hours)</b>
	Construction of single phase induction motors, types, double revolving field theory, methods of self-starting, torque-speed/slip characteristics, equivalent circuit, applications, Shaded Pole motor, Commutator motors, Universal motor, Repulsion motors, Servo motors	
<b>UNIT – VI</b>	<b>Modern Trends in DC Machines and Transformers</b>	<b>(06 Hours)</b>
	Construction, working, characteristics and applications of: PMDC Motor, Stepper motor, BLDC motor, Printed Circuit Board Motor, Air Motor, dry type transformer, isolation transformer, Optical CT/PT	
<b>Term Work:</b>		
The Practical's shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> <li>1. Open circuit and short circuit tests on a single phase transformer</li> <li>2. Performance of standard connections (Scott and open delta) for three phase transformers</li> <li>3. Sumpner's test on two identical single phase transformers</li> <li>4. Parallel operation of two single phase transformers</li> <li>5. Three phase to six phase transformation</li> <li>6. Identification of DC machine windings and resistances</li> <li>7. Speed control of D. C. Shunt motor by Armature and Field control</li> <li>8. Brake test on DC shunt motor</li> <li>9. Swinburn's Test on DC shunt Motor</li> <li>10. Load test on single phase induction motor (Split phase induction motor)</li> <li>11. Computation of Equivalent Circuit of single phase induction motor</li> <li>12. Load test on ac series motor</li> </ol>		
<b>Text Books:</b>		
1. Nagrath Kothari, "Electrical Machines", Tata McGraw Hill		
2. A. E. Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "Electric Machinery", Tata McGraw Hill		
3. M. G. Say, "Alternating Current Machines", Pitman Publishing Ltd.		
4. Ashfaq Husain, "Electric Machines", Dhanat Rai & Co.		
<b>Reference Books:</b>		
1. Dr. S. K. Sen, "Electric Machinery", Wiley Eastern		
2. B. H. Deshmukh, "Electrical Technology", Nirali Prakashan		
3. A. S. Langsdorff, "Theory of Alternator Current Machinery", Tata McGraw Hill		
4. Bhag S. Guru, Huseyin R. Hiziroglu, "Electric Machinery & Transformers", Oxford.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

<b>Linear and Digital Integrated Circuits</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral 25marks	01 Credit
<b>Course Prerequisites:</b>		
The students should have knowledge of		
1.	Fundamentals of semiconductor physics, electronics devices	
<b>Course Objectives:</b>		
	This course introduces basic knowledge about linear and Digital integrated circuits. It describes fundamentals of Operational amplifier characteristics and application circuits. It also introduces concepts of digital components, combinational and sequential circuits.	
<b>Course Outcomes:</b> After learning this course the students will be able to		
1.	Specify operational amplifier parameters and connect the operational amplifier to perform basic applications.	
2.	Describe the operation of circuit with proper component ratings, circuit diagram, input, output waveforms.	
3.	Compare specifications of voltage regulator ICs and select as per requirements. Identify pins of IC 555 and analyze circuits of IC 555	
4	Apply knowledge of number conversion and binary arithmetic and to use Boolean algebra to develop K map logic.	
5	Draw logic circuits of multiplexer , de-multiplexer, ADC, DAC	
6	Describe different flip- flops with circuit diagram, truth table and applications such as registers, counters	
<b>UNIT - I</b>	<b>Operational Amplifiers</b>	<b>(06Hours)</b>
	Block diagram and working of operational amplifier, pin diagram and specifications of IC 741, IC 324, operational amplifier parameters input offset current, input offset voltage, Common Mode Rejection Ratio (CMRR), PSRR, slew rate, bandwidth and frequency response, Basic op-amp applications: Inverting amplifier, Non-inverting amplifier, Adder, Subtractor, Instrumentation amplifier, AC voltage follower, V to I and I to V converter	
<b>UNIT - II</b>	<b>Waveform Generators using Operational Amplifiers</b>	<b>(06 Hours)</b>
	Integrator, differentiator, Square, triangular, sine wave generator, saw-tooth, Comparator, zero crossing detector, Schmitt trigger, precision rectifier, peak detector, clipper, clamper, V to F and F to V converter, sample and hold circuit	
<b>UNIT - III</b>	<b>Applications of Op-Amp and Other IC's</b>	<b>(06Hours)</b>
	Voltage regulators using ICs Viz. 78xx, 79xx, LM 317, IC 723 Active filters - configuration with frequency response, Analysis of first order low pass and high pass filters, Timer IC555 construction, working and modes of operation: astable, monostable and sequence timer	
<b>UNIT - IV</b>	<b>Numbering Systems and Boolean Algebra</b>	<b>(06 hours)</b>
	Numbering systems - binary, octal, decimal and hexadecimal and their conversion, codes - BCD, ASCII, Grey and excess3, Binary arithmetic: addition and subtraction by 1's and 2's compliment. Logic gates, Booleans algebra, De-Morgon's theorem, K-map: structure for two and three variables, SOP and POS form reduction of Boolean expressions by K-	



	map 1-bit comparator analysis using K-map	
<b>UNIT - V</b>	<b>Combinational Logic Circuits</b>	<b>(06Hours)</b>
	Comparator, parity generator, Multiplexer, De-multiplexer using K-map, adder, subtractor, arithmetic logic unit, decimal to BCD encoder (74147), BCD to 7 segment decoder/driver (7446/7447), display device, ADC, Dual slope SAR, DAC - binary weighted, ladder type, Memories: RAM - static and dynamic, ROM, PROMS and EPROMS, EEPROMS detailing.	
<b>UNIT - VI</b>	<b>Sequential Logic Circuits</b>	<b>(06 Hours)</b>
	Flip Flops: S-R, Clocked S-R, D latches, Edge triggered D flip-flops, Edge triggered JK flip flops, JK Master-slave flip flop, Registers, Buffer registers, shift registers, controlled shift registers, asynchronous counters, synchronous counter, twisted ring counters, N-module counters, Counter IC's	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> <li>To Study Data sheet of IC 741, 324, IC555, IC 723</li> <li>To observe op. amp as adder, subtractor</li> <li>To observe operational amplifier as square, triangular wave, sine wave generator.</li> <li>To observe operation of operational amplifier as comparator, ZCD, Schmitt trigger</li> <li>To observe input, output waveforms of an Operational amplifier as integrator and differentiator.</li> <li>Operational amplifier as low pass or high pass filter and observe frequency response</li> <li>To connect IC 555 as mono-stable multi vibrator and observe waveforms.</li> <li>To connect logic gates as per pin diagram and verify truth table</li> <li>To design half adder and full adder using basic gates.</li> <li>To verify operation of various flip flops by truth table</li> <li>To observe shift register operation using IC7495</li> <li>To understand features of synchronous and asynchronous counter and use them for different modes such as up/down, mode N, frequency divider.</li> <li>To use BCD to 7 segment decoder (7446,7447) BCD to decimal decoder (7441, 7442)</li> <li>To study specifications of ADC and DAC chips</li> </ol>		
<b>Text Books:</b>		
1. D. Roy Choudhary, Shail Jain – “Linear Integrated Circuits” -Wiley Eastern Limited.		
2. R. P. Jain - “Modern Digital Electronics”-Tata McGraw hill		
3. K. R. Botkar –“Integrated circuits”- Khanna publishers		
<b>Reference Books:</b>		
1. Ramakant A. Gaikwad- “Op-amp and Integrated circuits”, Fourth edition, PHI Publication, 2002.		
2. L. K. Maheshwari and M.M. S Anand – “Analog Electronics” -Prentice Hall of India, New Delhi		
3. D. P. Leach, A. P. Malvino- “Digital principles and applications” -Tata McGraw Hill		
4. James - “Operational amplifier and linear Integrated Circuits Theory and applications”		
5. Charles H. Roth –“Fundamental of Logic Design” –Jaico book		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

## Digital Computational Techniques

<b>Digital Computational Techniques</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks    Practical : 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Mathematics (integration, differentiation, simultaneous equations, polynomial equations), Basics of programming, C++ language, Program debugging skills, Flowchart and algorithm development	
<b>Course Objectives:</b>		
	To develop the students for understanding, analyzing and applying numerical methods using digital techniques (C++ and MATLAB) to solve mathematical and engineering problems.	
<b>Course Outcomes:</b> The students will be able to		
1.	Refresh the basics of C++ language and MATLAB and solve problems using multiple numerical techniques with C++ and MATLAB	
2.	Understand importance of high speed calculations, errors involved and preliminary mathematical theorems	
3.	Find the roots of transcendental & polynomial equations	
4.	Understand and use various numerical interpolation methods to solve polynomial equations	
5.	Perform numerical differentiation and integration using multiple methods/techniques	
6.	Solve linear algebraic simultaneous equations using elimination and iterative methods	
<b>UNIT – I</b>	<b>Basics of C++ and MATLAB Programming</b>	<b>(06 Hours)</b>
	Data types, Operator, Variables, Control Statements, Loops, Access Control, Arrays, Functions and their types, Object Oriented Programming (OOPS) concepts, Class and Object, Abstraction, Encapsulation, Inheritance, Polymorphism, Parameter passing, Function overloading, Inline functions, Virtual functions, Friend functions, Members and Functions, MATLAB Basics (operations, built-in functions, commands, arrays, display, files, programming in MATLAB	
<b>UNIT – II</b>	<b>Introduction to Numerical Computations:</b>	<b>(06 Hours)</b>
	Basic principle of numerical methods and necessity of computers for high speed calculations, Floating point algebra with normalized floating point technique, Significant digits, Mathematical preliminaries: Rolle's Theorem, Generalized Rolle's Theorem, Intermediate Value Theorem, Mean Value Theorem for derivatives, Errors and their computations: Absolute, Relative and Percentage errors	
<b>UNIT – III</b>	<b>Transcendental and Polynomial Equations:</b>	<b>(06 Hours)</b>
	Roots of an equation and methods to find the same, Solve equations using Bisection, Secant, Regula-Falsi and Newton-Raphson methods, Single variable and multi variable Newton-Raphson techniques, Curve fitting using least square approximation – first order and second order.	
<b>UNIT – IV</b>	<b>Interpolation:</b>	<b>(06 Hours)</b>
	Introduction to interpolation and calculus of finite differences, Polynomial interpolation methods: Lagranges, Newton's forward, backward & central difference methods, Sterling and Bessel's interpolation	
<b>UNIT – V</b>	<b>Differentiation and Integration:</b>	<b>(06 Hours)</b>
	Numerical differentiation using simple interpolation techniques like Lagrangian and Newton Gregory methods, Numerical integration using Trapezoidal, Simpsons	

	Rule, Solution of ordinary differential equation using Euler's, Modified Euler's, Taylor Series, Runge-Kutta second and fourth order techniques using Hune's and Polygon method	
<b>UNIT – VI</b>	<b>Linear Algebraic Simultaneous Equations:</b>	<b>(06 Hours)</b>
	Direct methods like Gauss Elimination method and Gauss Jordan method, Concept of pivoting – partial and complete, Iterative methods like Gauss-Siedel, Accelerated Gauss-Siedel and Jacobi's method, Matrix inversion using Jordan method and Eigen Values using Power method and Jacobi methods	
<b>Term Work:</b>		
The Practical's shall consist of record of minimum eight experiments.		
13. Newton-Rhapson method using C++ Programming 14. Gauss Elimination method using C++ Programming/MATLAB 15. Gauss Seidel Method using MATLAB 16. Jacobi Method using MATLAB 17. Lagranges Interpolation method using C++ Programming 18. Newtons Divided Difference Interpolation method using C++ Programming 19. Trapezoidal method using C++ Programming 20. Euler's method using C++ Programming 21. Runge-Kutta 4 <sup>th</sup> Order method using C++ Programming 22. C++ Program on Inheritance 23. C++ Program on Polymorphism 24. C++ Program on derived class constructor and destructor		
<b>Text Books:</b>		
3. S. S. Sastry, "Introductory Methods of Numerical Analysis", 4 <sup>th</sup> Edition, PHI		
4. M. K. Jain, R. K. Jain, S.R.K. Iyengar, "Numerical Methods for Scientific and Engineering Computation", 6 <sup>th</sup> Edition, New Age International Publishers		
5. Balaguruswamy, "Object Oriented Programming in C++", Edition 2008, Tata McGraw Hill		
4. Yashavant Kanitkar, "Let Us C++", 2 <sup>nd</sup> Edition, BPB Publications		
5. Dr. J. S. Chitodia, "Numerical Methods", Technical Publications		
6. Rao V. Dukupati, "MATLAB – An Introduction with Applications", New Age International Publishers		
<b>Reference Books:</b>		
5. Santosh K. Gupta, "Numerical Methods for Engineers", Wiley Eastern Ltd.		
6. John R. Hubbard, "Schaum's Outline of Programming with C++", 2 <sup>nd</sup> Edition, Schaum's Series		
7. Babu Ram, "Numerical Methods", Pearson Publications		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

<b>Electrical Measurement and Instrumentation</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03	End Semester Examination: 60 Marks	03 Credits
Practical: 02	Continuous Assessment: 40 Marks	
	Practical:	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Basic electrical Engineering Parameters such as Voltage, current, Power, Energy, etc.	
2.	Various physical Parameters such as, Temperature, Pressure, Flow, vibration, etc.	
<b>Course Objectives:</b>		
	This course introduces knowledge about electrical measurement and instrumentation. The course is designed to learn different methods of measurements of various electrical parameters and also to learn the different physical parameters with the help of the various measurement and instrumentation techniques.	
<b>Course Outcomes: After learning this course students will be able to</b>		
1.	Explores the importance of measurement and various terms related to measurement. Measure /calculate unknown inductance and capacitance by balancing of AC bridge. State specifications of instrument transformers and use them for high voltage and high current measurement.	
2.	Draw circuit diagram, connect wattmeter for measurement of three phase active and reactive power and energy meter for measurement of energy.	
3.	Draw block diagram, state specifications, functions of various digital/automated meter, harmonic analyzer	
4.	Classify various types of transducers. Explain principle of operation, characteristics, specifications of displacement and level transducers and different methods of measurement.	
5.	Explain principle of operation, characteristics, specifications of Pressure and temperature transducers and different methods of measurement.	
6.	Select appropriate transducer, recorder and display device as per requirement	
<b>UNIT – I</b>	<b>Introduction</b>	<b>(06 Hours)</b>
	<p><b>Introduction:</b> significance of measurement, classification of instruments, mechanical, electrical, electronic instruments, deflection and null type, applications of measurement system.</p> <p><b>AC Bridges:</b> Introduction, sources and detectors for ac bridge, general equation for bridge at balance. Measurement of Inductance: Maxwell's Inductance &amp; Maxwell's Inductance – Capacitance Bridge, Anderson's Bridge, Schering Bridge for measurement of capacitance, Wien's Bridge for measurement of frequency, Universal Impedance Bridge</p> <p><b>Instrument Transformers:</b> Introduction to CT &amp; PT as instrument transformers. Difference between CT operated meter &amp; whole current meter. Advantages of instrument transformers over shunts and multipliers, Accuracy class, burden on instrument transformers, expression for ratio and phase angle errors in case of C.T. and P.T. (No derivation), and precaution in using instrument transformers. Clip on ammeter.</p>	
<b>UNIT - II</b>	<b>Measurement of Power and Energy</b>	<b>(06 Hours)</b>
	<p><b>Measurement of Power:</b> Construction, working principle, torque equation, advantages/disadvantages, errors and their compensation of dynamometer type wattmeter, low power factor wattmeter, Active &amp; reactive power measurement in three phase balanced &amp; unbalanced system (one wattmeter and two wattmeter methods), Power Measurement using Instrument Transformer, Three Phase wattmeter.</p>	

	<b>Measurement of energy:</b> Energy Meters in AC circuits, Single Phase Induction Type Energy Meter - Construction, principle of operation, torque equation of induction type energy meter, errors and adjustments. Three phase three wires, and three phase four wire energy meter, Electronic energy meter	
<b>UNIT - III</b>	<b>Electronic Devices and Signal Analyzer's</b>	<b>(06 Hours)</b>
	Electronic Voltmeters and their Advantages, Vacuum Tube Voltmeters, difference Amplifier Type Voltmeters, DC Voltmeters with direct Coupled Amplifier, Measurement of Power at Audio and Radio Frequencies. Digital Storage Oscilloscope – Principle of operation and waveform reconstruction. Concept of: Numeric meter & its types (TOD, ABT, Prepaid & panel mounted meters.) Measurement of power & energy by sampling technique automatic meter reading (AMR) and advanced metering infrastructure (AMI), Meter reading instrument (MRI). Wave Analyzers – Frequency Selective Wave Analyzers and Heterodyne Wave Analyzers and its applications. Harmonic Distortion Analyzer, Spectrum Analyzer, Standing Wave Ratio, Power Analyzer.	
<b>UNIT - IV</b>	<b>Displacement and Level Measurement</b>	<b>(06 Hours)</b>
	Introduction to Transducers, classification, basic requirements for transducers and Advantages of Electrical Transducers. <b>Displacement measurement:</b> Potentiometer as displacement transducer, Strain Gauge: Theory of Strain Gauges, Types of strain gauges: Un-bonded and Bonded types their construction, working, advantages and disadvantages, load cell, LVDT & RVDT – construction, working, application, null voltage, specifications, advantages/disadvantages, effect of frequency on performance. Capacitive transducers – Advantages, Disadvantages and Applications. <b>Level measurement:</b> Introduction and importance of level measurement, level measurement methods: mechanical, hydraulic, pneumatic, Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors	
<b>UNIT - V</b>	<b>Pressure and Temperature Measurement</b>	<b>(06 Hours)</b>
	Pressure Measurement:, classification of pressure as low/medium/ high, absolute/gauge/vacuum, static/dynamic & head pressure. Types of Pressure Measurements Devices, Pressure Measurement using Electrical Transducers as Secondary Transducers. Low Pressure Measurement – Thermocouple Vacuum Gauge, Pirani Gauges and Ionization Type Vacuum. Temperature Measurement: Electrical Resistance Thermometer, Platinum Resistance Thermometer, Semi conductor Thermometers, Thermocouples, Thermistors, Quartz Crystal Thermometers, Bimetallic Thermometers. Electrical methods of temperature measurement – signal conditioning of industrial RTDs and their characteristics – 3 lead and 4 lead RTDs.	
<b>UNIT - VI</b>	<b>Measurement of Velocity and Flow, Recorders and Display Devices</b>	<b>(06 Hours)</b>
	<b>Measurement of Velocity</b> – Moving Magnet Type, Moving Coil Type, Seismic Tape Type. Measurement of Angular Velocity. <b>Measurement of flow</b> – Turbine Meter, Electromagnetic Flow Meters, Hot Wire Anemometer, Ultrasonic Flow Meter. <b>Recorders and Display Devices:</b> Recording Requirement, Analog Recorders, Graphic Recorders, Strip Chart Recorders, Null Type Recorders, X-Y Recorders, Ultraviolet Recorders, Direct Recorders. Digital Display Methods, Digital display Units, Rear Projector Display, Light Emitting Diodes (LED), Liquid Crystal Diodes (LCD), Resolution and Sensitivity of Digital Meters	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> <li>1. Calibration of ammeter and voltmeter with the help of potentiometer.</li> <li>2. To extend range of wattmeter by use of CT and PT.</li> <li>3. To measure power in three phase balanced load by one wattmeter method.</li> <li>4. To measure power in three phase balanced/ unbalanced load by two wattmeter method.</li> <li>5. To measure reactive power in three phase circuit by one wattmeter method.</li> </ol>		

6. To study and analyze the various electrical parameters using Power Analyzer.
7. To calibrate single phase energy meter at (i) unity power factor (ii) 0.5 lagging power factor (iii) 0.5 leading power factor (analog / Digital)
8. Study of digital storage oscilloscope C.R.O.s of different types and their applications.
9. Measurement of capacitance and loss angle by Schering Bridge.
10. Measurement of inductance by Anderson's bridge.
11. Displacement measurement by LVDT.
12. Strain measurement using strain gauge.
13. Bourdon Tube
14. Study of process control application of using the instrumentation kit.
15. Introduction to thermography, detection of hot spots, oil level, defective winding in transformer using thermo vision techniques.

**Text Books:**

1. A Course in Electrical and Electronic measurements & Instrumentation – by A. K. Sawhney, Dhanpat Rai & Sons.
2. Electronic Instrumentation: H.S. Kalsi – THM, 2<sup>nd</sup> Edition 2004.
3. A Course in Electronic and Electronic measurements by J. B. Gupta, S. K. Kataria & Sons.
4. Measurement by Baldwin

**Reference Books:**

1. Electrical Measurement & Measuring Instruments Fifth edition, by E. W. Golding & Widdies, A. H. Wheeler & Co. Ltd.
2. Electronic measurement and instrumentation by Dr. Rajendra Prasad, Khanna Publisher, New Delhi.
3. Introduction to Measurements and Instrumentation, Second Edition by Ghosh, PHI Publication.
4. Introduction to Measurements and Instrumentation by Anand .PHI Publication

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## B.Tech (Electrical) - SEM-IV

<b>Power Electronics</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks    Oral 25 marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Fundamentals of Electronics Engineering.	
<b>Course Objectives:</b>		
This course introduces basic knowledge about electronics devices used for control of power. It describes characteristics, application circuits of SCR and other power devices.		
<b>Course Outcomes:</b> After learning this course the students will be able to		
1.	Describe specifications, characteristics of power electronics components.	
2.	Explain operation of AC-AC converters at different load conditions with mathematical equation and waveforms	
3.	Explain operation of AC-DC converters at different load conditions with mathematical equation and waveforms	
4	Compare and select among switching device (IGBT, MOSFET, MCT) as per the application requirement.	
5.	Compare and select various Choppers based on application requirements.	
6.	Compare Voltage Source Inverter (VSI) and Current Source Inverter (CSI)	
<b>UNIT - I</b>	<b>Thyristor Power Devices</b>	<b>(06 Hours)</b>
	SCR - static and dynamic characteristics, specifications, two transistor analogy, gate characteristics, triggering circuits, protection of SCR Protection of power circuit from - over voltage, over current & temperature rise (thermal) Design of Snubber circuit.	
<b>UNIT - II</b>	<b>AC to DC Convertors (Single phase and three phase)</b>	<b>(06 Hours)</b>
	Single phase convertor, three phase semi controlled and fully controlled bridges with R, RL and RLE loads, derivation of average and RMS output voltage and current, rectification and inversion mode of operation, concept of overlap angle and associated voltage drop calculation, dual convertor and selection of transformer and semiconductor devices for convertors. Total Harmonic Distortion (THD).	
<b>UNIT - III</b>	<b>AC Voltage Controllers</b>	<b>(06 Hours)</b>
	DIAC, TRIAC - construction, characteristics, four mode operation, specifications, triggering of TRIAC using DIAC, AC voltage regulator principle, single phase and three phase analysis with R and RL Load, Harmonics and ripple factor, Applications of two stage, three stage and multistage voltage controllers, derivation of average and RMS output voltage and current	
<b>UNIT - IV</b>	<b>Transistor Power Devices</b>	<b>(06 Hours)</b>
	MOSFET, IGBT, MCT - Construction, Characteristics, Specifications, Safe Operating Areas, protection, switching action and their control circuit requirement, comparison and area of application of these devices, Diagram and working of Switched Mode Power supply (SMPS) and Uninterrupted Power Supply (UPS)	
<b>UNIT - V</b>	<b>DC to DC Convertors</b>	<b>(06 Hours)</b>
	Principle of operation of chopper, classification on the basis of operating quadrants control techniques, CLC, TRC, PWM and FM techniques, analysis of step up choppers and numerical with RLE load, area of application, necessity of input filter, derivation of average and RMS output voltage and current	
<b>UNIT - VI</b>	<b>DC to AC Inverters</b>	<b>(06 Hours)</b>
	Single phase and three phase inverters principle of operation, VSI and CSI inverters, applications, operating frequency range. PWM inverters: single pulse, multi-pulse and sinusoidal pulse modulation, PWM techniques for voltage control and harmonic elimination.	

<b>Term Work:</b>	
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.	
1. V-I Characteristic of SCR, DIAC & TRIAC	
2. V-I characteristic of power semiconductor devices GTO, MOSFET, IGBT	
3. 1 Phase half Controlled & Full controlled converter (R & RL Load)	
4. 3 phase converter (R, RL, RLE Load)	
5. Step down Chopper circuit (RC technique)	
6. 3 phase Voltage Source transistorized inverter	
7. Firing circuit for 3 phase converter	
8. 1 phase or 3 phase AC voltage regulator	
9. 3 phase AC – DC converter with RLE Load	
10. 1 phase PWM bridge inverter	
11. Commutation circuit of SCR	
12. Design of Snubber Circuit	
13. Collection of data sheets of Power Devices	
14. Summary reports of NPTEL videos on Power Devices	
<b>Text Books:</b>	
1. M. H. Rashid – “Power Electronics” 2009 Edition, Pearson publication	
2. Ned Mohan, Undeland, WP Robins - “Power Electronics” 3 <sup>rd</sup> edition, John Wiley & Sons International Student edition	
3. B. W. Williams – “Power Electronics” 2 <sup>nd</sup> edition -Macmillan publication	
4. Dr. P. S. Bhimbra - “Power Electronics” third edition, Khanna Publication	
5. K Hari Babu - “ Power Electronics” - Scitech Publication	
<b>Reference Books:</b>	
1. Vedam SubraManyam - “Power Electronics” - New Age international, New Delhi	
2. Dubey, Donald, Joshi, Sinha - “Thyristerised Power Controller”- Wiley Eastern New Delhi	
3. M. D Singh & K B Khandchandani, “Power Electronics” - Tata McGraw hill	
4. Jai P Agarwal - “Power Electronics, Systems theory & design” LPE Pearson Education	
5. L Umanand - “Power Electronic, Essentials & Applications” - Wiley publication	
6. Randall , Shaffer - “Fundamental of Power Electronics with Matlab”	
7. J. Michale, Jacob - “Power Electronics Principles & Applications”	
8. V K Mehta – “Principles of Electronics” – S. Chand Publications	
9. NPTEL website Video lectures by B. G. Fernandes	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



<b>Electrical Machines-II</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Basic laws of rotating machines like Faraday's Law, Lenz's Law, etc	
2.	Basics of Electrostatics and electromagnetic	
3.	Transformer operation	
4.	Induction machine operation	
5.	DC Machine operation	
<b>Course Objectives:</b>		
	To understand the theory, operation, characteristics and applications of Three phase Induction, Synchronous Machines and special purpose machines.	
<b>Course Outcomes:</b> The students will be able to		
1.	Describe the basics of synchronous generators & identify the different parts, different excitation systems, armature windings, to find the regulation by different methods of non-salient pole alternator.	
2.	Apply the concepts of three phase synchronous generator and analyze using the basics of different tests on Syn. Gen.	
3.	characteristics of alternators	
4	Understand the concept of synchronization and parallel operation of alternators	
5	Understand working principle, characteristics, operation and applications of synchronous motors	
6	Understand working, characteristics and usage of special purpose electrical machines	
<b>UNIT - I</b>	<b>Synchronous Generators (Alternators) - Principles</b>	<b>(08 Hours)</b>
	Types of synchronous machines & their constructional features, Excitation Systems. <b>Synchronous generator (cylindrical rotor type):</b> Principle of working, Armature Windings & Estimation of winding factor, EMF Equation, Rating of Generator, Generator on no load & balanced load, Armature reaction & its effect under load power factors, Synchronous Impedance, Equivalent Circuit & Phasor Diagram, <b>Synchronous Generator (Salient Pole):</b> Two Reaction Theory model, Estimation of Direct & Quadrature axes Synchronous Reactance by Slip Test, Phasor Diagram. Power Flow (Transfer) Equations, Power – Power angle relation and Capability Curves of synchronous generators.	
<b>UNIT - II</b>	<b>Synchronous Generators (Alternators) - Operation</b>	<b>(08 Hours)</b>
	DC resistance test, Open circuit Test & Short Circuit Test on synchronous generator, Determination of Voltage Regulation by direct load test & by Indirect Methods-EMF, MMF & Potier Triangle Method, Losses & Efficiency and Short Circuit Ratio. Parallel Operation of alternators - Necessity, Conditions, Prime Mover Characteristics & load Sharing. Concept of Infinite bus, alternators connected to infinite bus bar, Methods of	

	synchronizing alternators (synchronizing lamps and synchro-scope), Significance of Synchronizing Power Coefficient.	
<b>UNIT - III</b>	<b>Three Phase Synchronous Motor</b>	<b>(08 Hours)</b>
	Principle of operation, Methods of starting, Equivalent Circuit & Phasor Diagrams, Pull-in & Pull-Out Torque, Power Flow Equations, Operation with constant excitation & variable load and with Constant load & variable excitation (V Curves & Inverted V Curves), Phenomenon of Hunting & its remedies, Applications.	
<b>UNIT - IV</b>	<b>Three Phase Induction Motor – Principles</b>	<b>(08 Hours)</b>
	Construction (Squirrel cage, Wound rotor), Concept of rotating magnetic field, Principle of Operation, Concepts of Speed & Slip, Frequency of rotor voltage & current, Power Flow Diagram & development of Equivalent Circuits, Losses, Relationship between rotor copper loss, rotor input & gross mechanical power developed, Efficiency, Torque–Slip/Speed characteristics, Effect of rotor resistance on Torque-Slip characteristics, Condition for maximum torque, Relations between starting, Full load & Maximum torque.	
<b>UNIT - V</b>	<b>Three Phase Induction Motor – Operation</b>	<b>(08 Hours)</b>
	Starters for cage rotor & wound rotor induction motors (DOL, Star/Delta, Auto transformer, Stator resistance, Rotor resistance, soft starters), Open circuit and short circuit test, Circle diagram and computation of performance parameters, High Torque Cage Motors - Deep bar & Double cage rotor, Speed control mechanisms (VFD, cascading, pole changing, slip power recovery), Cogging & Crawling of induction motors, Applications.	
<b>UNIT - VI</b>	<b>Special Purpose Machines</b>	<b>(08 Hours)</b>
	Construction, working principle, characteristics and applications – Induction Generator, Induction Voltage Regulator, Linear Induction Motor, Synchronous Induction Motor, Permanent Magnet Synchronous Machine, Reluctance motor, Hysteresis motor, AC Series Motor.	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> <li>1. Direct loading test on alternator</li> <li>2. Open circuit and short circuit test on alternator – regulation by emf and mmf method</li> <li>3. Slip test on salient pole alternator – regulation by two reaction theory</li> <li>4. Synchronization of alternator with bus bar</li> <li>5. V-Curves of synchronous motor</li> <li>6. Load test on synchronous motor</li> <li>7. Load Test on three phase induction motor</li> <li>8. No load &amp; Blocked Rotor Test on three phase induction motor: Determination of Equivalent Circuit Parameters/Plotting Circle diagram</li> <li>9. Measurement of Slip by Stroboscopic Method</li> <li>10. Speed Control of Wound Rotor Induction Motor</li> <li>11. Demo and study of three phase Linear Induction Motor</li> <li>12. Study &amp; comparison of Starters of three phase induction motor.</li> <li>13. Load test on Universal Motor</li> <li>15. Load Test on PMSM</li> </ol>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Nagrath Kothari, “Electrical Machines”, Tata McGraw Hill</li> <li>2. B L Theraja, “Electrical Technology”, Vol II, Chand Publications</li> </ol>		

<b>Reference Books:</b>	
1.	Dr. S. K. Sen, "Electric Machinery", Wiley Eastern
2.	B. H. Deshmukh, "Electrical Technology", NiraliPrakashan
3.	M. G. Say, "Alternating Current Machines", McGraw Hill
4.	A. S. Langsdorff, "Theory of Alternator Current Machinery", Tata McGraw Hill
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

<b>Network Analysis</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	Theory : - 03
Practical: 02 Hrs/Week	Continuous Assessment: 40 Marks	Practical : - 01
Tutorial:- 1Hr/Week	Term Work : 25 Marks, Practical: 25 Marks	Total : - 04
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Engineering Physics, Fundamentals of Electrical Engineering	
2.	Engineering Mathematics ( Differential equations, Integrations, Laplace Transforms, Fourier Transform	
<b>Course Objectives:</b>		
	This course introduces concepts of Network Analysis such that simplification of any complex network applying theorems, classical method (Transient response) or Laplace transform method or Fourier transform method.	
<b>Course Outcomes: The students will be able to</b>		
1.	Calculate solution of differential equation of an active (Excited by an ac source or DC source), Linear, bilateral complicated network using various network theorems.	
2.	Analyze transient response of passive elements in pre-excited or unexcited conditions ( initial conditions) using classical method	
3.	Apply Laplace Transform Technique to analyze the behavior & response of passive elements in pre-excited or unexcited conditions ( initial conditions)	
4	Represent any network as two port network, Define and calculate various parameters like open circuit impedance, short circuit admittance, Transmission & Hybrid parameters and their applications in electrical domain	
5	Formulate network function for a given circuit and comment about stability from poles and zeros of function.	
6	Analyze a given circuit / waveform using Fourier Transform method.	
<b>UNIT - I</b>	<b>Network Theorems in AC circuits</b>	<b>(06 Hours)</b>
	Introduction, Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for AC networks, Concepts of super node and super mesh. Thevenin’s theorem, Norton’s theorem, Superposition theorem, Maximum power transfer theorem, Millman’s theorem, Reciprocity theorem, Substitution theorem, Compensation theorem, Tellegen’s Theorem	
<b>UNIT - II</b>	<b>Transient Response of Passive Circuits</b>	<b>(06 Hours)</b>
	Introduction, transient response of series R-L and R-C circuit having DC excitation, Transient response in RL and RC circuit with sinusoidal excitation. Transient response in RLC circuit with DC and sinusoidal excitation Resonance, Coupled circuits, Scattering matrix and its application in network analysis	
<b>UNIT - III</b>	<b>Laplace Transformation and its application</b>	<b>(06 Hours)</b>
	Laplace transform of a derivative and integration. Laplace transform of common forcing functions, Initial and final value theorem, Time displacement theorem, Convolution theorem, Impulse response of R-L and R-C Circuit, Application of Laplace transformation technique in electric circuit analysis.	
<b>UNIT - IV</b>	<b>Two Port Networks:</b>	<b>(06 Hours)</b>
	Short circuit admittance, open circuit impedance, transmission and inverse transmission, hybrid and inverse hybrid parameters. Relation between parameter sets, $T, \pi$ , Ladder, lattice, twin T networks. Input and out put impedance in terms two port parameters. Interconnection of networks. Symmetry and reciprocity	
<b>UNIT - V</b>	<b>Network Functions:</b>	<b>(06 Hours)</b>
	Network function for one port and two port networks: ladder networks, general network,	

	poles and zeros of network functions, Restriction on poles and zeros for driving point functions and transfer functions. Network synthesis of RL,RC,LC circuits	
<b>UNIT - VI</b>	<b>Fourier analysis</b>	<b>(06 Hours)</b>
	Exponential form of Fourier series, trigonometric form of Fourier series, symmetry in Fourier series, Frequency spectrum, properties of Fourier analysis, shifting of function, applications in circuit analysis. Fourier series representation of periodic signals, Fourier integral & Fourier transform analysis with Fourier transform. Convolution integral.	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> <li>1. Verification of Superposition theorem in A.C. circuits.</li> <li>2. Verification of Thevenin's theorem in A.C. circuits.</li> <li>3. Verification of Reciprocity theorem in A.C. circuits.</li> <li>4. Verification of Millmans' theorem.</li> <li>5. Verification of Maximum Power Transfer theorem in A.C. circuits.</li> <li>6. Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor)</li> <li>7. Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit)</li> <li>8. Determination of time response of R-L-C series circuit to a step D.C. voltage input.</li> <li>9. Determination of parameter of Two Port Network.</li> <li>10. Determination of Resonance of R-L-C Parallel circuit</li> <li>11. Determination of Resonance, Bandwidth and Q factor of R-L-C series circuit.</li> </ol>		
<b>Text Books:</b>		
1. C. K Alexander and M. Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, Fourth Edition, 2009 ( <a href="#">ISBN: 0077263197 / 9780077263195</a> )		
2. M. E. Van Valkenburg, "Network Analysis", PHI / Pearson Education, 3rd Edition. Reprint 2002.		
3. Roy Choudhury, "Networks and Systems", 2 <sup>nd</sup> edition, 2006 re-print, New Age International Publications		
4. F.F.Kuo, "Network analysis & Synthesis", Wayne Publication		
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai Publication		
6. G. K. Mithal, "Network Analysis", Khanna Publication		
<b>Reference Books:</b>		
1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", TMH, 7 <sup>th</sup> Edition, 2010		
2. J. David Irwin / R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8 <sup>th</sup> edition, 2006.		
3. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", Tata McGraw-Hill, 3 <sup>rd</sup> edition, 2009.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

<b>Generation, Transmission &amp; Distribution</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03	End Semester Examination: 60 Marks	Theory : - 03
Practical: 02	Continuous Assessment: 40 Marks	Practical : - 01
	Term Work : 25 Marks, Practical: 25 Marks	Total : - 04
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Electromagnetic energy conversion system	
2.	Fundamentals of Electrical Engineering	
<b>Course Objectives:</b>		
	This course introduces knowledge about electrical power generation, its transmission and distribution. The course is designed to learn different methods of power generation. Also it focuses on performance of transmission line and distribution system along with its design consideration.	
<b>Course Outcomes:</b> Students will be able to		
1.	Draw block diagram and describe the function of components of various Power Generation techniques by Conventional energy Sources.	
2.	Define and analyze the significance of terms such as load factor , diversity factor etc on economics of power generation Draw block diagram and describe the function of components of various Power Generation techniques by Non Conventional energy Sources.	
3.	Draw block diagram and describe the function of components of various Power Generation techniques by Non Conventional energy Sources.	
4	Calculate string efficiency, sag and R, L, C parameters of different types of transmission line.	
5	Represent TEE and PI model of line and analyze the performance of transmission line.	
6	Explore different type of cables & its calculations along with the computation of performance of AC distribution.	
<b>UNIT - I</b>	<b>Power Generation techniques by Conventional energy Sources</b>	<b>(06 Hours)</b>
	Introduction to energy sources, selection of site – classification – general arrangements and operations – functions of each component – types of turbines – electric generators – advantages and disadvantages - list of major power stations : of Hydro electric , Thermal and Nuclear power plants in India with capacity. Basic layout and working of diesel and gas power plant. Concept of grid, types of grids	
<b>UNIT - II</b>	<b>Load Curves and Economic Aspects</b>	<b>(06 Hours)</b>
	Load Curves: load curve – base load station and peak load station - demand factor – maximum demand – average demand – diversity of load – load factor – diversity factor – significance of high load factor & diversity factor – plant factor – capacity factor – connected load – load duration curve – integrated load duration curve – selection of units. Per capita energy consumption of developed & developing countries. Concept of cogeneration and captive generation.	
<b>UNIT - III</b>	<b>Power Generation techniques by Non -Conventional energy Sources</b>	<b>(06 Hours)</b>
	Different types of Nonconventional Energy Sources, Comparative benefits over conventional type, contribution of conventional & nonconventional energy sources, Solar energy – Its characteristics, basic concept of solar power plant, major solar power plants in India/world, Wind power plant– schematic arrangement - vertical axis, horizontal axis – electrical generator Hybrid solutions : Wind Turbine, diesel, WT-solar etc. – major wind farms in India / world, Power generation by bio gas, biomass, geothermal energy and tidal energy– its types, Magneto Hydro Dynamics (MHD), Concept of carbon credit.	
<b>UNIT - IV</b>	<b>Design of Transmission Line</b>	<b>(06 Hours)</b>

	<p>Transmission Line Components and its types - Line Supports, Conductors, Insulators, Potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.</p> <p>Sag: Catenary curve – calculation of sag and tension – effects of wind and ice loading sag templates – vibration dampers for transmission lines.</p> <p>Corona and interference, Various effects – Skin, Proximity, Ferranti etc.</p> <p>Various Parameters of Transmission Line – Resistance, Inductance and capacitance - their calculation.</p>	
<b>UNIT - V</b>	<b>Transmission Line Performance analysis :</b>	<b>(06 Hours)</b>
	<p>Circuit Representation of Transmission Line: Representation and performance of short, medium and long transmission line – Surge Impedance Loading (SIL), Characteristic Impedance, Generalized circuit constants: - Representation of tee and pi models of lines as two port networks – evaluation and estimation of ABCD constants –sending end and universal power circle diagrams.</p>	
<b>UNIT - VI</b>	<b>Underground Cables and Distribution System</b>	<b>(06 Hours)</b>
	<p>Underground Cables - Classification – construction - insulation resistance – capacitance – dielectric stress in single core cable. Grading of cables. Laying of cables – cable jointing – causes of failure – cable faults and location of faults.</p> <p>Distribution System – Classification – A.C. distribution connection schemes - requirements of distribution system – design consideration – design of radial, ring distributors for concentrated, distributed loads</p>	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments from below list.		
<ol style="list-style-type: none"> <li>1. Measurement of A, B, C, D constants of short transmission line.</li> <li>2. Measurement of A, B, C, D constants of Medium transmission line.</li> <li>3. Measurement of A, B, C, D constants of Long transmission line.</li> <li>4. Circle diagram of medium transmission line.</li> <li>5. Circle diagram of short transmission line.</li> <li>6. Drawing Sheet on power generation by Conventional energy Sources</li> <li>7. Drawing Sheet on power generation by non Conventional energy Sources</li> <li>8. Drawing Sheet on types of insulator</li> <li>9. Drawing Sheet on types of cables</li> <li>10. Industrial visit to cable manufacturing</li> <li>11. Industrial Visit report of HPS</li> <li>12. Industrial Visit report of TPS / GAS PP</li> <li>13. Industrial Visit report of WPS / Solar PP</li> </ol>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. A Course in Power System - J. B. Gupta - S. K. Kataria &amp; Son's</li> <li>2. V. K. Mehta, "Electrical Power System", S. Chand Publications</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Electrical Power - S. L. Uppal - Khanna Publication</li> <li>2. Energy Technology - S. Rao, Dr. B B Panelkar - Khanna Publication</li> <li>3. A Course in Power Plant Engineering - Arrora, Domkundwar - Dhanpatrai &amp; Co. Publications</li> <li>4. A Course in Electrical Power - Soni, Gupta, Bhatanagar - Dhanpatrai &amp; Co. Publications</li> </ol>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

<b>Electrical Engineering Materials</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b> Engineering Physics		
The Students should have knowledge of		
1.	Electrical Engineering materials	
<b>Course Objectives:</b>		
	To understand in detail the properties of interest of the materials used in Electrical Engineering	
<b>Course Outcomes:</b> Student should able to		
1.	get knowledge about conducting materials.	
2.	get knowledge about magnetic materials.	
3.	get knowledge about insulating materials.	
4	get knowledge about dielectric & optical properties of materials.	
5	get knowledge about Nano materials.	
6	get knowledge about materials for electronics components	
<b>UNIT - I</b>	<b>Electrical Conducting Materials</b>	<b>(06 Hours)</b>
	High conductivity materials : Copper, Aluminum, Iron & Steel ,Alloys of Copper Materials of High Resistivity: Materials used in precision work, Materials used for rheostat, materials used for heating devices. Electrical carbon materials, Superconductivity, Thermoelectric effects, operation of thermocouple, alloys, Thermobimetals, Study of Electrolyte.	
<b>UNIT - II</b>	<b>Magnetic Materials</b>	<b>(06 Hours)</b>
	Classification of magnetic materials: Diamagnetism, Paramagnetism, Ferromagnetism, Anti-ferromagnetism, Ferrimagnetism. Soft magnetic materials, Solid core materials, Sheet steel, electric steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet. Special purpose alloy, Alloyed steels with silicon, high silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines. Common magnetic materials, Magnetic resonance, Magnetic Shielding	
<b>UNIT - III</b>	<b>Insulating Materials</b>	<b>(06 Hours)</b>
	Electrical properties of insulating materials, Temperature rise and insulating materials, Classification of insulating materials. Insulating materials used in modern electrical machines. Applications of insulating materials: Insulating materials for wires, Insulating materials for laminations, Insulating materials for machines, Insulating materials for transformers. Thermoplastic materials: Poly-vinyl chloride (PVC), Polyethylene, silicons, their important properties & applications. Natural insulating materials: Mica, Asbestos, Ceramic materials, Glass, Cotton, Silk, Jute, Paper, Rubber	
<b>UNIT - IV</b>	<b>Dielectric &amp; Optical Properties of Materials</b>	<b>(06 Hours)</b>
	<b>A).Dielectric Properties of Insulating Materials:</b> Static Field ,Dielectric Parameters [Dielectric constant, Dipole moment, Polarization, Polarizability], Mechanisms of Polarizations-Electronic, Ionic and Orientational Polarization (Descriptive treatment only), Clausius Mossotti Equation, Piezo-Electric, Pyro-Electric & Ferro-Electric Materials, Dielectric Loss and loss Tangent. <b>B) Optical Properties of Materials &amp; Cells used for Power Generation:</b> Photo-Conductivity, Photo-Electric Emission, Photo-Voltaic cells [Materials Used, Construction, Equivalent Circuit, Working and Application], Photo-Conductive cells, Photo-Emissive cells, Photo emitters, photo transistors, photo resistors, application of photo sensitive materials (CRT, Tube Light, Photo Panals)	
<b>UNIT - V</b>	<b>Nano Materials</b>	<b>(06 Hours)</b>



	Introduction, Concepts of Energy bands & various Conducting Mechanism in Nano-structures, Carbon Nano-structures, Carbon Molecules, Carbon Clusters, Carbon Nano-tubes, Applications of Carbon Nano-tubes, Special Topics in Nano Technology such as Single Electron Transistor , Molecular Machines, BN Nanotubes, Nano wires, Application of Nano materials in electrical engineering.	
<b>UNIT - VI</b>	<b>Materials for Electronics Components</b>	<b>(06 Hours)</b>
	Introduction, Resistors: Carbon composition resistors, Insulated moulded resistors, Film type resistors, Cracked carbon resistors, Alloy resistors, Metallic–oxide film resistors, Wire wound resistors, High value resistors, Non linear resistors, Varistors, Variable resistors. Capacitors: Capacitor paper, Loss tangent, Electric strength & operating stress, Mica dielectric capacitors, Ceramic dielectric capacitors, Glass dielectric capacitors, Vitreous enamel dielectric capacitors, plastic dielectric capacitors, Electrolytic capacitors, Air dielectric capacitors, variable capacitors Inductors : Construction, Air cored coils, cored coils	
<b>Text Books:</b>		
1. A Course in Electrical Engineering Materials by S. P. Seth, Dhanpat Rai and Sons, Delhi -6.		
2. Electrical Engineering Materials by K. B. Raina & S. K. Bhattacharya, S. K. Kataria & Sons, Delhi-06.		
3. Electrical & Electronics Engineering Materials By Navneet Gupta , Dhanpat Rai & Co.		
4. Nanotechnology - A gentle introduction to next big idea by Mark Ratner & Daniel Ratner, Pearson Education		
5. Introduction to Nanotechnology by Charles P. Poole, Jr. Frank & J. Ownes (Wiley Student Edition)		
6. Introduction to Nano Science & Technology – Chattopadhyay – PHI Publication		
<b>Reference Books:</b>		
1. Electrical Engineering Materials by C. S. Indulkar & S. Thiruvengadam, S. Chand & Com.Ltd		
2. Electrical Engineering Materials by S. P. Chalotra & B. K. Bhatt, Khanna Publishers		
3. Introduction to Material Science for Engineering by James F. Shackelford, M.K. Muralidhara, Pearson Education, Sixth Edition.		
4. Insulation Technology Course Material of IEEMA, Ratner, Pearson Education.		
5. Electrical Engineering Materials, Dekkar, PHI Publications.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

Board of Studies  
Electrical Engineering Bharati Vidyapeeth  
University, Pune

**STRUCTURE AND THE SYLLABI**

**B.TECH. [ ELECTRICAL ]**

**SEMESTER V AND VI**

**[ 2014 Course ]**

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme: B.Tech (Electrical) Sem – V (2014 Course)**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
27	Linear Control Systems	3	2	--	60	20	10	10	--	50	150	3	1	4
28	Micro controller	3	2	--	60	20	10	10	--	50	150	3	1	4
29	Electrical Machine Design	4	2	1	60	20	10	10	--	50	150	5	1	6
30	Electrical Estimation, Costing & Installation	3	--	--	60	20	10	10	--	--	100	3	--	3
31	Elective - I	3	--	--	60	20	10	10	--	--	100	3	--	3
32	Professional skill development- 5	4	--	--	100	--	--	--	--	--	100	4	--	4
33	*Seminar	--	2	--	--	--	--	--	--	50	50	--	1	1
	<b>Total</b>	<b>20</b>	<b>8</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>--</b>	<b>200</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Optional Subject**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
15	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

**Bharati Vidyapeeth University, Pune**  
**Faculty of Engineering & Technology**  
**Programme : B.Tech (Electrical) Sem –VI (2014 Course)**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
34	Switchgear and Protection	3	2	--	60	20	10	10	--	50	150	3	1	4
35	Power System Analysis	4	2	--	60	20	10	10	50	--	150	4	1	5
36	Modern Control Systems	4	2	--	60	20	10	10	--	50	150	4	1	5
37	Elective - II	3	2	--	60	20	10	10	--	50	150	3	1	4
38	Industrial Organization & Management	3	--	--	60	20	10	10	--	--	100	3	--	3
39	Professional Skill development- 6	4	--	--	100	--	--	--	--	--	100	4	--	4
40	**Mini Project	--	2	--	--	--	--	--	--	--	--	--	--	--
<b>Total</b>		<b>21</b>	<b>10</b>	<b>--</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**\*\* Mini Project : (Individual student has to carry out the mini project activity and it will be allotted following grade as per his/her performance in term work. The grades are A+, A, B+, B, C, D)**

Marks	Grades
>= 45 to 50	A+
>= 40 to > 45	A
>= 35 to > 40	B
>= 30 to > 35	B+
>= 25 to > 30	C
> 25	D

**Total Credits Sem – III : 25**  
**Total Credits Sem – IV : 25**  
**Grant total : 50**

## Linear Control Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks    Oral 25marks	01 Credit

### Course Prerequisites:

The students should have knowledge of

Mathematics , Laplace transform , Ordinary differential equation

### Course Objectives:

This course introduces concepts of feedback control system. It provides foundation for mathematical modeling of components. It includes application of analytical and graphical techniques for stability analysis of system. These techniques can be used for any industrial system.

**Course Outcomes:** After learning this course the students will be able to

1. Calculate transfer function of components using mathematical equations.
2. Draw block diagram and signal flow graphs of system and evaluate overall transfer function of closed loop system.
3. Apply different techniques for stability analysis of any system in time domain.
4. Design PID controller and design compensator using root locus technique.
5. Draw Bode plot and Nyquist. plot and comment about stability in frequency domain.
6. Design a system using compensator to meet the desired needs and specifications by bode plot

<b>UNIT I</b>	<b>Introduction</b>	<b>(06 Hours)</b>
	Classification of control system, open loop, closed loop, examples, Block Diagram reduction, signal flow graph, Mason's gain formula. Mathematical Modeling and Transfer function of Electrical, mechanical system , Analogy for mechanical and electrical systems, Potentiometer, Synchronos, AC- DC Servomotor, Stepper motor, Gear Trains, AC-DC servomechanism, Tachogenerator, optical encoder	
<b>UNIT II</b>	<b>Time domain analysis</b>	<b>(06 Hours)</b>
	Standard test signals, Type and order of the system ,Time response of first and second order system to unit step input , Specifications for second order system, Steady state error, static error constants, Characteristic Equation, its roots in complex plane and time response	
<b>UNIT III</b>	<b>Stability analysis in time domain</b>	<b>(06 Hours)</b>
	Concept of stability absolute, relative, Routh-Hurwitz stability criteria , special cases, limitations. Root Locus: Basic properties of root locus. Construction of root locus. Angle and magnitude condition for stable	

	system. Determination of gain for specified damping ratio, Effect of pole, zero addition on root locus, cancellation of poles and zeros	
<b>UNIT IV</b>	<b>Design in time domain</b>	<b>(06 hours)</b>
	Basic concept of PID controller, tuning rules of PID controller, step response of system without and with PID controller, rate feedback , Need of compensation, transfer function of lead, lag, lag- lead , lead and lag compensator design using root locus. Use of SISO design tool in MATLAB	
<b>UNIT V</b>	<b>Frequency domain Analysis</b>	<b>(06 Hours)</b>
	Frequency response of first order and second order system to sinusoidal input, frequency domain specifications, Correlation between time domain and frequency domain , Polar plot, Nyquist stability Criteria, Nyquist plot, Gain margin, Phase margin and stability analysis using polar plots, Bode plot, Determination of Gain margin , phase margins and stability analysis using Bode Plot, Deduction of transfer function using bode plot	
<b>UNIT VI</b>	<b>Design in frequency domain</b>	<b>(06 Hours)</b>
	Bode plot of lead, lag, lag- lead compensating network, Design specifications, Design of lead, lag compensators using bode plot. Comparison of lag, lead compensator effect on system performance. Use of SISO design tool in MATLAB	

**Term Work:**

The term work shall consist of record of minimum eight experiments. Four from first seven, four from next seven and to ensure at least one experiment on each unit.

1. To plot characteristics of potentiometer and observe potentiometer pair as an error detector.
2. To plot characteristics of Synchro and observe Synchro pair as an error detector.
3. To determine transfer function of D C servomotor.
4. To observe step response of RLC series circuit for different values of R.
5. To analyze i) effect of gain ii) effect of tachometer feedback on output response of D.C. position servomechanism
6. To tune PID controller and analyze step response of temperature/ pressure control system.
7. To plot root locus using MATLAB and determine value of K for given value of damping ratio from the plot. ii) To analyze effect of addition of zero/ pole on root locus
8. To observe frequency response and to draw bode plot of lag, lead network.
9. To analyze stability of system in frequency domain by i) Nyquist plot ii) Bode plot using MATLAB .
10. To design lead compensator using bode plot and observe step response of uncompensated and compensated system.(SISOTOOL in MATLAB)
11. To design lag compensator using root locus technique and observe step response of uncompensated and compensated system. .(SISOTOOL in MATLAB)
12. To design PID controller for second order system to obtain desired performance specifications.
13. To use various commands for block diagram reduction like series, parallel, append, connect, feedback.(MATLAB)

14. To calculate steady state error for different inputs and different types of system(MATLAB)	
<b>Text Books:</b>	
1. I.J. Nagrath, M. Gopal, ““Control System Engineering”, New Age International Publishers – Fourth edition	
2. Katsuhiko Ogata, “Modern control system engineering”, Prentice Hall, 2010.	
3. M.N.Bandopadhyay, “ Control Engineering Theory and practice”- Prentice Hall of India 2006	
<b>Reference Books:</b>	
1. Nise N. S. “Control Systems Engineering”, John Wiley & Sons, Incorporated, 2011	
2. D. Roy Choudhary, "Modern Control Engineering", PHI Learning Pvt. Ltd., 2005	
3. Dorf, Bishop - “Modern control system”, Pearson Education	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Assignments:** Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on block diagram reduction to calculate overall transfer function of system and verify with Mason’s gain formula
2. To calculate transfer function of equivalent electrical system for given mechanical system.
3. Quiz –Multiple Choice Questions 20
4. To solve numerical on time domain and analyze parameter variations on transient response and steady state error.
5. Solve two years question paper of Pune university unit wise.
6. Solve two years question paper of GATE unit wise.
7. To observe NPTEL video lecture by M. Gopal on any topic of control and give presentations, group discussion.
8. To collect information about controllers used in process control in thermal power plant.
9. To collect information about controllers used in power system for voltage and frequency control.
10. To collect information about controllers used in machine control.
11. To validate the design by hardware.

## Microcontroller

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS</u></b>
				<b><u>ALLOTTED:</u></b>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral : 25 Marks		01 Credit
<b>Course Pre-requisites:</b>				
The Students should have knowledge of				
<b>1.</b>	Digital electronics & Microprocessor 8085.			
<b>Course Objectives:</b>				
	This course introduces basic knowledge of Microcontroller 8031/51 & PIC Microcontroller.			
<b>Course Outcomes:</b>				
<b>1.</b>	Understand basic architecture and block diagram of microcontroller 8051.			
<b>2.</b>	Understand the different addressing modes and use them to write instructions			
<b>3.</b>	Understand the basics of interrupt structure of 8051			
<b>4</b>	Understand the 8051 programming.			
<b>5</b>	Introduction to PIC microcontrollers			
<b>6</b>	Understand PIC peripherals			
<b>Introduction</b>				
<b>UNIT - I</b>	Introduction to the concept of micro-controllers. Comparison of microprocessor and microcontroller. Difference between RISC and CISC microcontrollers. Harvard and Von Neumann Architectures, Architecture of 8031/51 microcontroller, Pin diagram, special function registers. Ports, Internal Memory, External memory, Counters and timers in 8051, Clock, Timer modes.			<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>MCS-51 Addressing modes and Instructions</b>			
	Addressing modes, MCS-51 Instruction set, external data moves, code memory read only data moves, Push and Pop, data exchanges, byte level logical operations, bit level logical operations. Rotate and swap operations. Instructions affecting flags, incrementing/decrementing, Arithmetic operations, Jump and call instructions.			<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Interrupts</b>			
	Serial data I/O, serial data mode interrupt, serial port interrupt, external hardware interrupts, software generated interrupts, interrupt control, interrupt priority in the 8051.			<b>(06 Hours)</b>
<b>UNIT - IV</b>	<b>Applications</b>			
	Applications like Interfacing of 8051 with ADC , Interfacing of 8051 with DAC Interfacing of 8051 to stepper motor, Interfacing of 8051 to DC motor, Application for Traffic Control System.			<b>(06 Hours)</b>



<b>UNIT - V</b>	<b>Introduction to PIC Microcontroller</b>	
	Introduction to PIC 16F8XX family and development tools. CPU architecture and instruction set. Harvard architecture and pipelining, program memory considerations, register file structure and addressing modes, CPU registers.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>PIC Peripherals</b>	
	I/O ports, external interrupts and timers, timer operation, ADC, short overview of synchronous serial port, serial peripheral interface I2C bus.	<b>(06 Hours)</b>
<b>Term Work:</b>		
The term work shall consists of record of minimum eight experiments		
<ol style="list-style-type: none"> <li>1. Programs of addition, subtraction, multiplication etc.</li> <li>2. Programs on logical and decision making group of instructions</li> <li>3. Programs related to interrupt, timer and serial communication logic.</li> <li>4. Programs related to data transfer between internal and external memory.</li> <li>5. Simulator based programming.</li> <li>6. Interfacing of 8051 with ADC</li> <li>7. Interfacing of 8051 DAC</li> <li>8. Interfacing of 8051 to stepper motor, DC motor</li> <li>9. Application for Traffic Control System.</li> <li>10. Interfacing PIC with LCD.</li> <li>11. ADC conversion with PIC.</li> <li>12. Interfacing PIC with keyboard.</li> </ol>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. B.Ram “Fundamentals of Microprocessors and Microcomputers”, edition 1995 Dhanapat Rai Publications</li> <li>2. Ajay Deshmukh, ‘Microcontrollers Theory and Applications’, TATA McGraw Hill.</li> <li>3. Myke Predko, ‘Programming and customizing the 8051 microcontroller’, TATA McGraw Hill</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. M.A.Mazidi “The 8051 micro controller &amp; embedded systems”, Pearson Education Publication</li> <li>2. K.J.Ayala “The 8051 microcontroller Architecture programming and applications”</li> <li>3. Kenneth Ayala , Delmar ,Cengage Fearing ,” “The 8051 Microcontroller Architecture ,Programming &amp; Applications” Third Edition , TATA McGraw Hill</li> <li>4. Intel micro controller data book.</li> <li>5. Microchip PIC family Microcontroller handbook</li> <li>6. Design with PIC microcontrollers –John Peatman, Pearson Education Asia ,LPE</li> </ol>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

**Assignments:**

1. Group discussions on any one of the topics.
2. Watch the NPTEL video on this subject of any TWO modules and summarize it.
3. Open book class test on this subject.
4. Give presentation on PIC microcontroller.
5. Solve questioners in the class room on microcontroller.
6. List different microcontroller & compare them.
7. Prepare report on different microcontrollers used in your laboratory.
8. Give a presentation on “commercial aspects of microcontroller”.
9. Give presentation on different applications on PIC microcontroller.
10. Give presentation on different applications on 8051 microcontroller.
11. Program 8051 microcontroller for addition, subtraction & multiplication operations.
12. Write a note on PIC peripherals.
13. Study instruction set of 8051 microcontroller.
14. Study instruction set of PIC microcontroller.

## Electrical Machine Design

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	05 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 01 Hours/ Week	Term Work: 25 Marks & Oral: 25 Marks	01 Credit

### **Course Pre-requisites:**

The Students should have knowledge of

1. Various Materials Used in Electrical Machines
2. Types, construction & working of Transformers
3. Types, construction & working of DC & AC Machines

### **Course Objectives:**

This course introduces Design of Electrical machines for the given specifications

### **Course Outcomes: The students will be able to**

1. Apply the concepts of machines and materials in design of machines.
2. Analyze and estimate the transformer performance parameters
3. To estimate the main dimensions and performance parameters of 3- Induction Machines by understanding the general concepts and constraints in design.
4. To estimate the main dimensions and performance parameters of 1- Induction Machines by understanding the general concepts and constraints in design.
5. To estimate the main dimensions and performance parameters of Synchronous Machines & DC machines by understanding the general concepts and constraints in design.
6. To use different software (AutoCAD) for design.

<b>UNIT - I</b>	<b>Fundamental Aspects, Thermal Design Aspects and General concepts, Constraints in design of Electrical Machines.</b>	<b>(10 Hours)</b>
	<p>Introduction, Design factors, Limitations in design, Modern trends in Design of Electrical Machines, Basic Principles.</p> <p>Modes of heat dissipation, Heating and cooling curves, calculation of heating and cooling time constants, Rating of machines, selection of motor power ratings, Cooling of rotating of rotating machines, Types of duties and ratings and selection of motor capacity. Methods of measurement of temperature rise. Measurement of winding temperature.</p> <p>Relation between Rating and Dimensions of Rotating Machines: Main dimensions, Total loadings, Specific loadings, Output equation, Factors affecting size of rotating machines, Choice of specific magnetic &amp; specific electric loading</p>	

<b>UNIT - II</b>	<b>Design Of Transformer.</b>	<b>(08 Hours)</b>
	Output equation with usual notations, design of core, yoke and windings of transformer. Estimation of resistance and leakage reactance of transformer. Estimation of no-load current, regulation of transformers. Calculation of mechanical forces, methods of cooling & tank design. Design of small single phase transformers.	
<b>UNIT - III</b>	<b>Design of 3- Induction Motors.</b>	<b>(07 Hours)</b>
	General Specifications of 3- Induction Motor. Stator winding design, Stator slot design, Stator teeth design, Depth of stator core, Rotor design: Air gap length, squirrel cage rotor and wound rotor, Design of rotor teeth & rotor core, Estimation of operating characteristics, Dispersion Coefficient.	
<b>UNIT - IV</b>	<b>Design of 1- Induction Motors.</b>	<b>(07 Hours)</b>
	Design of single phase Induction motor: Choice of specific loadings. Determination of main dimensions. Relative size of three phase and single phase Induction motor for same output. Design of main and starting winding for split phase, capacitor start motors. Design of rotor. Operating characteristics.	
<b>UNIT - V</b>	<b>Design of DC &amp; Synchronous Machines.</b>	<b>(08 Hours)</b>
	<b>Design of DC Machines:</b> Design of field system and interpoles. Design of armature. Design of commutator and brushes. Design of heating coil, motor resistance starter, regulators, lifting magnets. <b>Alternators:</b> Output equation, Main dimensions, Choice of specific electric and magnetic loadings, choice of speed and number of poles, different types of pole structure used in synchronous machines. Design of armature: conductors, slots. Armature winding, Design of air-gap, Design of rotor: Height of pole, pole shoe, damper winding. open circuit characteristics, Losses and temperature rise.	
<b>UNIT - VI</b>	<b>Modern Tools for Machine Design.</b>	<b>(08 Hours)</b>
	Design optimization using various FEA (Finite Element Analysis) based machine design packages- Maxwell 2D, 3D, Magnet, 2D FEA analysis. FEMM (Finite Element Method Magnetics) free software.	

<b>Industrial Visit: Industrial visit to a manufacturing unit of transformer or Induction motor.</b>	
<b>Term Work:</b>	
The term work shall consist of 3 Drawing sheets and Design problems. (three in AutoCAD)	
<ol style="list-style-type: none"> <li>1. Details (Elevation, side view, top view) and assembly of 3- phase (power or distribution) transformer with design report.</li> <li>2. Details and layout of AC &amp; DC winding with design report.</li> <li>3. Assembly of 3- phase induction motor.(only sheet)</li> <li>4. Report based on Industrial visit to a manufacturing unit. (Transformer or Induction motor).</li> <li>5. Details and assembly of 3-phase Alternator with design report.</li> <li>6. Assembly of 1- phase transformer.</li> <li>7. Details and assembly of 3- phase Induction Motor with design report.</li> <li>8. Assembly of 1- phase Induction Motor.</li> </ol>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Sawhney A. K., <i>Electrical Machine Design</i>, Dhanpath Rai &amp; Co. (P) Ltd Sixth Edition: 2006</li> <li>2. M.G. Say – Theory and Performance and Design of A.C. Machines, 3rd Edition, ELBS London.</li> <li>3. P. P. Silvester and Ferraris’s book on Electrical Machine Design using FEA</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. A Shanmugasundaram, G. Gangadharan, R. Palani, - Electrical Machine Design Data Book, 3rd Edition, 3rd Reprint 1988 - Wiely Eastern Ltd., - New Delhi</li> <li>2. K.L. Narang , A Text Book of Electrical Engineering Drawings, Reprint Edition : 1993 / 94 – Satya Prakashan, New Delhi.</li> <li>3. Vishnu Murti, “Computer Aided Design for Electrical Machines”, B.S. Publications</li> </ol>	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

### Assignments

1. Students should compile the list of vendors (manufacturers of Transformers, DC Machines, Single phase Induction Motors, PMDC motor, Stepper Motor, contact, and address) along with the details like types, specifications, and costs and should prepare the comparative for the same.
2. Students should prepare the report on “Estimation of no-load current of transformer” or “Estimation of operating characteristics of 3- Induction Motor”.
3. One industrial visit to the Manufacturing industry and the students will prepare the report which includes the consumption pattern of the products produced, process flow diagram and process description, major engineering problems in the industry.
4. Students should prepare the plant-layout for the industry visited.

5. Watch the NPTEL video on this subject of any TWO modules and summarize it
6. Solve Design problems for all types of machines.
7. Students should prepare the Datasheet for different machines.
8. Open book class test (Objective test).
9. Students have to study any One NPTEL videos related to a particular unit in group and prepare/present power point presentation.
10. Visit to Winding workshops, any machine repairing shop and prepare a report on detailed specifications of a machine, construction, types, material used and applications.
11. Students should prepare the report on modern tools in Design of Machines.
12. Prepare models for any types of machines related to the subject and write industrial applications.

## Electrical Estimation, Costing & Installation

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
		Continuous Assessment: 40 Marks		
<b>Course Pre-requisites:</b>				
The Students should have knowledge of				
<b>1.</b>	Introduction of Electrical supply system, typical A.C. power supply scheme, Classification of Supply systems			
<b>2.</b>	Single line diagram of electrical supply system			
<b>Course Objectives:</b>				
	1. To understand the basic concepts, installation, estimation and costing of distribution systems, substation and residential electrification.			
	2. To enable candidate to understand earthing system for residential and commercial Installation.			
	3. To understand practical aspects of condition monitoring and maintenance of various electrical equipments			
<b>Course Outcomes: Student will be able to</b>				
<b>1.</b>	Draft tender documents.			
<b>2.</b>	Do estimation and costing of residential and commercial buildings.			
<b>3.</b>	Select appropriate method for service connection.			
<b>4</b>	Calculate total electrical load.			
<b>5.</b>	Do detail Estimation and costing of industrial installation.			
<b>UNIT - I      Contracts, Tenders And IE Rules      (06 Hours)</b>				
	Concept of Contracts and Tenders, Types of Contracts and Contractors, types of tenders, tender notice, procedure for submission and opening of tenders ,requirements of valid contract and good Contractor, comparative statements for selection of contractors, IE rules related to electrical installation, work to permit.			
<b>UNIT - II      Service Connections      (06 Hours)</b>				
	Concept of service connections, types of service connections and their features, methods of installation of service connections, difference between underground and over head service connections, service connections for 11KV HT consumers, panel designing, cable jointing.			
<b>UNIT - III      Electrification Of Residential Installation      (06 Hours)</b>				
	General rules and guidelines for installation of residential electrification and positioning of equipments, calculation of total electrical load in the residential installation, procedure for the design of number of sub circuits, load calculations and selection of size of wire by considering overload and future expansion, determine length of batten and length of wire, selection of rating for main switch, distribution board, MCB, ELCB			

	and wiring accessories, total estimation and costing of overall residential installation with proper cost of material, labor charges	
<b>UNIT-IV</b>	<b>Electrification Of Commercial Installation</b>	<b>(06 Hours)</b>
	Concept of commercial installation, difference between residential and commercial installation ,types of cables required for commercial installations according to size and core ,general requirements and selection factors for commercial installation, load calculations and selection of size of service connections and nature of supply, decide number of lighting and power sub circuits as per IE rules, decide length of wire required for every sub circuit, decide ratings of wiring accessories, main switch, bus bar MCB,ELCB etc. Decide proper method of earthing for commercial installation find out the estimation chart with proper cost of material,cost of labor, contingencies charges and profit margin.	
<b>UNIT - V</b>	<b>Electrification Of Industrial Installation</b>	<b>(06 Hours)</b>
	Concept of motor wiring circuit and single line diagram, guidelines about power wiring and motor wiring, design considerations of electrical installations in industry/factory/workshop, machine current calculations ,selection of size of wires, cables required for the machines and its controlling unit, decide length and size of cable required for every industrial load, decide ratings of wiring accessories, main switch, bus bar MCB,ELCB etc. for every industrial load, decide proper method of earthing for industrial installation with their costing, find out the estimation chart with proper cost of material, cost of labor, contingencies charges and profit charges and profit margin.	
<b>UNIT - VI</b>	<b>Maintenance</b>	<b>(06 Hours)</b>
	Definition, Need of maintenance, Types of maintenance, Breakdown maintenance, Preventive maintenance, Condition monitoring, Advanced tools and techniques of condition monitoring, Maintenance strategy, Maintenance type selection, Comparison of different maintenance types,	
<b>Text Books:</b>		
4. Surjit Singh – “Electrical Estimating and Costing” Dhanpat Rai Publications		
<b>Reference Books:</b>		
1. S. L. Uppal - “Electrical wiring, estimating & costing” Khanna Publishers		
2. B. V. S. Rao - “Operation and Maintenance of electrical equipments” (Vol. 2) Media promoters and publishers Pvt. Ltd.		
3. Raina.K.B and Bhattacharya S.K.,”Electrical design,Estimating and Costing”,Tata McGraw Hill,NewDelhi		
4. B.D. Arora-Electrical wiring,Estimation and costing-New Heights,New Delhi		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	



Assignments:

1. To solve numerical on calculations of total electrical load in the residential installation.
2. To solve numerical on calculations of total electrical load in commercial installation.
3. To solve numerical on calculations of total electrical load in industrial installation.
4. To calculate the total electrical load of electrical machine laboratory/any building.
5. To solve two years question papers of University unit wise.
6. To collect information about the recent/new installation techniques.
7. To observe and study the earthing system of our collage & to prepare a report on the earthing system which is used.

## Elective I: Engineering Economics and Accountancy

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits		
		Continuous Assessment: 40 Marks				
<b>Course Pre-requisites:</b>						
The Students should have knowledge of						
<b>1.</b> Fundamental of Electrical Engineering Economics						
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>• This course will introduce various concepts and methods of economic analysis in engineering, including the time value of money and its effect on economic decisions, economic equivalence, economic measures of worth, cash flow analysis, equipment depreciation, effects of taxation and inflation, decision making under uncertainty, capital budgeting, replacement decisions, and benefit-cost analysis.</li> </ul>						
<b>Course Outcomes:</b>						
The student will be able to						
<b>1.</b> Understand the economic fundamentals.						
<b>2.</b> Learn about principles of decision making involved in engineering projects.						
<b>3.</b> They learn about: cash flows, time value of money and evaluation of investments and projects.						
<b>UNIT - I</b>	<b>Introduction</b> Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis.				<b>(06 Hours)</b>	
<b>UNIT - II</b>	<b>Demand &amp; Supply Analysis</b> Demand - Types of demand - Determinants of demand - Demand function – Demand elasticity - Demand forecasting - Supply - Determinants of supply - Supply function -Supply elasticity.				<b>(06 Hours)</b>	
<b>UNIT - III</b>	<b>Production And Cost Functions</b> Production function - Returns to scale - Production optimization - Least cost input - Isoquants - Managerial uses of production function.				<b>(06 Hours)</b>	
<b>UNIT - IV</b>	<b>Cost Analysis</b> Cost Concepts - Cost function – Types of Cost - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.				<b>(06 Hours)</b>	

<b>UNIT - V</b>	<b>Pricing</b>	<b>(06 Hours)</b>
	Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice – role of Government in pricing control.	
<b>UNIT - IV</b>	<b>Financial Accounting (Elementary Treatment)</b>	<b>(06 Hours)</b>
	Balance sheet and related concepts - Profit & Loss Statement and related concepts - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis – Comparative financial statements - Analysis & Interpretation of financial statements. Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.	
<b>Assignment:</b>		
1. Managerial Economics - Relationship with other disciplines		
2. Demand and supply Analysis		
3. Production and cost function		
4. Cost analysis		
5. Pricing		
6. Financial accounting		
<b>Text Books:</b>		
1. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.		
2. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.		
<b>Reference Books:</b>		
1. Samuelson. Paul A and Nordhaus W.D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.		
2. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.		
3. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson South Western, 4th Edition, 2001.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

## Elective I: Six Sigma

<b>Elective I: Six Sigma</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
<b>1.</b>	Computer Programming	
<b>Course Objectives:</b>		
	<ol style="list-style-type: none"> <li>1. To explore the concept of six sigma thoroughly.</li> <li>2. The actual working of six sigma in industries.</li> <li>3. Various terms related with six sigma.</li> <li>4. The outcome and analysis of six and sigma.</li> </ol>	
<b>Course Outcomes: The students will be able to</b>		
<b>1.</b>	Recognize the six sigma organization and concepts of six sigma matrix.	
<b>2.</b>	Explore the six sigma administration	
<b>3.</b>	Explore the Basic Quality Tools & Statistical concepts related with six sigma.	
<b>4.</b>	Explore the Capability Analysis Process capability indices.	
<b>5.</b>	Explicit the concept of DFSS.	
<b>6.</b>	Explore the various concepts regarding objectives and benefits of SPC and Lean Principles.	
<b>UNIT - I</b>	<b>Introduction of Six Sigma Origin of Six Sigma &amp; Basic concept</b>	<b>(06 Hours)</b>
	<p><b>Six Sigma Overview:-</b>Recognize why organizations use Six Sigma, how they apply its philosophy of Value Focus and goals. Concepts of CTQ / CTP / <math>Y=f(X)</math></p> <p><b>Six Sigma Metrics:-</b>Recognize key drivers for business (profit, market share, customer satisfaction, efficiency, product differentiation) and how key metrics and scorecards are developed and impact the entire organization. Calculate process performance metrics such as defects per unit (DPU), rolled throughput yield (RTY), cost of poor quality (COPQ), defects per million opportunities (DPMO) &amp; sigma levels</p>	
<b>UNIT - II</b>	<b>Six Sigma Administration</b>	<b>(06 Hours)</b>
	<p>Describe the project selection process, Six Sigma improvement methodology (DMAIC). Six Sigma and other team roles and responsibilities, Describe and define the roles and responsibilities of participants on Six Sigma and others including Black Belt, Master Black Belt, Green Belt, Champion, executive, coach, facilitator, team member, sponsor, process owner.</p> <p><b>Voice Of Customer</b> Use various methods to collect customer feedback (e.g., surveys, focus groups, interviews, observation) and identify the key elements that make these tools effective. Review survey questions to eliminate bias, vagueness, etc. Define Internal &amp; External Customers,</p>	

	DEFINE Project charter, Stake-holders, Project Team dynamics	
<b>UNIT - III</b>	<b>Basic Project Management &amp; Planning Tools</b>	<b>(06 Hours)</b>
	Describe Process Mapping, SIPOC/COPIS, process inputs, outputs. Design and process failure mode and effects analysis (DFMEA & PFMEA). Basic Tools:- 1) Affinity Diagrams, 2) Interrelationship Digraphs, 3) Tree Diagrams, 4) Prioritization Matrices, 5) Matrix Diagrams, 6) Process Decision Program (PDPC) Charts, 7) Activity Network Diagrams. Quality function deployment (QFD), <b>Basic Quality Tools &amp; Statistical concepts</b> Graphical, Enumerative Tools, Population parameters and sample statistics. Data Types, Measurement scales, Sampling Techniques, Data collection tools - Check Sheets, Stratification. Data Analysis Tools - Pareto diagram, Cause & Effect analysis, Trend Charts, Multi-Vary analysis, Scatter Diagrams, Histogram & Control Charts. Basic Probability Concepts, Measures of Distribution, Dispersion and Central Tendency, Probability distributions - Discrete data - Binomial & Poisson. Continuous data - Normal distribution. Z transform, Central Limit Theorem. Student's t distribution & Chi square distribution.	
<b>UNIT - IV</b>	<b>Capability Analysis Process capability indices</b>	<b>(06 Hours)</b>
	- Short term - Process Capability - Cp, Cpk. Long Term - Process performance indices - Pp, Ppk. Confidence Intervals CI for Means & for Variance. Hypothesis Testing ANOVA & Regression One Way & Multiway ANOVA, Co-relation & Regression analysis MSA Bias, Linearity, Stability and precision/tolerance (P/T) ratio for Continuous data & Percent agreement for Discrete Data. Calculate, analyze, and interpret measurement system capability using repeatability and reproducibility (GR&R) for continuous data. Kappa agreement concepts for Discrete data.	
<b>UNIT - V</b>	<b>DFSS Concepts</b>	<b>(06 Hours)</b>
	DMADV (define, measure, analyze, design, verify) and IDOV (identify, design, optimize, verify), Robust Design Concept. <b>Experimental Methods</b> Introduction to Design of Experiments	
<b>UNIT - VI</b>	<b>Control Methods</b>	<b>(06 Hours)</b>
	Describe the objectives and benefits of SPC, including controlling process performance, identifying special and common causes, Rational sub-grouping, Control Charts for Continuous & Discrete data. <b>Lean Principles</b> Define and describe concepts such as Theory of Constraints, value chain, flow, pull, etc., and tools commonly used to eliminate waste, including kaizen, 5S, error-proofing, value-stream mapping, etc. Value-added and non-value-added activities Identify waste in terms of excess inventory, space, test inspection, rework, transportation, storage, etc., and reduce cycle time to improve throughput.	

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<b>Text Books:</b>	
1.	The Six Sigma Black Belt Handbook by MacCarty, Daniels, Bremer and Gupta, TMGH, 2010 Edition Juran Institute's Six Sigma Breakthrough and Beyond by De Feo and Barnard, TMGH. What is Six Sigma? by Peter Pande, TMGH
2.	Six Sigma Management by Blashka, TMGH
3.	All about Six Sigma by Warren Brussee, TMGH
<b>Reference Books:</b>	
1.	Lean Six Sigma by Hubert Ramprasad, Sara Books Pvt.Ltd.
2.	The Certified Six Sigma Black Belt Hand Book, Donald Benbow, Pearson
3.	The Certified Six Sigma Black Belt Hand Book, Donald Benbow, Pearson
4.	Achieving Business Excellence by Pravin Rajpal, Om Books International, India.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Assignments:** Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on block diagram reduction to calculate overall transfer function of system and verify with Mason's gain formula
2. To calculate transfer function of equivalent electrical system for given mechanical system.
3. Quiz –Multiple Choice Questions 20
4. To solve numerical on time domain and analyze parameter variations on transient response and steady state error.
5. Solve two years question paper of Pune university unit wise.
6. Solve two years question paper of GATE unit wise.
7. To observe NPTEL video lecture by M. Gopal on any topic of control and give presentations, group discussion.
8. To collect information about controllers used in process control in thermal power plant.
9. To collect information about controllers used in power system for voltage and frequency control.
10. To collect information about controllers used in machine control.
11. To validate the design by hardware.

## Elective- I Risk and Derivatives

<b>Elective- I Risk and Derivatives</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
<b>Course Prerequisites:</b>		
The students should have knowledge of		
<b>1.</b>	Management Studies	
<b>Course Objectives:</b>		
	<ol style="list-style-type: none"> <li>1. To explore the concept of Risk and Derivatives thoroughly.</li> <li>2. The actual working of Risk and Derivatives in industries.</li> <li>3. Various terms related with Risk and Derivatives.</li> </ol>	
<b>Course Outcomes:</b> After learning this course the students will be able to		
<b>1.</b>	Explore the various terms related with derivatives	
<b>2.</b>	Explore the various contracts related with the future.	
<b>3.</b>	Explore the term options and various terms associated with options	
<b>4.</b>	Explore the term SWAPS and terms associated with SWAPS.	
<b>5.</b>	Explore to the meaning of risk management and associated terms .	
<b>6.</b>	Explore with various Instruments of External techniques of Risk Management	
<b>UNIT I</b>	<b><u>Derivatives</u></b>	<b>(06 Hours)</b>
	Definition and Types Forward Contracts, Futures Contracts, Options, Swaps, Differences between Cash and Future Markets, Types of Traders ,OTC and Exchange Traded Securities, Types of Settlement, Uses and Advantages of Derivatives, Evolution of Derivatives Market in India, Regulations – Framework, Exchange Trading in Derivatives	
<b>UNIT II</b>	<b><u>Futures Contract</u></b>	<b>(06 Hours)</b>
	Specifications of Futures Contract, Margin Requirements, Marking to Market, , Hedging using Futures, Types of Futures Contracts – Securities, Stock Index Futures, Currencies and Commodities, Delivery Options, Relationship between Future Prices, Forward Prices and Future Spot Prices, Commodity Futures, Contract Terminology and Specifications for Stock Options and Index Options in NSE, Contract Terminology and specifications for Stock Futures and Index futures in NSE, Contract Terminology and Specifications for Interest Rate Derivatives.	
<b>UNIT III</b>	<b><u>Options</u></b>	<b>(06 Hours)</b>
	Meaning and Definition, Exchange Traded Options, OTC Options – Specifications of Options, Call and put Options, American and European	

	Options, Intrinsic Value and Time Value of Options, Option payoff options on Securities, Stock Indices, Currencies and Futures, Options pricing models Differences between Future and Option contracts	
<b>UNIT IV</b>	<b><u>SWAPS</u></b>	<b>(06 Hours)</b>
	Definition of SWAP, Interest Rate SWAP, Currency SWAP, Role of Financial Intermediary, Warehousing, Valuation of Interest rate SWAPs and Currency SWAPs Bonds and FRNs	
<b>UNIT V</b>	<b>Introduction to Risk Management</b>	<b>(06 Hours)</b>
	Identifying types of risks, Management of Translation, Transaction and economic Exposure, Quantifying Risk and Hedging techniques, Internal and External Techniques viz Netting, Matching, Leading and Lagging, Price variation, Short Term borrowing, Pricing in Foreign Currency, Assets Liability Management	
<b>UNIT VI</b>	<b>Instruments of External techniques of Risk Management</b>	<b>(06 Hours)</b>
	Forwards, Futures, Swaps, Options, Forward Rate Agreement, Caps, Collars, Floors and their applications, Pricing techniques, Operational aspects.	
<b>Text Books:</b>		
1. Derivatives simplified – An Introduction to Risk Management- P.Vijaya Bhaskar & B.Mahapatra		
<b>Reference Books:</b>		
4. Options and Futures- Hull		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

**Assignments:** Assignments should be able to verify course outcome and skills of group work, communication skills

1. To solve numerical on derivatives
2. Quiz –Multiple Choice Questions 20
3. Solve two years question paper of Pune university unit wise.
4. Solve two years question paper of GATE unit wise.
5. To observe NPTEL video lecture on any topic of control and give presentations, group discussion.
6. Case study on risk management related with any factory or commercial industry.



### Elective I: Total Quality Management

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	

#### **Course Pre-requisites:**

The Students should have knowledge of

1. Power Quality Management

#### **Course Objectives:**

1. To introduce the fundamental concepts of total quality management, statistical process control, six sigma and the application of these concepts.
2. To introduce philosophies and strategies to quality related issues.
3. To provide skills in diagnosing and analyzing problems causing variation in manufacturing and service industry processes.
4. To provide a basic understanding of "widely-used" quality analysis tools and techniques.

#### **Course Outcomes:**

The student will be able to

1. Develop an understanding on quality management philosophies and frameworks
2. Develop in-depth knowledge on various tools and techniques of quality management
3. Learn the applications of quality tools and techniques in both manufacturing and service industry.

<b>UNIT - I</b>	<b>Quality, Strategic Planning, and Competitive Advantages</b>	<b>(06 Hours)</b>
	Brief History - Definitions of Quality. Quality in Manufacturing and Service Systems. Quality and Price - Quality and Market Share - Quality and Cost - Quality & Competitive Advantage.	
<b>UNIT - II</b>	<b>Principles of Total Quality Management:</b>	<b>(06 Hours)</b>
	Introduction - Elements of Total Quality Management - Malcolm Baldrige National Quality Award Criteria. Benefits of Total Quality Management. The Deming Management Philosophy – The Juran Philosophy – The Crosby Philosophy	
<b>UNIT - III</b>	<b>Customer Focus :</b>	<b>(06 Hours)</b>
	The Customer-Driven Quality Cycle - Quality Function Deployment –Customer Satisfaction Measurement Techniques - Customer Relationship Management Techniques.	
<b>UNIT - IV</b>	<b>TQM Tools &amp; Techniques (I)</b>	<b>(06 Hours)</b>

	The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.	
<b>UNIT - V</b>	<b>TQM Tools &amp; Techniques (Ii)</b>	<b>(06 Hours)</b>
	Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.	
<b>UNIT - VI</b>	<b>Quality Systems</b>	<b>(06 Hours)</b>
	Need for ISO 9000-2008 quality system – elements, documentation, quality auditing- as 9000 –ISO 14000 – concepts, requirements and benefits – case studies of TQM implementation in manufacturing and service sectors.	
<b>Assignment:</b>		
1. Quality , strategic Planning and competitive Advantages		
2. Principles of total quality management		
3. Customer Focus :		
4. TQM tools and techniques (I)		
5. TQM Tools & Techniques (II)		
6. Quality Systems		
<b>Text Books:</b>		
1. Total Quality Management – Sundarajan		
2, Quality Control & Total Quality Management – Jain		
3.Dale H.Besterfiled, et at., “Total Quality Management”, Pearson Education Asia,3rd Edition, Indian Reprint (2006).		
<b>Reference Books:</b>		
1.James R. Evans and William M. Lindsay, “The Management and Control of Quality”, 6th Edition, South-Western (Thomson Learning), 2005.		
2.Oakland, J.S., “TQM – Text with Cases”, Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 200UNIT III		
3.Suganthi,L and Anand Samuel, “Total Quality Management”, Prentice Hall (India) Pvt. Ltd.,2006.		
4.Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd., 2006.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

## Elective I: New Enterprise Creation and Management

<b>Elective I: New Enterprise Creation and Management</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
<b>1.</b>	Progressive Skills	
<b>Course Objectives:</b>		
<b>1.</b>	Develop an understanding of the importance of entrepreneurship in society and the different forms of entrepreneurial activity	
<b>2.</b>	Develop an understanding of the new venture creation process and the life cycle of a new venture from idea development and launch through growth and various exit strategies	
<b>3.</b>	Gain knowledge of business plans, sources of capital, marketing and distribution strategies, operations, organization issues, as well as key legal and ethical considerations affecting entrepreneurial ventures	
<b>Course Outcomes:</b>		
The student will be able to		
<b>1.</b>	Develop your analytical skills: thinking, problem solving, and decision-making	
<b>2.</b>	Learn to analyze and critically evaluate ideas and viewpoints	
<b>3.</b>	Acquire an interest in learning more by questioning and seeking answers	
<b>4.</b>	Learn to find and use resources to answer your questions	
<b>5.</b>	Learn to form conclusions and recommendations and to support them with logic and Evidence.	
<b>UNIT - I</b>	<b>Foundations of Entrepreneurship Development:</b>	<b>(06 Hours)</b>
	<p>Concept and Need of Entrepreneurship Development Definition of Entrepreneur, Entrepreneurship, Innovation, Invention, Creativity, Business Idea, Opportunities through change.</p> <p>Concepts of Entrepreneur, Manager, Entrepreneur / Corporate Entrepreneur –Comparative study - Roles, Responsibilities, Career opportunities.</p> <p>Entrepreneurship as a career, Entrepreneurship as a style of management, The changing role of the entrepreneur: mid-career dilemmas – Closing the window: Sustaining Competitiveness - Maintaining competitive advantage.</p>	

<b>UNIT - II</b>	<b>Theories of Entrepreneurship:</b>	<b>(06 Hours)</b>
	Innovation Theory by Schumpeter & Imitating Theory of High Achievement by McClelland X-Efficiency Theory by Leibenstein Theory of Profit by Knight Theory of Social change by Everett Hagen	
<b>UNIT - III</b>	<b>Influences on Entrepreneurship Development :</b>	<b>(06 Hours)</b>
	Entrepreneurial Traits, External Influences on Entrepreneurship Development: Socio-Cultural, Political, Economic, Personal. Entrepreneurial culture with special reference to Entrepreneurship / Corporate Entrepreneurship. Entrepreneurial Success and Failure: Reasons and Remedies.	
<b>UNIT - IV</b>	<b>Women Entrepreneurs and Business Planning Process</b>	<b>(06 Hours)</b>
	<b>Women Entrepreneurs:</b> Challenges to Woman Entrepreneurs, Achievements of Woman Entrepreneurs, Role Models of Woman Entrepreneurs. <b>Business Planning Process</b> - The business plan as an entrepreneurial tool Elements of Business Plan, Objectives, Market Analysis, Development of Product / idea, Marketing, Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones.	
<b>UNIT - V</b>	<b>Creating Entrepreneurial Venture</b>	<b>(06 Hours)</b>
	Entrepreneurship Development Cycle Entrepreneurship Development and Government. Role of Central Government and State Government in promoting Entrepreneurship with various incentives, subsidies, grants etc. – with special reference to ‘Export oriented unites’ Role of the following agencies in the Entrepreneurship Development DIC – District Industrial Center SISI – Small Industries Services Institute EDII – Entrepreneurship Development Institute of India NIESBUD – National Institute of Entrepreneurship and Small Business Development NEDB – National Entrepreneurship Development Board	
<b>UNIT - VI</b>	<b>Project Management</b>	<b>(06 Hours)</b>
	Technical, Financial, Marketing Personnel and Management feasibility Reports Financial schemes offered by various financial institutions like Commercial Banks, IDBI, ICICI, SIDBI, SFCs, Venture Capital Funding, Angle Capitalist Case studies of Entrepreneurs – successful, failed, turnaround ventures should be discussed in the class.	
<b>Assignment:</b>		
1. Foundation of entrepreneurship development		
2. Theories of entrepreneurship		
3. Influence pf entrepreneurship development		
4. Women Entrepreneurs and Business Planning Process		
5. Creating Entrepreneurial Venture		
6. Project management		

<b>Text Books:</b>	
1. Dynamics of Entrepreneurship Development – Vasant Desai.	
2. Entrepreneurship Development New Venture Creation – Satish Taneja, S.L.Gupta	
3. Entrepreneurship and Small Business Management – Siropolis	
<b>Reference Books:</b>	
1. Project management – K. Nagarajan.	
2. Corporate Entrepreneurship – Vijay Sathe	
3. New Vistas of Entrepreneurship: Challenges & Opportunities – A. Sahay, M.S.Chhikara	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

## Elective I: Operational Research

**TEACHING SCHEME:**

Theory: 03 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

**CREDITS ALLOTTED:**

03 Credits

**Course Pre-requisites:**

The Students should have knowledge of

1. Basics about literature reviews and surveys.

**Course Objectives:**

1. The objective of this course is to help the students acquire quantitative tools, and use these tools for the analysis and solution of business problems.
2. The emphasis will be on the concepts and application rather than derivations.

**Course Outcomes:**

The student will be able to learn

1. Methods for making decisions
2. Analyzing the outcome of events
3. Mining and analyzing data using statistics
4. Programming methods
5. Problem-solving and organization
6. Computing algorithms

<b>UNIT – I</b>	<b>Quantitative Techniques and Operations Research</b>	<b>(06 Hours)</b>
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Meaning, Scope of Quantitative Techniques and Operations Research in Management, Advantages and Limitations of Quantitative Techniques ,OR Models

<b>UNIT – II</b>	<b>Linear Programming</b>	<b>(06 Hours)</b>
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Meaning of Linear .Programming, General Mathematical Formulation of LPP, Graphical Analysis, Simplex Method, Two-phase Method, Big M-Method. Duality and Post Optimality Analysis Advantage and Limitations of LPP.

<b>UNIT - III</b>	<b>Transportation Model</b>	<b>(06 Hours)</b>
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Mathematical Formulation, Initial Basic Feasible Solution, Vogel's Approximation Method, Optimization (Minimization and Maximization) Using Modified Distribution Method and Stepping Stone Method.

<b>UNIT - IV</b>	<b>Dynamic Programming</b>	<b>(06 Hours)</b>
	Nature of Dynamic Programming Problem, Dynamic Programming Solutions for Knap Sack, Traveling Salesman (Stage Coach), Assignment of Salesmen to Sales Area and Capital Budgeting. Integer linear programming: Meaning, Application, integer programming algorithm (branch and bound algorithm, cutting plan algorithm).	
<b>UNIT – V</b>	<b>Waiting Line Models and Replacement Models</b>	<b>(06 Hours)</b>
	Introduction, Scope in Management Decisions, Queuing Models M/M/1 (Infinite and Finite Population), Probability Calculations and Application of M/M/C (Infinite Population) Introduction Scope in Management, Single Equipment Replacement Model and Group Replacement.	
<b>UNIT - VI</b>	<b>Game Theory &amp; Markov Chain Analysis</b>	<b>(06 Hours)</b>
	Introduction to Games, Maximin and Minimax Principles, Pure and Mixed Strategies, Solution of Games Using-Algebraic and Graphical Methods. Computation of Sequential Probability of States for Different Periods, Steady State Probability of States and Application of Markov Chain.	
<b>Assignment:</b>		
1. Quantitative Techniques and Operations Research		
2. Linear Programming		
3. Transportation Model		
4. Dynamic Programming		
5. Waiting Line Models and Replacement Models		
6. Game Theory & Markov Chain Analysis		
<b>Text Books:</b>		
1. Hamdy A.Taha, <b>Operations Research: An Introduction</b> , Pearson 2008		
2. H.M. Wagner, <b>Principles of Operations Research with Application to Managerial Decisions</b> , PHI Learning. 2nd Ed., 2009.		
3.Chawla, <b>Operation Research</b> , Kalyani Publication Ludhiyana,2009		
<b>Reference Books:</b>		
1.V. K. Kapoor, <b>Problems and Solutions in Operations Research</b> , New Delhi, Suitan Chand and Sons, 2001		
2. F. Hillier, <b>Introduction to Operation Research</b> , TMH, 2005		
3. Bobby Srinivasan and C.L. Sandblom, <b>Quantitative Analysis for Business Decisions</b> , Singapore, McGraw Hill Publications, 2001.		
4. C.R. Kothari, <b>An Introduction to Operational Research</b> , New Delhi, Vikas Publications, 3rd Ed., 2009.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

**Name of subject: Engineering Mathematics-IV (Optional Subject)**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	04 Credits

**Course Pre-requisites:**

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

**Course Objectives:**

The course aims at making the students familiar about the most basic numerical methods and Concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

**Course Outcomes:**

**The student should be able to**

1. Derive appropriate numerical methods to solve algebraic and transcendental equations
2. Evaluate the accuracy of common numerical methods.
3. Develop appropriate numerical methods to solve a difference equation.
4. Be familiar with numerical interpolation and approximation of functions, numerical integration and differentiation.
5. Be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

<b>UNIT - I</b>	<b>Numerical solutions of algebraic and transcendental equations</b>	<b>(08 Hours)</b>
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
<b>UNIT - II</b>	<b>Solution of system of linear algebraic equation</b>	<b>(08 Hours)</b>
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
<b>UNIT - III</b>	<b>Difference equation and Solution of difference equations</b>	<b>(08 Hours)</b>
	Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
<b>UNIT - IV</b>	<b>Interpolation and Numerical differentiation and integration</b>	<b>(08 Hours)</b>
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting: Method of least squares. Straight line, Second degree, parabola, Exponential curve.	



	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
<b>UNIT - V</b>	<b>Numerical solution of I order ordinary differential equation</b>	<b>(08 Hours)</b>
	Solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
<b>UNIT - VI</b>	<b>Numerical Solution of Partial Differential Equations</b>	<b>(08 Hours)</b>
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	
<b>Text Books:</b>		
1. Gupta P.P.& Malik G.S., <i>Calculus of Finite Differences and Numerical Analysis</i> , Krishna Prakashan Mandir, Meerut, 21/e, 2006.		
2. B.S.Grewal, <i>Engineering Mathematics</i> , Khanna Publishers, 12/e, 2006.		
<b>Reference Books:</b>		
1. Francis J. Scheid, <i>Schaum's Outline of Numerical Analysis</i> , McGraw-Hill, New York, 1989.		
2. S. S. Sastry, <i>Engineering Mathematics</i> , Vol I, II Prentice Hall Publication, 3/e, 2004.		
3. C.Ray Wylie & Louis C. Barretle, <i>Advanced Engineering Mathematics</i> , Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I,II,III	
Unit Test -2	UNIT – IV,V,VI	

## Switchgear And Protection

<b>Switchgear And Protection</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks    Oral : 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
	Generation, Transmission & distribution of electrical energy.	
<b>Course Objectives:</b>		
	To develop the students to identify, analyze & to understand the fundamentals, classification, application and selection of various switchgears and different protection schemes of power system components.	
<b>Course Outcomes:</b> The students will be able to		
1.	Elaborate construction and working principle of different types of Circuit interrupting devices & to compute fault levels.	
2.	Describe the need of protective Relaying and operating principles of different types of relays.	
3.	Study different type of faults in transformer, alternator, I.M. and various protective schemes related to them.	
4.	Learn transmission line protection schemes, and characteristics of different types of distance relays.	
5.	Learn over voltage protection schemes, and different neutral earthing.	
6.	Learn substation layouts and PC applications in short circuit studies for designing relaying scheme	
<b>UNIT – I</b>	<b>Fundamentals of power system protection &amp; Circuit interrupting devices.</b>	<b>(06 Hrs.)</b>
	<p><b>Fundamentals of power system protection:</b> Functions of protective system, Normal and abnormal conditions and their effects on power system, Fault-types, Causes, Essential qualities of protections, Short circuit kVA calculations, and Current limiting reactors.</p> <p><b>Circuit interrupting devices:</b> Arc formation process, Methods of arc extinction, important terms - re-striking and recovery voltage RRRV. Construction, working &amp; application of low tension switchgear - Fuses, Isolators, MCB, MCCB, ELCB, Contactor, ACB.</p> <p>Construction, working &amp; application of low tension switchgear: - OCB, MOCB, SF6 CB, VCB. Rating of circuit Breaker, Resistance switching and current chopping, capacitive current breaking, auto re-closures. Introduction to HVDC circuit breaking.</p>	
<b>UNIT – II</b>	<b>Protective Relaying</b>	<b>(06 Hrs.)</b>
	Evolution of protective relaying, classification of relays, zones of protection, primary and backup protection, essential qualities of protective relaying. Trip circuit of circuit breaker. Various basic operating principles of protection- over current, (current graded & time graded),directional over current, differential, distance, induction type	

	<p>relay, torque equation in induction type relay, current and time setting in induction relay, Numerical on TSM, PSM and operating time of relay.</p> <p><b>Static &amp; Digital Relaying</b></p> <p>Overview of Static relay, block diagram, operating principal, merits &amp; demerits of static relay. Numerical Relays :-Introduction, Block diagram of numerical relay, Sampling theorem, Anti –Aliasing Filter, Block diagram of Phasor Measurement Unit (PMU).</p>	
<b>UNIT–III</b>	<b>Protection of Power System Components</b>	<b>(06 Hrs.)</b>
	<p><b>Protection of Alternator &amp; Transformer</b></p> <p>Various faults in Alternator, abnormal operating conditions, protection against stator faults, Protection against rotor faults, protection against loss of excitation and loss of prime mover.</p> <p><b>Protection of Transformer :</b></p> <p>Types of faults in transformer. Percentage differential protection in transformers, Restricted E/F protection. Incipient faults, Buchholz relay. Protection against over fluxing. Protection against inrush current</p> <p><b>3 Phase Induction Motor Protection-</b> Abnormal conditions &amp; causes of failures in 3 phase Induction motor, single phasing protection, Overload protection, Short circuit protection.</p>	
<b>UNIT–IV</b>	<b>Protection of Busbar &amp; Transmission Line</b>	<b>(06 Hrs.)</b>
	<p><b>Bus bar Protection:</b> Differential protection of bus bars. Selection of C.T. ratios for bus bar protection. High impedance differential relay.</p> <p><b>Transmission line:</b> over current protection for feeder using directional &amp; non-directional over current relays, Introduction to distance protection, impedance relay, reactance relay, mho relay &amp; Quadrilateral Relays, Introduction to PLCC, block diagram, advantages, disadvantages, three stepped distance protection, Effect of arc resistance, and power swing on performance of distance relay. Realization of distance relays (impedance, reactance and mho relay) using numerical relaying algorithm (flowchart, block diagram), Introduction to Wide Area Measurement (WAM) system.</p>	
<b>UNIT – V</b>	<b>Over voltage protection &amp; System grounding</b>	<b>(06 Hrs.)</b>
	<p><b>Over voltage protection :</b> Overvoltage, causes of overvoltage, Lightning phenomenon, direct &amp; indirect strokes, protection of overhead transmission lines from direct lightning strokes, Lightning arresters, rod gap type, horn gap type, Thyrite type, Metal oxide (ZnO) type lightning arrester.</p> <p><b>System grounding:</b> Introduction and importance of earthing, terms and definitions, types of earthing, substation earthing.</p>	
<b>UNIT-VI</b>	<b>Substation layouts &amp; PC applications in short circuit studies for designing relaying scheme :</b>	<b>(06 Hrs.)</b>
	<p><b>Substation layouts :</b> Classification of substation, selection &amp; location of site, main connection schemes, Equipments used in substation, various symbols – C.B. , L.A., fuses, relays, power transformer, bus bar and its arrangement, CT.- PT, isolators, earthing switch, capacitor bank, batteries PLCC, control room, etc., Connection diagram and its layout.</p> <p><b>PC applications in short circuit studies for designing relaying scheme:</b> Introduction, Types of faults, and Assumptions for conducting short circuit studies,</p>	

	steps in development of algorithm.	
<b>Term Work:</b>		
The Practical's shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> <li>1. To find the characteristics of MCB using relay testing kit.</li> <li>2. To find the characteristics of MCCB using relay testing kit.</li> <li>3. To find the characteristics of Fuse using relay testing kit.</li> <li>4. To find the pickup and drop off voltage of Contactor</li> <li>5. To find the characteristics of Induction type over current relay</li> <li>6. To find the characteristics of Induction type under voltage relay</li> <li>7. To find the characteristics of microprocessor based over current relay</li> <li>8. To find the characteristics of microprocessor based under voltage relay</li> <li>9. To find the characteristics of microprocessor based over voltage relay</li> <li>10. Differential protection of 3 phase alternator.</li> <li>11. Protection of transmission line.</li> <li>12. Report on industrial visit to switchgear training centre /or switchgear/relay manufacturing unit/ or H.T. substation visit.</li> </ol>		
<b>Text Books:</b>		
1. S. Rao, "Switchgear Protection & Power Systems", Khanna Publications		
2. Y. G. Paithankar, S. R. Bhide, "Fundamentals of Power System Protection", Prentice Hall of India		
3. Bhavesh Bhalja, R.P. Maheshwari, N.G. Chothani," Protection and Switchgear", Oxford University Press, 2011 Edition.		
4. A Course in Electrical power – M L Soni, P V Gupta, U S Bhatanagar - Dhanpat Rai and sons		
<b>Reference Books:</b>		
5. Badri Ram, D. N. Vishwakarma, "Power System Protection & Switchgear", Tata McGraw Hill Publishing Co. Ltd.		
6. J. Lewis Blackburn , Thomas J. Domin, "Protective Relaying: Principles and Applications", Fourth Edition, CRC Press.		
7. Prof. Dr S.A. Soman, IIT Mumbai , A Web course on "Digital Protection of power System" <a href="http://www.cdeep.iitb.ac.in/nptel/Electrical%20Engineering/Power%20System%20Protection/Course_home_L27.html">http://www.cdeep.iitb.ac.in/nptel/Electrical%20Engineering/Power%20System%20Protection/Course_home_L27.html</a>		
8. A.G. Phadke and J.S. Thorp , Computer relaying for Power System, Research Studies Press LTD, England.(John Willy & Sons Inc New York)		
9. Crussel Mason, "The Art and Science of Protective Relaying", Wiley Eastern Limited.		
10. Power system Protection and Switchgear – B Ravindranath and M M Chander – Wilsey Eastern Ltd.		
11. L. P. Singh, Digital Protection, New age international Publisher		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

#### Assignments:

1. Market survey for various switchgear devices and prepare report on the same.
2. Industrial visits to Manufacturer of switchgear devices and prepare report.
3. Solve 3 University exam question papers.
4. Prepare report on NPTEL Video lectures on any topic related with syllabus.

5. Solved the unsolved questions from books for every Unit.
6. Solve the GATE question papers Unit wise.
7. Prepare self-study report on topics related with Units.

## Power System Analysis

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	TW: 25Marks                      Practical:25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
<b>1.</b>	Structure of Power System, Transmission & Distribution Systems, Network Analysis.	
<b>Course Objectives:</b>		
	This course aims at understanding the components of interconnected power system, Representation of these system components in terms of mathematical models and Tools for analyzing the system operation during the normal & abnormal operating conditions.	
<b>Course Outcomes:</b>		
<b>1.</b>	To apply the concepts of Complex Power.	
<b>2.</b>	To interpret Single Line Diagram of power systems & model the power system in per unit	
<b>3.</b>	To formulate the load flow problem for 3-4 bus system & interpret the results.	
<b>4</b>	To compute fault current on the occurrence of symmetrical fault on power system	
<b>5</b>	To convert the unbalanced system parameters to sequence components & vice versa & to compute fault current on the occurrence of SLG, LL and DLG fault on power system	
<b>6</b>	To Derive swing Equation & apply solution to understand the rotor dynamics of synchronous machines	
<b>UNIT - I</b>	<b>Complex Power</b>	<b>(08Hour)</b>
	Structure of Interconnected & Integrated Power System, Formation of National Grid, Present Indian Power Industry, Power system analysis and their necessity. Concept of complex power, Complex power flow through transmission lines, Load on the system, its composition, nature of load curves for various consumer categories, Load voltage-frequency specifications & permissible variations, Real power-frequency and reactive power- voltage dependency, Conventional methods of voltage control of Power system.	
<b>UNIT - II</b>	<b>Power System Modeling</b>	<b>(08Hour)</b>
	Representation of power system-Single line diagram, Representation and modeling of long line, Synchronous generator-simple model such as emf behind reactance, power transformer, three winding transformer. Impedance and Reactance diagrams of power systems and their use. The per unit system of parameter value representation-selection of base, change of base, advantages, its application to impedance/reactance diagram.	
<b>UNIT - III</b>	<b>Load Flow Analysis</b>	<b>(08Hour)</b>
	Development of mathematical models of simple systems by network reduction, Driving point & Transfer Admittance, Concept of Z-bus and Y-	

	bus matrices, Formation of Y Bus Matrix ,Introduction to load flow analysis, Classification of buses, Formation of power flow equations (PFES) for n bus power system, Classification of variables& solution techniques, Newton-Raphson Method(Polar form) for load flow solution ,Introduction to optimal power flow and DC power flow, its importance, necessity and difference from conventional power flow.	
<b>UNIT - IV</b>	<b>Symmetrical Fault Analysis</b>	<b>(08Hour)</b>
	Symmetrical faults on power system, Sudden three [phase short circuit fault on unloaded alternator, Sub-transient, transient and steady state currents and impedances, DC offset and effect of the instant of short circuit on the waveforms, Estimation of fault currents with and without pre-fault current for simple power system, Selection of circuit breakers and current limiting reactors.	
<b>UNIT - V</b>	<b>Unsymmetrical Fault Analysis</b>	<b>(08Hour)</b>
	Methods of symmetrical components, relationships, sequence impedances. Representation of power systems by positive, negative and zero sequence networks, Nature of sequence impedance of power system components. Line-Line, Line-Ground, Line-Line-Ground faults, Analysis of unloaded and pre loaded alternators and simple power systems with and without fault impedance.	
<b>UNIT - VI</b>	<b>Power System Stability</b>	<b>(08Hour)</b>
	Concept of steady state, dynamic and transient stability of power systems and the factors controlling each, Steady state stability, its evaluation and variation of limits of stability under system conditions, Transient stability and importance of rotating machine dynamics in the power system stability evaluation,. The swing equation, its derivation, Equal Area Criteria (Consideration of one machine-infinite bus problem only.)	
<b>Term Work:</b>		
The term work shall consist of record of minimum eight experiments.		
<ol style="list-style-type: none"> <li>1. Study of effect of VAR compensation on receiving end voltage profile on a transmission line using capacitor bank.</li> <li>2. Determination of steady state stability limit for transmission line.</li> <li>3. Determination of steady state limit of a synchronous motor and plotting P- curve.</li> <li>4. Measurement of sub transient reactance of a salient pole synchronous machine by Static impedance /Dalton – Cameron method.</li> <li>5. Measurement of negative sequence reactance of synchronous machine.</li> <li>6. Measurement of zero sequence reactance of synchronous machine.</li> <li>7. Fault analysis for symmetrical fault by simulation or AC/DC network analyzer.</li> <li>8. Unsymmetrical fault analysis by simulation or AC/DC network analyzer.</li> <li>9. Computer aided solution of 3 bus load flow problem using Gauss-Seidel method.</li> <li>10. Formation of Y bus matrix using computer programming.</li> <li>11. Study of load flow on 3 bus system using by actual simulation/ AC network analyzer.</li> </ol>		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. I J Nagrath , D P Kothari, "Modern Power System Analysis", Tata McGraw Hill Publication</li> <li>2. Grainger Jhon J, W D Stevenson Jr, "Power System Analysis" Mc-Graw Hill Publication</li> </ol>		

<b>Reference Books:</b>	
1.	O I Elgerd, "Electrical Energy Systems Theory: An Introduction", Tata McGraw Hill Publication
2.	Hadi Sadat," Power Sysem Analysis", McGraw Hill International Publication
3.	A R Bergen and Vijay Vittal,"Power System Analysis", Pearson Education Asia.
4.	J D Glover and M Sarma," Power System Analysis & Design",
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

#### Assignments:

1. Refer the following web sites& prepare presentation on Power Scenario of India  
Ministry of Power, CERC, MNRE
2. Sketch the load curves for Residential, Industrial, Agriculture, Municipal and Commercial categories of consumers and compare them with reference to Load factor, Diversity factor. Also plot the monthly load curve of the college substation. Estimate the maximum demand, Load factor.
3. Sketch the single line diagram (SLD) of the college & department power supply system. Enter all the specifications of the power system components & develop SLD using the ETAP software.
4. Develop the power system model of the department/College power system/any other power system (up to 50 buses) & conduct the load flow analysis using E TAP software. Analyse the results using N-R method.
5. Develop the power system model of the department/College power system/any other power system (up to 50 buses) & conduct the short circuit analysis using E TAP software. Analyse the results to confirm the Circuit Breaker ratings.
6. Develop the model of long transmission line and synchronous machine & estimate the steady state stability limit using ETAP/MATLAB software.
7. Self-learn NPTEL sessions on i) Symmetrical Fault Analysis ii) Unsymmetrical Fault Analysis & Generate presentation to explain the concepts: i) Nature of Short Circuit Current ii) Selection of Circuit Breakers iii) Symmetrical components
8. Arrange Industrial Visit to Load Dispatch Center: Prepare Study Report on Control Functions applied by the load dispatcher for Power System Analysis



## Modern Control Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks    Oral 25marks	01 Credit
<b>Course Prerequisites:</b>		
The students should have knowledge of		
	Linear control system , methods of stability analysis, Matrix algebra, Z transform,	
<b>Course Objectives:</b>		
	This course introduces state space modeling and stability analysis of system. It includes phase plane and describing function method of stability analysis of nonlinear system. It also introduces fundamental mathematical concepts and stability analysis of digital control system	
<b>Course Outcomes:</b> After learning this course the students will be able to		
<b>1.</b>	Represent the system equation in various state space models (physical, phase variable, canonical	
<b>2.</b>	Draw block diagram and signal flow graph from state space model of system.	
<b>3.</b>	Calculate the solution of state equation; calculate transfer function from state space model.	
<b>4</b>	Recognize various nonlinearities and its effect on system stability	
<b>5</b>	Compare between Linear and nonlinear, analog and digital, state space and transfer function model	
<b>6</b>	Calculate pulse transfer function of digital system. Explain the mathematical model of digital system and select appropriate sampling frequency.	
<b>7</b>	Describe principle of operation and applications of adaptive control, robust control and Artificial neural network, Fuzzy logic .	
<b>UNIT I</b>	<b>State Variable representation</b>	<b>(08Hours)</b>
	Comparison of transfer function and state variable analysis, concept of state, state space, state vector, state equation of the system, state space representation using physical variable, phase variable and canonical variables with block diagram, Decomposition of transfer function, Eigen values and Eigen Vectors, Diagonalization of the system matrix with distinct and repeated roots.	
<b>UNIT II</b>	<b>State variable stability analysis and design</b>	<b>(08Hours)</b>
	Solution of state equation with and without inputs, State Transition Matrix (STM), Methods to determine STM using Infinite series method ,Laplace transform, Caley Hamilton theorem. Definition of controllability, observability, Kalman's test, Gilbert's test, Determination of transfer	

	functions from state model. State feedback control, pole placement design through state feed back	
<b>UNIT III</b>	<b>Nonlinear system</b>	<b>(08Hours)</b>
	Different types of nonlinearities, peculiar behavior of nonlinear system-response, jump resonance, limit cycle: stable and unstable, amplitude as function of frequency oscillation, nonlinear spring mass system, sub harmonic oscillation, asynchronous quenching, frequency Phase plane method, singular points, phase plane plots using delta method determination stability from state trajectory, relation with time domain analysis. Concept of Describing Function, derivation of describing function of various nonlinear elements, Stability analysis using describing function, existence of limit cycle, Merits demerits of describing function method	
<b>UNIT IV</b>	<b>Discrete time system</b>	<b>(08Hours)</b>
	Basic elements of discrete data system, merits of discrete system, Sampling and selection of sampling period, Sample and hold circuit, A/D and D/A converter, modeling of zero order hold , reconstruction of signals from samples, Shannon's sampling theorem. Z transform – definition, simple functions, Inverse Z transform, linear difference equations and their solution	
<b>UNIT V</b>	<b>Analysis of Discrete time system</b>	<b>(08Hours)</b>
	Derivation of Pulse Transfer function, , pulse transfer function of closed loop system, Bilinear transformation, stability in Z plane, Jury's test, Routh's criteria , State space representation of discrete time systems, state space models from pulsed transfer function.	
<b>UNIT VI</b>	<b>Introduction to advances in control system</b>	<b>(08Hours)</b>
	Adaptive control , Model reference Adaptive control block diagram and working with practical applications, Robust control ,Fuzzy logic , Artificial neural network, algorithm and learning architecture	

**Term Work:**

The term work shall consist of record of minimum eight experiments .To ensure that at least one experiment on each unit.

1. To convert transfer function into state model i) phase variable form ii) canonical form
2. To derive state model of DC servo motor from physical variables and observe step response, i.e. to solve state equation of DC servo motor
3. To determine Eigen values, Eigen vectors and diagonalises the system.
4. To determine controllability and observability by Kalman's test and Gilbert's test.
5. Design of state feedback gain matrix by pole placement.
6. To plot phase plane trajectory of system with nonlinear elements using SIMULINK.
7. To analyze stability of nonlinear system using describing function.
8. To convert continuous time system to discrete time system and to observe effect of sampling time on step response.
9. To determine the gain for stability in Z domain.

10. To study adaptive control and robust control applications with MATLAB demos.	
<b>Text Books:</b>	
4. I.J. Nagrath, M. Gopal, ““Control System Engineering”, New Age International Publishers – Fourth edition	
5. Katsuhiko Ogata, “Digital control system”, Prentice Hall, 2010.	
6. M.Gopal , “ Digital control system”	
7. Dorf and Bishop , “Modern Control systems”- Pearson education	
<b>Reference Books:</b>	
5. Nise N. S. “Control Systems Engineering”, John Wiley & Sons, Incorporated, 2011	
6. D. Roy Choudhary, "Modern Control Engineering", PHI Learning Pvt. Ltd., 2005	
7. Dorf, Bishop - “Modern control system”, Pearson Education	
8. M. N. Bandyopadhyay, “Control Engineering – Theory and Practice”, Prentice Hall of India Ltd. Delhi	
9. Geir E. Dullered, F.G.Paganini - “ A course in robust control theory “- Springer	
10. Jan Jan tzen- ‘Foundation of Fuzzy control – a practical apporoach – Wiley	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

#### Assignments:

- To solve numerical on decomposition of transfer function to state variable (different forms)and to draw state diagram
- To identify state variables of physical system and write down state model.
- To determine transfer function from given state model
- To calculate STM by three different methods.
- To derive describing function of different nonlinearities
- To draw phase plane trajectory by isoclines method
- To derive pulse transfer function
- To prepare comparative analysis of discrete time and continuous time system.
- To prepare chart of Z transform of standard functions
- To solve question papers of GATE unit wise.
- To study Research paper on adaptive control and prepare presentation.
- To observe NPTEL video on robust control and group discussion related to it.

## Industrial Organization & Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	03 Credits
<b>Course Pre-requisites:</b>		
The Students should have knowledge of Professional skill development 1 to 5.		
<b>Course Objectives:</b>		
	<ul style="list-style-type: none"> <li>• This course will help the students to understand the basic operations in any organization.</li> <li>• With the technical skill sets, there are also some more things that to be studied to be in any organization.</li> <li>• This course will help the students to learn these aspects. They are going to learn about Management related terms like Depreciation, Replacement engineering, Product Engineering, Production Planning and Inventory Control.</li> <li>• This course will also help to understand the Job Evaluation techniques, Personnel Management, Behavioral Aspects of Management and Operations Research.</li> <li>• This course will complete the overall aspects of the student with technical knowledge with needed management skills.</li> </ul>	
<b>Course Outcomes:</b>		
The student will be able to		
<b>1.</b>	Explore the basic terms related to management like function, principles. Leadership qualities will also get improved.	
<b>2.</b>	Explore the type of companies and the various financial aspects related with the company.	
<b>3.</b>	Exculpate the terms related with the depreciation, replacement and products of the company and to deal with it.	
<b>4</b>	Explore the production and inventory related terms. The control on the inventory and information related with it.	
<b>5</b>	Explore the company's requirement as per the human resource requirement, which also very important part in any company.	
<b>6</b>	Behaviors and ethics of an employee in the organization are to be studied which will be requiring in carrying out the operations research.	
<b>UNIT - I</b>		
<b>Management</b>	<b>(06 Hrs)</b>	
	Introduction, Phases in Management: scientific management, Behavioral management and Information technology and operations research. Industrial Management, Contents and Principle of Management, Functions of Management: Planning, coordination, motivation and control. Leadership: Qualities of leader, Leading Process. Education and Training of Management. Elements of Quality Management System ISO 9001-2008.	

<b>UNIT - II</b>	<b>Formation of Company and Financial Planning</b>	<b>(06 Hrs)</b>
	Introduction, Company definition, Types of company Structure: Proprietorship, Partnership, Joint Stock companies, Limited and Unlimited Company, Private and Public, Corporative, Public, Private and Joint Sector, Trust and Holding Companies. Classification of Capital, Capital Procurement, Structure of Authorized Pattern, Economic Aspects of Cost Patterns, Breakeven Analysis, Financial Management.	
<b>UNIT - III</b>	<b>Depreciation, Replacement and Product Engineering</b>	<b>(06 Hrs)</b>
	Introduction, objective of Business Enterprise, Depreciation and Depreciation Calculation, Estimation of Life of an Engineering Aspects, Replacement of Plant and Machinery, Product Classification, Initiation of Product, Production Analysis, simplifications and Standardization, Product Research, Diversification and specialization, Patent Analysis.	
<b>UNIT - IV</b>	<b>Production Planning and Inventory Control</b>	<b>(06 Hrs)</b>
	Introduction, Production System, Production Types, Production Planning functions, Efficiency of Production planning and Drawing Office Organization. Inventory Control Functions, Procedures for Purchase, Principles of Inventory Control, Inventory Policies, Economic Batch Quantities, Purification of Inventory, control of incoming materials and store Issues. Information flow analysis.	
<b>UNIT - V</b>	<b>Job Evaluation and Personnel Management</b>	<b>(06 Hrs)</b>
	Introduction, Job Evaluations and Analysis, Classification of Job evaluation techniques, Evaluation of wages structures, system of merit rating, measurement of responsibility and wage incentives. Importance of personnel management, human relations, attitude of employers towards employees. Functions of personnel management. Personnel research, labour participation in management. Labour turnover, industrial disputes.	
<b>UNIT - VI</b>	<b>Behavioral Aspects of Management and Operations Research</b>	<b>(06 Hrs)</b>
	Scientific management, Hawthorne Studies, Elton Mayo, Theory X and Theory Y, Herzberg's motivation and Hygiene Theory, Organizational goals and Culture. Stresses at workplace, Interpersonal Behavior, power and Politics in organization. Phases of an Operations Research, formation of some typical problems, competitive model, Program Evaluation and Review Techniques, Graphical and Matrix solution of linear programming models.	

**Assignment:**

1. Introduction to management
2. Formation of Company and Financial Planning
3. Depreciation, Replacement and Product Engineering
4. Production Planning and Inventory Control
5. Job Evaluation and Personnel Management
6. Behavioral Aspects of Management and Operations Research

**Text Books:**

1. "Industrial Organization and Management", S. K. Basu, K. C. Sahu, B. Rajiv, PHI learning Private Limited, New Delhi.
2. "Industrial Engineering and Management", O.P. Khanna, Dhanpat Rai & Sons. New Delhi.

<b>Reference Books:</b>	
1.	“Industrial Organization and Management: Principles and Practice”, S. Sundaramurthy, R. V. R. Sivagnanam, United Book Corporation.
2.	“Industrial Organization and Management Fundamentals”, Herman B. Henderson, Albert E. Haas Industrial Press.
3.	“Professional Management in Industrial Organisations”, K.P. Kaur, Deep and Deep Publications.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Elective II: Renewable Energy Systems

<b>TEACHING SCHEME:</b>			<b>EXAMINATION SCHEME:</b>			<b>CREDITS ALLOTTED:</b>		
Theory: 03 Hours / Week			End Semester Examination: 60 Marks			03 Credits		
Practical: 02 Hours / Week			Continuous Assessment: 40 Marks					
			Term Work: 25 Marks Oral:25Marks			01 Credit		
<b>Course Pre-requisites:</b>								
The Students should have knowledge of								
<b>1.</b>	Fundamentals of Electrical Engineering, Power Generation Techniques							
<b>Course Objectives:</b>								
1.	To create awareness of renewable energy sources like wind, solar energy, biogas plant, mini-hydro plant and fuel cell							
2.	To impart knowledge of biogas plant, tidal energy, wave energy, ocean thermal and geothermal energy							
3.	To impart knowledge of energy storage and hybrid systems.							
<b>Course Outcomes:</b>								
	Students are able to							
<b>1.</b>	Uses renewable energy sources							
<b>2.</b>	Utilize wind energy							
<b>3.</b>	Apply solar energy to any equipment							
<b>4</b>	Describe biogas plant, mini-hydro plant and fuel cell							
<b>5.</b>	Compare tidal energy, wave energy, ocean thermal and geothermal energy							
<b>6.</b>	Decide energy storage and hybrid systems for particular application							
<b>UNIT - I</b>	<b>Energy scenario</b>						<b>(06 Hours)</b>	
	<p>Classification of energy sources, energy needs of India and energy consumption patterns, worldwide potential of these sources, energy efficiency and energy security, energy economics, energy conservation supply curves,</p> <p>Environmental issues, environmental impacts, global warming and climate change, carbon trading, concept of carbon credits, carbon footprints, carbon dioxide sequestration, atmospheric pollutants, Kyoto protocol, ozone depletion. Concept of clean development CDM and prototype carbon funds PCF. Impacts of renewable energy, Factors favoring and against renewable energy sources. Market survey, International electro technical commission standards for renewable energy sources.</p>							

<b>UNIT - II</b>	<b>Wind energy systems</b>	<b>(06 Hours)</b>
	Types of wind turbines, electrical generators for wind turbines, power in the wind, impact of tower height, measurement of wind speed, maximum rotor efficiency, various controls in wind turbines, fixed speed and variable speed wind turbines, power converters, wind turbine economics, specific wind turbine performance calculations, impacts of wind turbines. Wind turbine specification, stand alone and grid connected wind turbines, offshore wind farm, magnetic levitated wind turbine, floating wind turbine, wind turbines on vessels, installation, maintenance and commissioning of wind turbines. wind turbine system market survey, design, layout, costing, grid integration issues, case studies, data analysis, numericals	
<b>UNIT - III</b>	<b>The solar resource and solar thermal systems</b>	<b>(06 Hours)</b>
	The solar spectrum, the earth's orbit, altitude angle of the sun at solar noon, solar position at any time of day, sun path diagrams for shading analysis, solar time and civil (clock) time, clear sky direct-beam radiation, total clear sky insolation on a collecting surface, monthly clear-sky insolation, solar radiation measurements, average monthly insolation. Direct and diffused radiation and effect on power generation. Solar thermal water heating, types of collectors, efficiency, solar thermal energy generation. Applications of solar thermal system, solar ponds, solar cooker, issues in solar energy, case studies, data analysis, system design, layout, costing, numericals	
<b>UNIT - IV</b>	<b>Solar photovoltaic systems</b>	<b>(06 Hours)</b>
	Basic semiconductor physics, a generic photovoltaic cell, the simplest equivalent circuit for a photovoltaic cell from cells to modules to arrays, the P-V I-V curve under standard test conditions (STC), impacts of temperature and insolation on i-v curves, shading impacts on i-v curves, crystalline silicon technologies, single-crystal czochralski (CZ) silicon, ribbon silicon technologies, cast multi-crystalline silicon, crystalline silicon modules, thin-film photovoltaic, efficiency of PV system. Methods of measurements. : introduction to the major photovoltaic system types, current-voltage curves for loads, grid-connected systems: interfacing with the utility, dc and ac rated power, the "peak-hours" approach to estimating PV performance, capacity factors for PV grid-connected systems, stand-alone PV systems, concentrating solar power (CSP) technologies, PV-powered water pumping, building integrated solar systems, solar facades, solar cars, PV systems – off grid systems and scope for inclusive growth of rural India. Grid autonomy. Bi-directions metering. maximum power point tracking, Calculation of system details. Grid integration issues, case	



	studies, data analysis, grid-connected PV system economics, system trade-offs, dollar-per-watt ambiguities, amortizing costs, grid connected and standalone system sizing, design, layout, costing, payback period,numericals	
<b>UNIT - V</b>	<b>Other sustainable energy sources and hybrid systems</b>	<b>(06 Hours)</b>
	Micro-turbine generation, wave energy conversion systems, tidal energy conversion systems, ocean thermal energy systems, clean coal power plants, biogas, biomass to electrical energy conversion, gasifires, biomass fired boilers, co-firing, cogeneration in sugar industry, energy from municipal solid waste, geo-thermal energy, biomechanical energy, bio-chemical and photosynthesis techniques. Biomass for electricity, small hydro, mini hydro, micro-hydropower, pico hydro,nano hydro systems, electricity from water pipelines, fuel cells, fuel cell efficiency, types of fuel cells, hydrogen production, standalone system,hybrid systems, wind solar hybrid, wind diesel, solar diesel, wind mini hydro hybrid system, numericals	
<b>UNIT - VI</b>	<b>Energy storage</b>	<b>(06 Hours)</b>
	Battery storage, charge regulators, battery types, maintenance, management, fly wheel energy storage, pumped water energy storage, hydrogen energy storage, super capacitor energy storage systems, compressed air energy storage systems, cryogenic energy storage, thermal energy storage, seasonal thermal energy storage. Use of various energy storage techniques in renewable energy sources, numericals	
<b>Term Work:</b>		
1. Fabrication of solar over.		
2. Fabrication of solar cooker.		
3. Desalination of water using solar still.		
4. Fabrication of solar car.		
5. Fabrication of solar updraft tower.		
6.Fabrication of small horizontal axis wind turbine and testing.		
7. Fabrication of small vertical axis wind turbine and testing.		
8. Fabrication of small biogas plant.		
9. Fabrication of a simple fuel cell.		
10. Fabrication of small hydro turbine.		
11. Testing of super capacitor.		
12. Comparison of performance of wind turbine with and without flywheel.		
<b>Text Books:</b>		
1. G. D. Rai, “Non-Conventional Energy Sources”,Khanna Publication		
2. R. Ramesh, “ Renewable energy Technologies”,Narosa Publication		
3. S. Rao, Dr. B. B. Parulekar, “Energy Technology – Non Conventional, Renewable and Conventional”,Khanna Publication		
4. Mittal, “ Non-conventional systems ”,Wheelers publication		

5. Gilbert M. Masters, "Renewable and Efficient Electrical Power Systems", Wiley -IEEE Press, August 2004

**Reference Books**

1. Dr. S. P. Sukhatme, "Solar Energy", Tata McGraw Hills
2. S. Bandopadhyay, "Solar Energy", Universal publishing.
3. Paul Gipe, "Wind Energy Comes of Age", John Wiley & Sons Inc.
4. Njenkins, "Wind energy technology", John wiley and sons
5. Mcniels, Frenkel , Desai , "Solar and wind energy technologies", Wiley Eastern
6. G. N. Tiwari, SangeetaSuneja, "Solar Thermal Engineering Systems",Narosa Publishing House
7. L. L. Freris, "Wind Energy Conversion System", Prentice Hall
8. Mukund Patel, " Wind and solar systems", CRC press
9. TapanBhattachary, "Solar photovoltaics for terrestrials
10. MiliMajumdar, "Energy Efficient Buildings in India", Published by Tata Energy Research Institute & MNRE
11. Thomas Ackermann, "Wind Power in Power Systems", Wiley Publications
12. Tony Burton et al, "Wind Energy Hand Book", John Wiley & Sons Inc.
13. Siegfried Heier, Rachel Waddington, "Grid Integration of Wind Energy Conversion Systems", Wiley Publications

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Assignments**

1. Market survey for solar thermal system for water heating and solar photo voltaic system for power generation. Collection of information charts brochures / leaflets from suppliers, manufacturers, cost, technical specification etc. comparative tables for techno commercial information of various products from various companies. List of solar power plants in India and nearby Pune city
2. Clean development mechanism CDM, Carbon credit, carbon credit certificate, types of Carbon Credits, carbon footprints, Measuring carbon footprints, Average carbon emissions per person by country
3. Various wind generators and their comparison w.r.t techno commercial information, their suitability to grid and standalone system, suitability of installation
4. Design of water pumping system for irrigation purpose using wind energy system with a 5 hp pump. Design of suitable water storage facility and drip irrigation system. Size of storage tank. Detailed design with required techno commercial information, turbine size, tower size, cost, market survey for procurement.
5. Design of solar thermal system for hot water system for Bharati Vidyapeeth College of engineering hostel and guest house. The report should involve all techno-commercial

information. Complete design of solar thermal system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email-ID.

6. Design of solar Photovoltaic system for water pumping system for Bharati Vidyapeeth College of engineering campus. The report should involve all techno-commercial information. Complete design of photovoltaic system. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.
7. Detailed report for grid integration and challenges in grid integration. Recent trends in grid integration. Methods of grid integration for solar and wind power plants. Detailed report.
8. Design of Canteen waste management system for Bharati Vidyapeeth College of engineering canteen with detailed report for feasibility of biogas plant for cooking in canteen and possibility of generation of electricity. The report should involve all techno-commercial information. Complete design of biogas plant for canteen waste. Block diagram and detailed diagram of plant for installation and costing. List of suitable vendors for procurement of raw material also should be available in the report with their detailed address, phone numbers, website and email id.
9. Design of fuel cells for a PMPML bus with all techno commercial information.
10. Design of Solid waste management for katraj area, Pune city, system design and detailed report with all techno commercial information and layout.
11. Design of micro hydro power plant for canal and piped drinking water at parwati pumping station with all techno commercial information and layout.
12. Design of nano hydro system for electrical energy generation system using kinetic energy of water through pipes in a large housing r society with suitable energy storage and illumination system using LED for parking of the society.
13. Types of storage systems for electrical energy. The storage systems suitable for wind energy, solar energy should be given. All other new unconventional methods of storage of energy along with conventional methods should be explained. e.g. super capacitors, compressed air storage, pumped water storage, hydrogen energy storage etc. Techno-commercial comparison all methods should be done. Actual sites where these methods are used should also be mentioned.
14. Industrial visit report for a renewable energy power plant.

Note : - Each practical needs power point presentation and detailed report with techno-commercial information.

## Elective II: Programmable Logic Controllers

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
<b>1.</b>	Logic gates operations, Boolean algebra, Data types (integer, float, unsigned)	
<b>Course Objectives:</b>		
	This course aims at understanding the basic concepts PLC hardware and PLC software and Programming language like ladder, construction of ladder diagram, their symbol and component of the instruction. Knowledge of analog and digital input and Output devices, PID, SCADA and Communication Protocols.	
<b>Course Outcomes:</b>		
<b>1.</b>	Describe Programmable Logic Controller along with the block diagram with its components in detail.	
<b>2.</b>	Develop architecture of SCADA explaining each unit in detail.	
<b>3.</b>	Develop a software program using modern engineering tools and technique for PLC and SCADA.	
<b>4</b>	Enlist various industrial applications using PLC and SCADA.	
<b>5</b>	Describe the importance of SCADA in critical infrastructure.	
<b>6</b>	Execute, debug and test the programs developed for digital and analog operations.	
<b>UNIT -I</b>	<b>Introduction to PLC</b>	<b>(06 Hours)</b>
	History of PLC, PLC system, Block Diagram of general PLC, PLC input and output module, Sensors and actuators for PLC, Central Processing Unit, Monitors, solid state memory, Power supplies, HMI and Interfaces, Selection criteria for PLC, PLC advantages and disadvantages, Present PLC manufacturers.	
<b>UNIT – II</b>	<b>Programming of PLC</b>	<b>(06 Hours)</b>
	Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices, Programming equipments, Introduction of Programming languages, Basic components & symbols in ladder diagram, Construction of PLC ladder diagram for programming, Fundamentals of ladder diagram, Boolean logic & relay logic, programming ON/OFF Inputs to produce ON/OFF outputs.	
<b>UNIT – III</b>	<b>PLC Applications</b>	<b>(06 Hours)</b>
	Analog PLC operation, PID control of continuous processes, closed loop systems and common problems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface. Industrial process example: Motors Controls - AC Motor starter, AC	

	motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive. Temperature, level and Flow control.	
<b>UNIT - IV</b>	<b>SCADA Systems Overview</b>	<b>(06 Hours)</b>
	Introduction and definitions of SCADA, Principles of SCADA systems, SCADA system evolution. Basic SCADA system Architecture: Human Machine Interface, Master Terminal Unit, Remote Terminal Unit. SCADA data transfer through PLCC. Communication Technologies, Communication system components, SCADA Communication in an electrical power system. SCADA system desirable Properties, Real Time System, SCADA server, SCADA functions.	
<b>UNIT - V</b>	<b>SCADA Architecture</b>	<b>(06 Hours)</b>
	First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture, Intelligent Electronic Devices. Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, State estimation, and SCADA system security issues overview. SCADA systems in the critical Infrastructure: Conventional Electric Power Generation, water Purification System, Chemical Plant, Petroleum Refining Process.	
<b>UNIT - VI</b>	<b>The Evolution Protocols</b>	<b>(06 Hours)</b>
	Overview of Open systems interconnection (OSI) Model, Functions of OSI Model Layers, OSI Protocols, Functions of Transmission control protocol / Internet protocol (TCP/IP) Layers, TCP/IP protocol, DNP3 protocol, IEC layered architecture, Ethernet/IP, Process Field bus (Profibus), Modbus, The Security Implications of the SCADA protocols.	
<b><u>Term Work:</u></b>		
The term work shall consist of record of minimum eight experiments. Four from first 6 and four from next 6 out of given below.		
<ol style="list-style-type: none"> <li>1. Interfacing of lamp &amp; button with PLC for ON &amp; OFF operation. Verify all logic gates.</li> <li>2. Performed delayed operation of lamp by using push button.</li> <li>3. UP/DOWN counter with RESET instruction.</li> <li>4. Combination of counter &amp; timer for lamp ON/OFF operation.</li> <li>5. Set / Reset operation: one push button for ON &amp; other push button for OFF operation.</li> <li>6. DOL starter &amp; star delta starter operation by using PLC.</li> <li>7. PLC interfaced with HMI&amp; status read/command transfer operation.</li> <li>8. Parameter reading of PLC interface with SCADA.</li> <li>9. Alarm annunciation using PLC &amp;SCADA.</li> <li>10. Tank level control by using PLC &amp;SCADA.</li> <li>11. Temperature monitoring by using PLC &amp;SCADA.</li> <li>12. Reporting &amp; trending in SCADA system.</li> </ol>		

<b>Assignments:</b>	
<ol style="list-style-type: none"> <li>1. Automation requirement in industries</li> <li>2. Recent trends in automation</li> <li>3. Basic concepts in Ladder diagrams</li> <li>4. Basic programming for automation</li> <li>5. A solar panels automatic tracking system based on PLC</li> <li>6. Automated water supply control system using PLC</li> <li>7. PID implementation of heating tank in industrial plant</li> <li>8. PLC based SCADA for oil storage</li> <li>9. Web based remote access laboratory using SCADA</li> <li>10. Three layer PLC/SCADA system architecture in process automation</li> </ol>	
<b>Text Books:</b>	
3. John R. Hackworth, Frederick D., Hackworth Jr., “Programmable Logic Controllers Programming Methods and Applications”, PHI Publishers.	
4. John W. Webb, Ronald A. Reis, “Programmable Logic Controllers: Principles and Application”, PHI Learning, New Delhi, 5 <sup>th</sup> Edition.	
5. Ronald L. Krutz, “Securing SCADA System”, Wiley Publications.	
6. Wiley Boltan	
<b>Reference Books:</b>	
5. Batten G. L., “Programmable Controllers”, McGraw Hill Inc., Second Edition	
6. Gordan Clark, Deem Reynders, “Practical Modern SCADA Protocols”, ELSEVIER	
7. P. K. Srivstava, “Programmable Logic Controllers with Applications”, BPB Publications	
8. Krishna Kant, “Computer Based Industrial Control”, PHI	
9. Catalogues and user manuals PLC and SCADA	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Elective II: Signal and Systems

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS</u></b>
				<b><u>ALLOTTED:</u></b>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral:25Marks		01 Credit
<b>Course Pre-Requisites:</b>				
The Students should have				
1.	Mathematics			
2.	Physics			
3.	Fundamentals of Electrical Engineering			
<b>Course Objectives:</b>				
The course introduces fundamental concepts of signals,.				
<b>Course Outcomes:</b>				
1.	Understand and apply knowledge of various types of signals			
2.	Understand and apply knowledge of Fourier analysis to signals			
3.	Understand and apply knowledge of Laplace transforms in Analysis of CT systems .			
4.	Understand and apply fundamental concepts of DTFT			
5.	Understand and apply the Z transform analysis			
6.	Understand and apply the concept of Fourier and Laplace to real time applications			
<b>UNIT - I</b>	<b>CLASSIFICATION OF SIGNALS AND SYSTEMS.</b>			<b>(06 Hours)</b>
	Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & A periodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal &No causal, Stable & Unstable			
<b>UNIT - II</b>	<b>ANALYSIS OF CONTINUOUS TIME SIGNALS</b>			<b>(06 Hours)</b>
	Fourier series analysis-spectrum of Continuous Time (CT) signals-Fourier and Laplace Transforms in CT Signal Analysis - Properties.			
<b>UNIT - III</b>	<b>LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS</b>			<b>(06 Hours)</b>
	Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems .			
<b>UNIT - IV</b>	<b>ANALYSIS OF DISCRETE TIME SIGNALS</b>			<b>(06 Hours)</b>
	Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform			
<b>UNIT - V</b>	<b>LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS</b>			<b>(06 Hours)</b>
	Difference Equations-Block diagram representation-Impulse response - Convolution sum- Discrete Fourier and Z Transform Analysis of			

	Recursive & Non-Recursive systems	
<b>UNIT - VI</b>	<b>Real Life Application presentations</b>	<b>(06 Hours)</b>
	Analysis of obstacle detection, Speech and hearing, applications of Fourier Transform, Neuro Electronics, Automation for Smart traffic controller, Image processing, CDMA, Speaker verification, Pattern recognition in forex rates, Use of signals in SETI, SAS in radio astronomy, SAS in economic analysis, SAS in meteorology, SAS in Fourier optics	
<b>Term Work:</b>		
1. Generation of Signals: continuous time and discrete time		
2. Convolution of Signals, Solution of Difference equations		
3. Fourier series representation of continuous time signals		
4. Fourier transform of continuous time signals.		
5. Discrete time Fourier analysis		
6. Introduction to SIMULINK and calculation of output of systems represented by block		
7. Sampling and reconstruction of continuous time signals		
<b>Text Books:</b>		
1) 'Signals and systems' by Rajiv Kapadia, Jaico Publishing		
2) 'Signals and systems' by Anand Kumar		
3) 'Linear Systems and signals' by B.P.Lathi		
4) Textbook on Signals and systems' by Harish Parthasarathy, I.K.International Publishing		
<b>Reference Books:</b>		
1. 'Signals and systems' by Allen Openheim and Wilsky, Prentice Hall Publication		
2. Schaum's outline series book on 'Signals and systems' by H.Hsu and R.Ranjan		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

**Assignments:**

1. Solve the unsolved question from the books Unit wise.
2. Prepare report from NPTEL video lectures.
3. Prepare programming assignments from the syllabus topic.
4. Solve the University Question Papers Unit wise.
5. Group Discussions from syllabus topics from students and prepare report on the same.
6. Topics preparation from students on any topics and prepare PPT on the same.



## Elective II: Introduction to JAVA and .NET

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
<b>1.</b>	Object Oriented Programming like C++ and Internet concepts	
<b>Course Objectives:</b>		
	To expose students to the programming in JAVA and .NET for basic level programming so that they can program static and dynamic web pages using JAVA and .NET platforms.	
<b>Course Outcomes:</b> After learning the subject students will be able to		
<b>1.</b>	Use basic JAVA programming using JDK	
<b>2.</b>	Construct JAVA programs and applications deployed on server with server components and communication	
<b>3.</b>	Develop JAVA platform applications with database connectivity for dynamic and static web pages	
<b>4</b>	Use basics of .NET platform programming using .NET technologies	
<b>5</b>	Construct web applications using .NET technologies involving server communication and front end	
<b>6</b>	Use .NET platform for building applications using web services	
<b>UNIT - I</b>	<b>Introduction to JAVA</b>	<b>(06 Hours)</b>
	Why Java, Java Virtual Machine (JVM), Features, Variables, Data Types, Operators, Control Statements, Object Oriented Concepts in Java, Libraries, Packages,	
<b>UNIT – II</b>	<b>Server Programming Concepts in JAVA</b>	<b>(06 Hours)</b>
	Java Development Kit (JDK), Exception Handling (try-catch, throws and finally), Java API, Compile and Runtime Environment, JAVA – J2EE, JAVA.awt - Applets, JAVA GUI Components, Java Scripting	
<b>UNIT – III</b>	<b>Database and Application Programming Concepts in JAVA</b>	<b>(06 Hours)</b>
	Java Beans, Web Servers, Servelets, HTTP Request and Response, JDBC, Accessing Database from JSP Page, Exploring JAVA Programs and Applications	
<b>UNIT – IV</b>	<b>Introduction to .NET</b>	<b>(06 Hours)</b>
	Introduction to .NET Framework, Evolution of .NET technologies - CTS, CLS, CLR, MSIL, Introduction to Base Class Library, Introduction to VB.NET - Working with Visual Studio IDÉE – IDE Components, VB.NET Fundamentals – Variables, Data Types, Control Flow Statements, Subroutines, Functions, Object Oriented Concepts in .NET	

<b>UNIT - V</b>	<b>Building Applications with .NET</b>	<b>(06 Hours)</b>
	.NET Class Library, Input and Output, Windows Forms, Building Forms, Responding to User Inputs/Events, Menu Design, Information Presentation, Dialog Control, Working with XML, GUI's	
<b>UNIT - VI</b>	<b>Advanced .NET and Applications</b>	<b>(06 Hours)</b>
	ADO.NET Architecture, Web Programming, Web Services, Database Controls, ADO .NET Programming, Exploring .NET Applications and Programs, Comparison Between J2EE and .NET	
<b>Term Work :</b>		
The term work / assignments shall consist of record of topics from the list given below.		
<ol style="list-style-type: none"> <li>1. Development of static pages using HTML of an online Departmental Store having home page, login page and items catalog page.</li> <li>2. Add validations to above static pages of home page, login and items page using Java Script.</li> <li>3. Creation of a XML document of 20 students. Add their roll numbers, marks obtained in 5 subjects, total and percentage and save this XML document at the server. Write a program that takes students' roll number as an input and returns the students' marks, total and percentage by taking the students' information from the XML document on server.</li> <li>4. Creation of a JavaBeans which gives converted value of Temperature (in degree Celsius) into equivalent Fahrenheit.</li> <li>5. Do the assignment using JSP by converting the static web pages of assignment 2 into dynamic web pages. Create database with User Information and Item information. The Item catalog should be dynamically loaded from the database.</li> <li>6. Implementation of "Hello World!" program using JSP Struts Framework.</li> <li>7. Repeat all / some of the above experiments using VB.NET.</li> </ol>		
<b>Text Books:</b>		
1. Achyut Godbole and Atul Kahate, " Web Technologies - TCP/IP Architecture and Java Programming"		
2. Matha "Core Java: A comprehensive Study" Publisher PHI		
3. Black, "Web Technologies – HTML, JavaScript, PHP, JAVA, JSP, ASP.NET, XML and AJAX", Wiley India		
4. Pro ADO.NET with VB.NET – Sahil Mailk and Paul Dickinson		
5. Programming with JAVA - E Balgurusamy		
6. N.P .Gopalan, J.Akileneshwari, "Web Technology-A developer's Perspective", PHI		
<b>Reference Books:</b>		
1. Complete Reference J2EE – Jim Keogh		
2. McDonald, "ASP .Net Complete Reference", TMH		
3. Online Java Developer Tutorials and Training: <a href="http://www.oracle.com/technetwork/java">http://www.oracle.com/technetwork/java</a>		
4. H.M. Deitel and P.J. Deitel, "Java™ How to Program", Prentice-Hall of India, Seventh edition		

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI
<b><u>Assignments:</u></b>	
<ol style="list-style-type: none"><li>1. Solve the unsolved question from the books Unit wise.</li><li>2. Prepare report from NPTEL video lectures.</li><li>3. Prepare programming assignments from the syllabus topic.</li><li>4. Industrial visit to software company for the learning the applications of JAVA and .NET.</li><li>5. Solve the University Question Papers Unit wise.</li><li>6. Group Discussions from syllabus topics from students and prepare report on the same.</li></ol>	

## Elective II: Special Purpose Machines

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits
Practical: 02Hours / Week		Continuous Assessment: 40 Marks		
		Term Work: 25 Marks Oral:25Marks		01Credit
<b>Course Pre-requisites:</b>				
The Students should have knowledge of				
<b>1.</b>	Electrical machines (AC and DC)			
<b>Course Objectives:</b>				
To expose students to construction, principle of operation, performance and applications of special electrical machines as an extension to the study of basic electrical machines.				
<b>Course Outcomes:</b> After learning the subject students will be able to				
<b>1.</b>	Use the MMF and EMF equations for rotating machines			
<b>2.</b>	Analyze, perform basic experiments and can apply use of BLDC and PMSM motors for different applications			
<b>3.</b>	Analyze, perform basic experiments and can apply use of SRM and SYNREL motors for different applications			
<b>4</b>	Analyze, perform basic experiments and can apply use of Linear Induction Motors and Traction Motors for different applications			
<b>5</b>	Analyze, perform basic experiments and can apply use of Transverse Flux - Axial Flux machines and PMSG and DFIG Generators for different applications			
<b>6</b>	Analyze, perform basic experiments and can apply use of small control motors like servo motors, stepper motors, universal motors and PCB motors for different applications			
<b>UNIT - I</b>	<b>Generalized Machine Theory</b>			<b>(06 Hours)</b>
	Energy in singly excited magnetic field systems, Magnetic force and torque from energy, Magnetic force and torque from co-energy, Forces and torques in systems with permanent magnets, Magnetic field production of EMFs in rotating machines			
<b>UNIT – II</b>	<b>Permanent Magnet Special Motors</b>			<b>(06 Hours)</b>
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Brushless DC Motor (BLDC) 2. PM Synchronous Motor (PMSM)			
<b>UNIT – III</b>	<b>Reluctance Type Special Motor</b>			<b>(06 Hours)</b>
	Types, Construction, Principle of operation, Characteristics, Drives / Control and Applications of – Reluctance Motor – includes 1. Switched Reluctance Motors (SRM) 2. Synchronous Reluctance (SYNREL) Motors			

<b>UNIT – IV</b>	<b>Linear and Traction Motors</b>	<b>(06 Hours)</b>
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Linear Induction Motor (LIM) 2. Traction Motors	
<b>UNIT - V</b>	<b>Transverse Flux &amp; Axial Flux Machines and Special Generators</b>	<b>(06 Hours)</b>
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Axial Flux Permanent Magnet (PM) Synchronous Generators 2. Doubly Fed Induction Generators (DFIG) 3. Transverse Flux Machines	
<b>UNIT - VI</b>	<b>Control of Small Special Motors</b>	<b>(06 Hours)</b>
	Types, Construction, Principle of Operation, Characteristics, Drives / Control and Applications of – 1. Stepper / Stepping Motors 2. Servo Motors 3. Printed Circuit Board (PCB) Motors 4. Universal Motors	

**Term Work:**

The term work / assignments shall consist of record of topics from the list given below.

1. Laboratory demonstration of PMSM motor and drive.
2. Laboratory demonstration of BLDC Drive.
3. Experimental analysis of Reluctance Motor Drive.
4. Laboratory demonstration of Stepper Motor Drive.
5. Laboratory demonstration of Linear Induction Motor.
6. Laboratory demonstration of AC / DC Servo motor.
7. Laboratory demonstration of Induction Generator.

**Text Books:**

7. P. S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers
8. K. Venkatratnam, ‘Special Electrical Machines’, University Press
9. A. E. Fitzgerald, Charles Kingsley, Stephen Umans, ‘Electric Machinery’, Tata McGraw Hill Publication
10. V. V. Athani, ‘Stepper Motors: Fundamentals, Applications and Design’, New Age International
11. T. J. E. Miller, ‘Brushless Permanent Magnet and Reluctance Motor Drives’, Clarendon Press, Oxford Publication
12. Ion Boldea, ‘Linear Electric Machines, Drives and Maglevs’, CRC Press

**Reference Books:**

5. M. G. Say “Alternating current Machines”, Pitman & Sons
6. T. Kenjo, ‘Stepping Motors and Their Microprocessor Controls’, Clarendon Press London
7. P. C. Sen, “Principles of Electrical Machines and Power Electronics”, John Willey & Sons

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<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Assignments:**

1. Solve the unsolved question from the books Unit wise.
2. Prepare report from NPTEL video lectures.
3. Solve the University Question Papers Unit wise.
4. Group Discussions from syllabus topics from students and prepare report on the same.
5. Industrial visit to electrical machine manufacturing company and prepare report on the same.
6. Market survey for various electrical special machines and preparing report on the same.

## Elective II: Illumination Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks Oral:25Marks	01Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1. Fundamentals of Electrical Engineering & Color acknowledgement.		
<b>Course Objectives:</b>		
1. Basics of Illumination Engineering.		
2. Illumination Design		
3. Interior & Exterior Illumination		
<b>Course Outcomes:</b>		
1. To study working of various light sources.		
2. To design illumination systems as per illumination laws.		
3. To make students perform interior lighting design		
4. To make students perform Exterior lighting design		
5. To study various lighting systems such as solar, cold lighting		
6. To make students able to apply lighting design in green buildings.		
<b>UNIT 1</b>	<b>Basic physics of Light</b>	<b>(06 Hours)</b>
	Nature And Properties Of Light. Radiation, color, eye & vision; different entities of illuminating systems; Light sources: daylight, incandescent, electric discharge, fluorescent, arc lamps and lasers;	
<b>UNIT 2</b>	<b>Illumination design</b>	<b>(06 Hours)</b>
	Luminaries, wiring, switching & control circuits; Laws of illumination; illumination from point, line and surface sources. Photometry and spectrophotometry; photocells. Environment and glare. General illumination design.	
<b>UNIT 3</b>	<b>Interior lighting</b>	<b>(06 Hours)</b>
	Industrial, residential, office departmental stores, indoor stadium, theater and hospitals. Lighting For <i>Hazardous Areas</i>	
<b>UNIT 4</b>	<b>Exterior lighting</b>	<b>(06 Hours)</b>
	Flood, street, aviation and transport lighting, lighting for displays and signaling- neon signs, LED-LCD displays beacons and lighting for surveillance. <i>Sports lighting.</i>	

<b>UNIT 5</b>	<b>Other lighting designs</b>	<b>(06 Hours)</b>
	1) Solar Lighting 2) Day-lighting for building 3) Cold Lighting 4) Energy efficient lighting.	
<b>UNIT 6</b>	<b>Lighting in sustainable buildings</b>	<b>(06 Hours)</b>
	1) Reduction methods of Lighting pollution 2) Significance of Lighting in Green building design. 3) Comparison of conventional and new energy saving lighting appliances. 4) LEED certification	
<b>TermWork:</b>		
1. Study of commercial catalog for LEDs, CFLs and Tubes for understanding lumens output and wattages of each lamps.		
2. Study of Design and assemble various Illuminating lamps.		
3. Study of Design of illumination for Hotel.		
4. Study of Design of illumination for residential sector		
5. Study of Design of illumination for office departmental stores.		
6. Study of Design of illumination for Hospital.		
7. Study of Design of Solar Lighting for College.		
8. Study of Design of Energy efficient lighting		
<b>Text Books:</b>		
National Lighting Code- Published by Govt of India		
<b>Reference Books:</b>		
1) Lamps and Lighting – Edited by J.R.Coaton and A.M.Marsden, 4th Edition		
2) IES Lighting Handbook – IES North America		
3) Interior Lighting – Boer, Fischer, Pub – Philips Technical Library		
4) Website: <a href="http://lighting.sustainableources.com/">http://lighting.sustainableources.com/</a>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

**Assignments:-**

1. Define and explain Radiation, color, eye & vision
2. Discuss Different entities of illuminating systems
3. Write a short note on General illumination design
4. State and explain Laws of illumination
5. Design illumination for Industrial, residential, office departmental stores,
6. Design illumination for indoor stadium, theater and hospitals.
7. Design illumination for Flood, street, aviation and transport lighting
8. Design illumination for lighting for displays



9. Write in brief about Solar Lighting
10. What is Significance of Lighting in Green building design

# Bharati Vidyapeeth University, Pune

## Faculty of Engineering & Technology

### Programme : B.Tech (Biomedical) Sem – III (2014 Course)

Sr. No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments							
1	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	3	1	4	
2	Analog Electronics	4	2	0	60	20	10	10	50	-	150	4	1	5	
3	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4	
4	Human Biology	3	2	0	60	20	10	10	50	-	150	3	1	4	
5	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4	
6	Professional Skill Development-III	4	0	0	100	0	00	0	-	-	100	4	0	4	
<b>Total</b>		<b>20</b>	<b>6</b>	<b>2</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>05</b>	<b>25</b>	

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

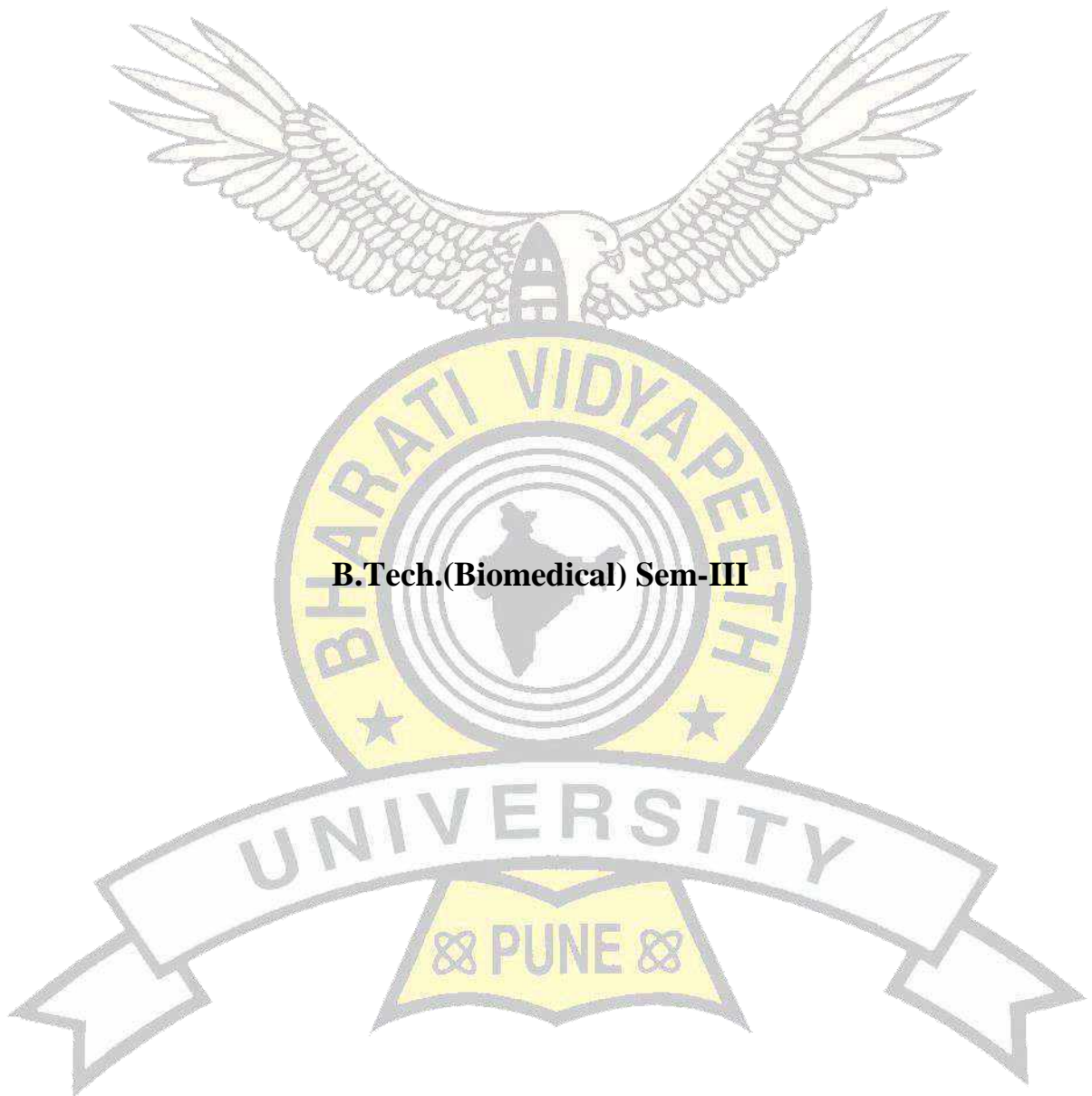
**Programme : B.Tech (Biomedical) Sem – IV (2014 Course)**

Sr. No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments							
7	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4	
8	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5	
9	Electronic Instruments & Measurement System	3	2	1	60	20	10	10	-	-	100	3	2	5	
10	Digital Logic Circuits	3	2	0	60	20	10	10	-	50	150	3	1	4	
11	Rehabilitation Engineering	2	2	0	60	20	10	10	-	50	150	2	1	3	
12	Professional Skill Development-IV	4	0	0	100	-	-	-	-	-	50	4	0	4	
<b>Total</b>		<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>19</b>	<b>6</b>	<b>25</b>	

**Total Credits Sem – III : 25**

**Total Credits Sem – IV : 25**

**Grant total : 50**



**B.Tech.(Biomedical) Sem-III**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- III**

**SUBJECT: - Engineering Mathematics-III**

**Lecture: 3 hours/week**

**Tutorial: 1 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

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**Course prerequisites:**

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

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**Course objective:**

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

## **Contents:**

### **Unit-I**

#### **Linear Differential Equations (LDE) (08Hours)**

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

### **Unit-II**

#### **Complex Variables (08Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

### **Unit-III**

#### **Transforms (08Hours)**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

### **Unit-IV**

#### **Laplace Transform (LT) (08Hours)**

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

### **Unit -V**

#### **Vector Differential Calculus (08Hours)**

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

## Unit-VI

### Vector Integral Calculus

(08Hours)

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

#### Assignments:

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

#### Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

#### Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- III**

**SUBJECT: - Analog Electronics**

**Lecture: 4 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical.: 50 marks**

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**Course prerequisites:**

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

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**Course objective:**

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.



## **Contents:**

### **Unit-I**

#### **Transistor Biasing (08Hours)**

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

### **Unit-II**

#### **BJT Amplifiers (08Hours)**

Two port device and Hybrid model, transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

### **Unit-III**

#### **Field Effect Transistor (FET) (08Hours)**

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

### **Unit-IV**

#### **MOSFETs (08Hours)**

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction, breakdown effects and temperature effects, MOSFET as VLSI device

### **Unit -V**

#### **Wave shaping and Multivibrator Circuits (08Hours)**

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

## Unit-VI

### Optoelectronic devices and PCB design

(08Hours)

Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

#### List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

#### Assignments:

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

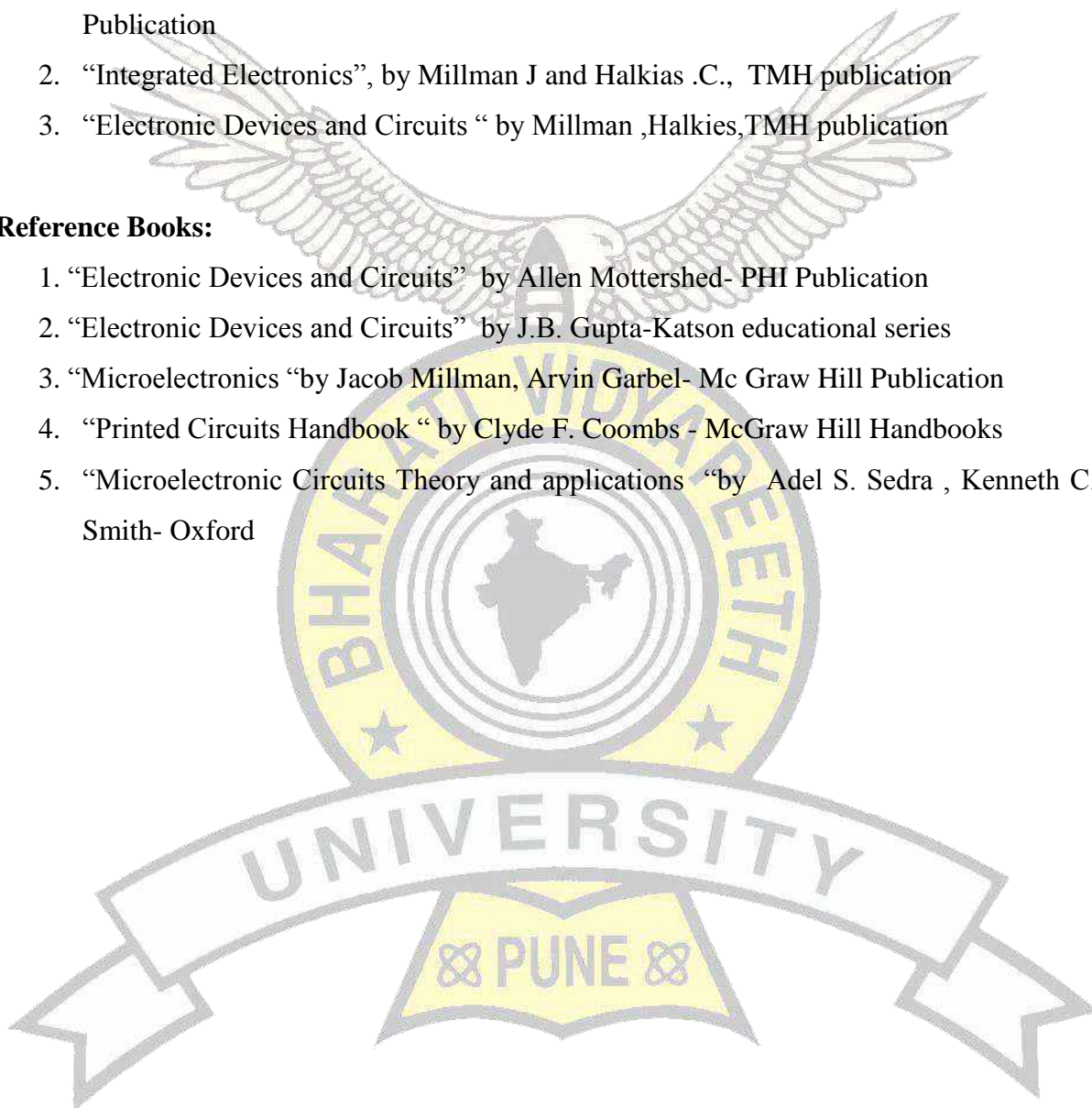
1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. “Electronic Devices and Circuits” by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication
3. “Electronic Devices and Circuits “ by Millman ,Halkies,TMH publication

**Reference Books:**

1. “Electronic Devices and Circuits” by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits” by J.B. Gupta-Katson educational series
3. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. “Printed Circuits Handbook “ by Clyde F. Coombs - McGraw Hill Handbooks
5. “Microelectronic Circuits Theory and applications “by Adel S. Sedra , Kenneth C. Smith- Oxford





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- III**

**SUBJECT: - Signals and Systems**

**Lecture: 3 Hrs/week**

**Tutorial: 01 Hr/Week**

**Theory: 60 marks**

**Unit Test: 20 Marks**

**Attendance: 10Marks**

**Assignments: 10Marks**

**TW & Oral: 50 Marks**

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**Course prerequisites:**

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

**Course objective:**

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

**Contents:**

**Unit-I**

**Introduction to signals**

**(06 Hours)**

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic,

energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

## **Unit-II**

### **Classification of Discrete time systems (06 Hours)**

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

## **Unit-III**

### **Continuous Time system Analysis: (06 Hours)**

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

## **Unit-IV**

### **System Analysis in Laplace Transform (06 Hours)**

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

## **Unit-V**

### **System Analysis in Z-Transform (06 Hours)**

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

## **Unit VI:**

### **Correlation and Spectral Density (06 Hours)**

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

**Assignments:**

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

**Content Delivery Methods:** Chalk & talk, Power point presentation, Quiz

**Assessment Methods:**

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

**Reference Books:**

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham"s outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) SEM: - III  
SUBJECT: - Circuit Theory**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical: 50 marks**

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**Course prerequisites:**

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

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**Course objective:**

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

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**Course Outcomes:** On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.

4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

**Contents:**

**Unit I**

**Fundamentals Of Network**

**(6 Hours)**

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

**Unit II**

**Application Of Graph Theory**

**(6 Hours)**

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

**Unit III**

**Transient Analysis**

**(6 Hours)**

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

**Unit IV**

**Resonance**

**(6 Hours)**

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits



## Unit V

### Passive Filters

(6 Hours)

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

## Unit VI

### Two Port Networks

(6 Hours)

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

### List of Experiments:

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

### Assignments:

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

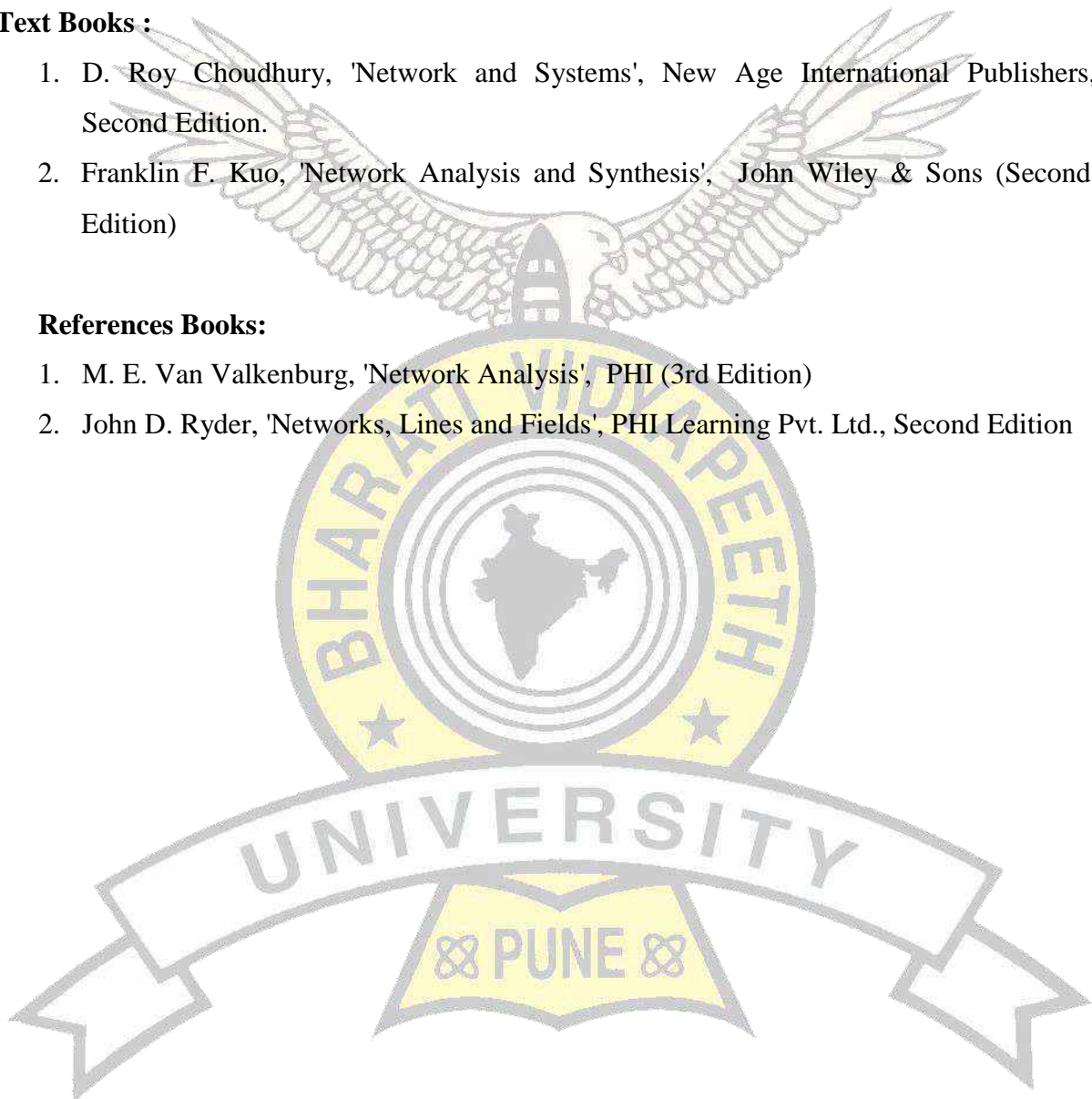
1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books :**

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

**References Books:**

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- III**

**SUBJECT: - Human Biology**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 marks**

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**Course prerequisites:**

- Basic knowledge of Human body parts.

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**Course objective:**

This course provides in depth knowledge on Anatomy of Physiology of Different systems exist in Human body.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Classify types of Bones
2. Demonstrate anatomy of various systems such as cardiovascular Respiratory, Gastrointestinal & Excretory System, various special senses & Central nervous system.
3. Demonstrate Physiology of various systems such as cardiovascular Respiratory, Gastrointestinal, Excretory System & various special senses.

**Contents:**

**Unit-I**

**General Anatomy**

**(06 hours)**

Anatomy of Cell, Tissues & bones, Types of bones of Upper and Lower extremity.

**Unit-II**

**Systemic Anatomy**

**(06 hours)**

Structure & anatomy of Cardiovascular system, Respiratory system, Gastrointestinal system, Excretory system & reproductive system.

### **Unit-III**

#### **Anatomy of Special Senses & Central nervous system (06 hours)**

Anatomy of special senses: Nose, Eye, Ear, Tongue, Skin & CNS: Cerebrum, Cerebellum, Brain Stem & Spinal Cord.

### **Unit-IV**

#### **Physiology of Cardio-respiratory System (06 hours)**

Blood: composition, blood groups, blood vessels, blood pressure, blood transfusion, blood clotting, parts of heart, conduction system, ECG, Physiology of respiration

### **Unit-V**

#### **Physiology of Gastrointestinal & Excretory System (06 hours)**

Blood, Blood Groups, Blood Transfusion, Blood Pressure, Blood Clotting Physiology of Gastrointestinal system, Excretory system: Physiology of Nephron, urine formation, Functions of Kidney, Physiology of Endocrine System

### **Unit-VI**

#### **Physiology of special Senses (06 hours)**

Physiology of Nose, Eye, Ear, Tongue & Skin.

**Content Delivery Methods:** Chalk & talk, Charts & Models

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books/ References Books:**

1. Arthur C. Guyton "Medical Physiology" Prismbook.
2. B.D. Chaurasia "General Anatomy", Third edition, CBS publication.
3. Tortora and Graabowski, "Principles of Anatomy and Physiology", Haper colin Publication



**B.Tech.(Biomedical) Sem-IV**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- IV**

**SUBJECT: - Analog Integrated Circuits**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 marks**

---

**Course prerequisites:**

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

---

**Course objective:**

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

**Contents:**

**Unit-I**

**Fundamentals of Operational Amplifier**

**(06 hours)**

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.

## **Unit-II**

### **Operational Amplifier – Linear circuits**

**(06 hours)**

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

## **Unit-III**

### **Operational Amplifier - Non-linear circuits**

**(06 hours)**

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

## **Unit-IV**

### **Active filters and waveform generators**

**(06 hours)**

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038

## **Unit-V**

### **Special function IC's**

**(06 hours)**

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

## **Unit-VI**

### **Interfacing circuits**

**(06 hours)**

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

### **List of Experiments:**

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

**Assignments:**

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4<sup>th</sup> Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10<sup>th</sup> edition, 2010

**References Books:**

1. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford publication, 3<sup>rd</sup> edition, 2011
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3<sup>rd</sup> edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4<sup>th</sup> edition, 2010.





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- IV**

**SUBJECT: - Electronic Circuits and applications**

**Lecture: 4 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical.: 50 marks**

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**Course prerequisites:**

- Knowledge of linear circuit theory
- Basic concept of BJT

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**Course objective:**

1. To make student understand analysis of multistage transistor amplifier.
2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
3. To make student understand analysis and design of voltage regulators.
4. To make student understand the behavior of high frequency BJT amplifiers

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

**Contents:**

**Unit-I**

**Multistage amplifiers**

**(08hours)**

Need of Multistage amplifiers, Parameter evaluation such as  $R_i$ ,  $R_o$ ,  $A_v$ ,  $A_i$  & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct

coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

## **Unit-II**

### **Feedback amplifiers (08 hours)**

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

## **Unit-III**

### **Power amplifiers (08 hours)**

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

## **Unit-IV**

### **Oscillators (08 hours)**

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

## **Unit- V**

### **Regulators (08 hours)**

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

## Unit-VI

### High frequency amplifiers

(08hours)

High frequency T model. Common base short circuit current frequency response, alpha cut-off frequency, CE short circuit current frequency response, high frequency hybrid  $\pi$  CE model, Amplifier response taking into account source and load resistances.

#### List of Experiments:

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

#### Assignments:

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

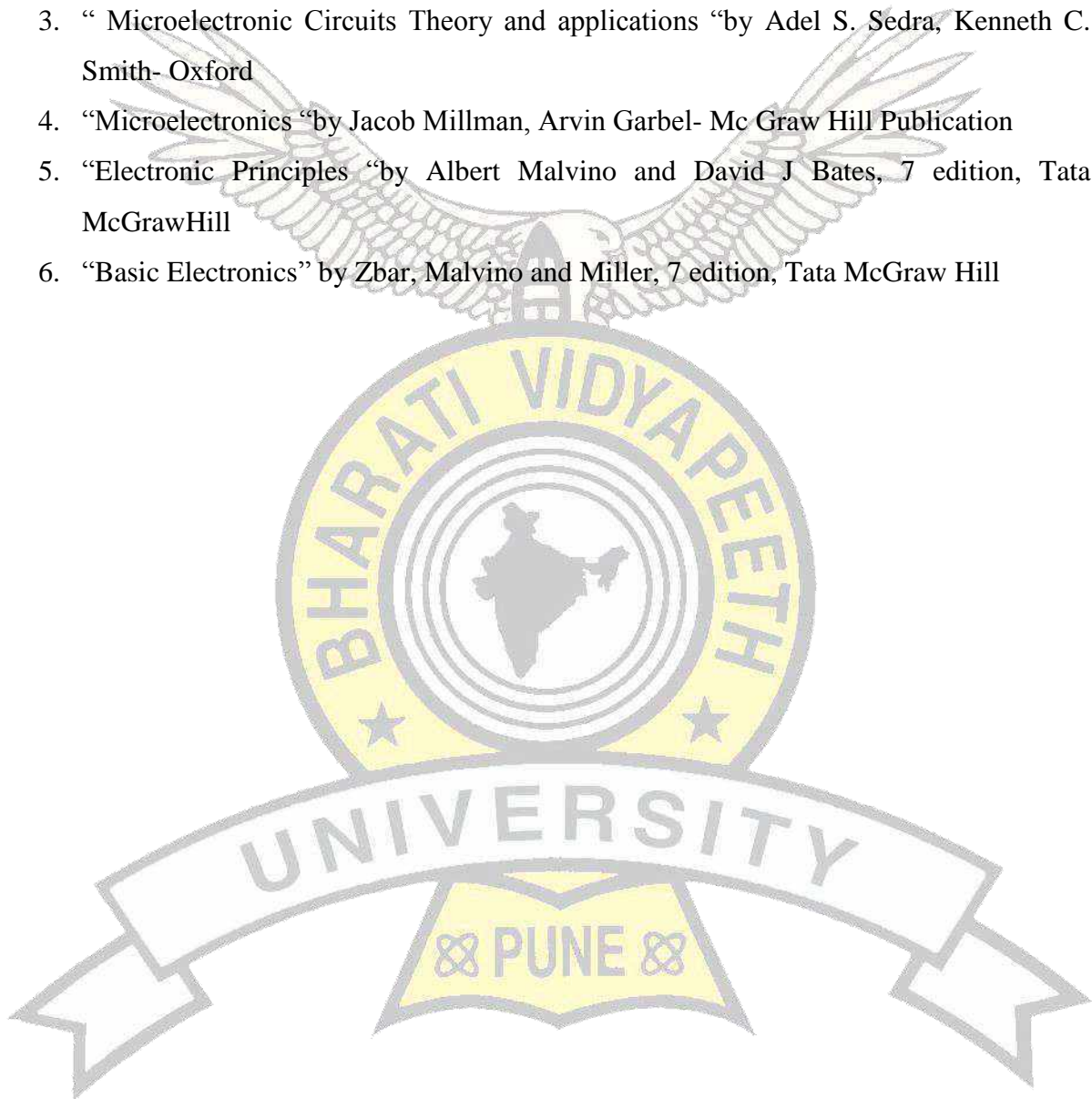
#### Text Books:

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication

2. "Electronic devices and circuits "by Millaman Halkies ,TMH publication
3. "Integrated Electronics", by Millman J and Halkias .C., TMH publication

**Reference Books:**

1. "Electronic Devices and Circuits "by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits "by J.B. Gupta- KATSON educational series books
3. " Microelectronic Circuits Theory and applications "by Adel S. Sedra, Kenneth C. Smith- Oxford
4. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. "Electronic Principles "by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. "Basic Electronics" by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill





**Class: B. Tech. (Biomedical) Sem:- IV**

**SUBJECT: - Electronic Instruments and Measurement Systems**

**Lecture: 4 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical: 50 marks**

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**Course prerequisites:**

- Knowledge of process instrumentation.
- Knowledge of Integrated circuits.

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**Course objective:**

The objective of the course is to introduce the fundamentals of Electronics Instruments and Measurement. Students learn the essential topics in Measurement systems. The course includes an in-depth understanding of oscilloscope, digital storage oscilloscope, analyzers, communication Measurements.

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**Course Outcomes:** On successful completion of this course, students will be able to:

1. Explain the basic operation of measuring instruments.
2. Describe functioning, specifications, and applications of signal analyzing instruments.
3. Describe the basic features of oscilloscope and the internal structures of different types of oscilloscopes.

**Contents:**

**Unit-I**

**Fundamentals of Instrumentation & Measurement:**

**(08 hours)**

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration

etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

## **Unit-II**

### **Measuring Instruments**

**(08 hours)**

Voltage , current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes ,LCR-Q meter.

## **Unit-III**

### **Signal Generators & counters**

**(08 Hours)**

Sine-wave generator, standard signal generators, Frequency synthesized signal generator, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

## **Unit-IV**

### **Signal Analyzers & computer aided measurements:**

**(08 hours)**

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

## **Unit-V**

### **Communication Measurements:**

**(08 hours)**

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer- system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer.

## **Unit-VI**

### **Oscilloscopes:**

**(08 hours)**

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes & its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design

considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**List of Experiments:**

Any 8 assignments should be conducted from the following list.

1. Peak ,average and r.m.s. measurement using rectifier circuit.
2. Calibration of DVM for any one range: e.g. 200 V dc, 200 V ac, 200mA dc, using Standard calibrator or standard 6½DMM.
3. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
4. Measurements on DSO:
  - i) FFT analysis of LF signal
  - ii) Capturing transients
  - iii) Storing and retrieving number of different signals
  - iv) Study of various operations like add, subtract, integrate, differentiate.
5. Measurement and timing analysis of digital signals using Logic Analyzer.
6. Experiment with virtual instruments using software such as Lab view.
7. Measurement of Total harmonic distortion using distortion factor meter.
8. Measurements on L-C-R Q meter.
9. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).
10. Study of characteristics of Diode, Transistors using Curve Tracer.
11. Study of Power scope.

**Text Books/ Reference Books:**

1. Oliver-Cage, “Electronic measurements and instrumentation”, TMH edition.
2. M.M.S. Anand, “Electronics instruments and instrumentation technology”, PHI.

3. Coombs, Clide F. Jr., “Electronic instrument handbook”, McGraw –Hill.
4. Car Joseph, “elements of Electronics Instrumentation and Measurement”, PHI
5. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill.







**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) SEM: - III  
SUBJECT: - Digital Logic Circuits**

**Lecture: 3 Hours/Week**

**Practical: 2 Hours/Week**

**Theory: 60 marks**

**Unit Test: 20 Marks**

**Attendance: 10Marks**

**Assignments: 10Marks**

**TW & Practical: 50 Marks**

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**Course Prerequisite:**

1. Fundamentals of Number Systems.

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**Course Objective:**

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

**Contents:**

## **Unit –I**

### **Number Systems, Codes & reduction techniques:**

**(6 Hours)**

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

## **Unit-II**

### **Combinational Logic Modules and their Applications**

**(6 Hours)**

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

## **Unit-III**

### **Logic Families**

**(6 Hours)**

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

## **Unit-IV**

### **Sequential Logic Modules**

**(7 Hours)**

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.

## **Unit-V**

## **Shift Registers & Counters**

**(5 Hours)**

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

## **Unit-VI**

### **PLDs & Memories**

**(6 Hours)**

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

### **List of Experiments:**

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

### **Assignments:**

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter, timers, and various multi-vibrator circuits, small processor ports or scrolling display
4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register
6. Design example based on state machine

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

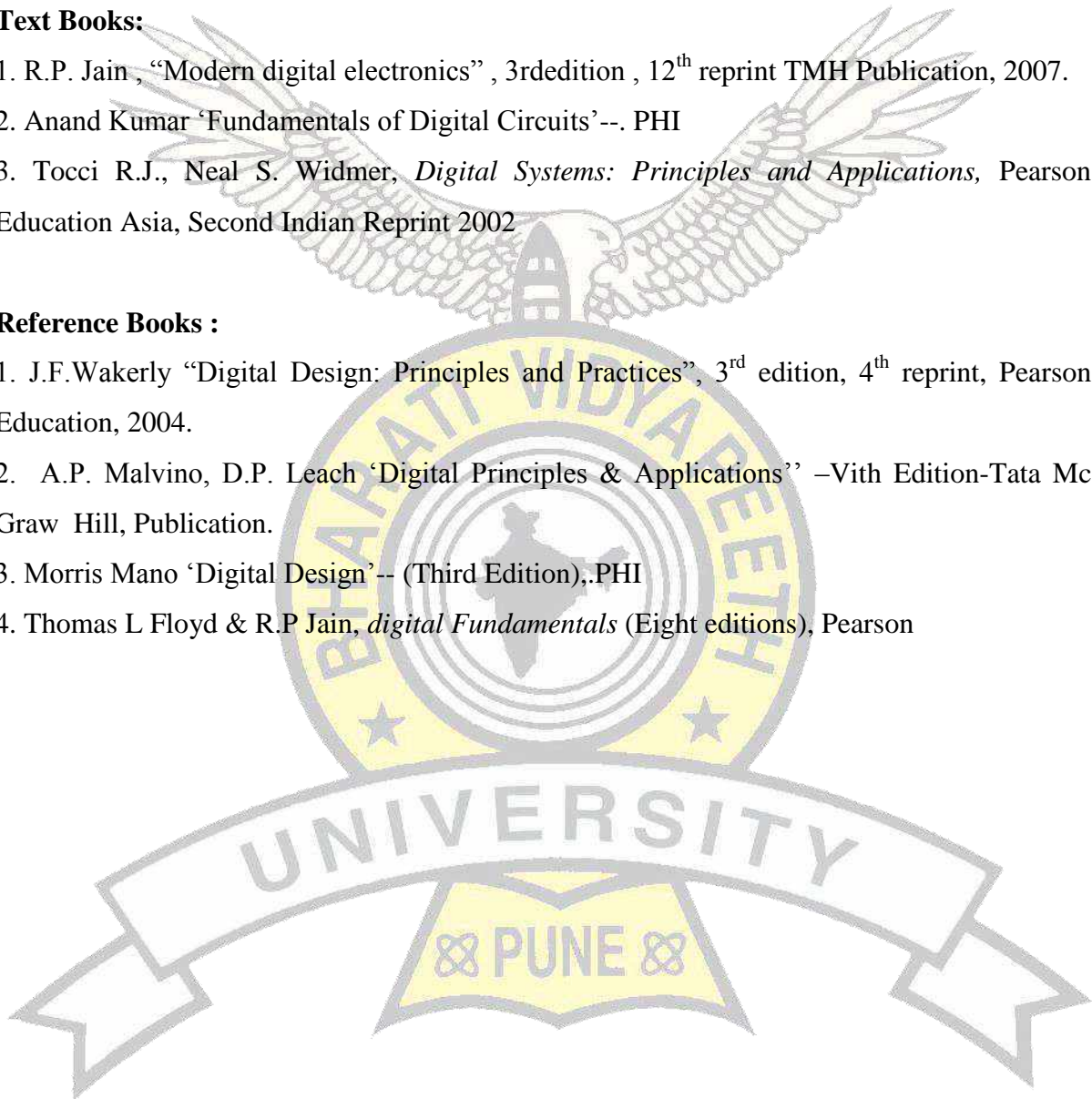
1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12<sup>th</sup> reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
3. Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications*, Pearson Education Asia, Second Indian Reprint 2002

**Reference Books :**

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3<sup>rd</sup> edition, 4<sup>th</sup> reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, *digital Fundamentals* (Eight editions), Pearson





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Biomedical) Sem:- IV**

**SUBJECT: - Rehabilitation Engineering**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & oral: 50 marks**

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**Course prerequisites:**

- Basic Knowledge of Bones in Upper & lower Extremity
- Basic knowledge of Joints in Upper and Lower Extremity.

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**Course objective:**

This course provides in depth knowledge on biomechanics of all soft tissues and also about prosthetic and orthotic devices introduces for upper and lower Extremity..

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**Course Outcomes:**

On successful completion of this course, students will be able to:

1. Demonstrate Mechanical properties of soft tissues.
2. Classify various types of Orthosis and Prosthesis.
3. Demonstrate applications of orthosis and prosthesis.
4. Design of Prosthesis for upper extremity

**Contents:**

**Unit-I**

**Tissue Biomechanics**

**(06 hours)**

General Principles of Biomechanics, Biomechanics of Soft Tissues: Stress strain behaviour, creep stability, biomechanics of Skin, biomechanics of Muscles, Biomechanics of Ligaments, biomechanics of Tendon & Bones.

## **Unit-II**

### **Movement Biomechanics**

**(06 hours)**

Gait analysis, Forces transmitted by joints, Mass motion action, joint forces results in normal & disabled person, Biomechanical analysis of human motion using instrumentation

## **Unit-III**

### **Classification of Orthosis**

**(06 hours)**

Principles in designing orthosis, Principles of Three point pressure, International conventions for providing orthosis, upper extremity orthosis, lower extremity orthosis, Recent developments

## **Unit-IV**

### **Classification of Prosthesis**

**(06 hours)**

Principles in designing prosthesis, International Conventions for Providing Prosthesis, Upper extremity prosthesis, lower Extremity Prosthesis, Recent developments.

## **Unit-V**

### **Design of upper Extremity Prosthesis**

**(06 hours)**

Introduction to Rehabilitator, Design of Artificial arms, nature of problem, general design considerations, safety & control, biomaterials used for the same.

## **Unit-VI**

### **Design of Lower Extremity prosthesis**

**(06 hours)**

Design of Artificial limb for lower Extremity ,History of lower limb Prosthesis, Amputation surgery ,recent development.

### **List of Experiments:**

- 1.study of Knee Ankle Foot Orthosis
- 2.Study of Hip Knee Ankle Foot Orthosis
- 3.Study of Below elbow Orthosis
- 4.Lamination of prosthesis
- 5.Study of Milwaukee brace

## 6.Study of Hand prosthesis and Orthosis

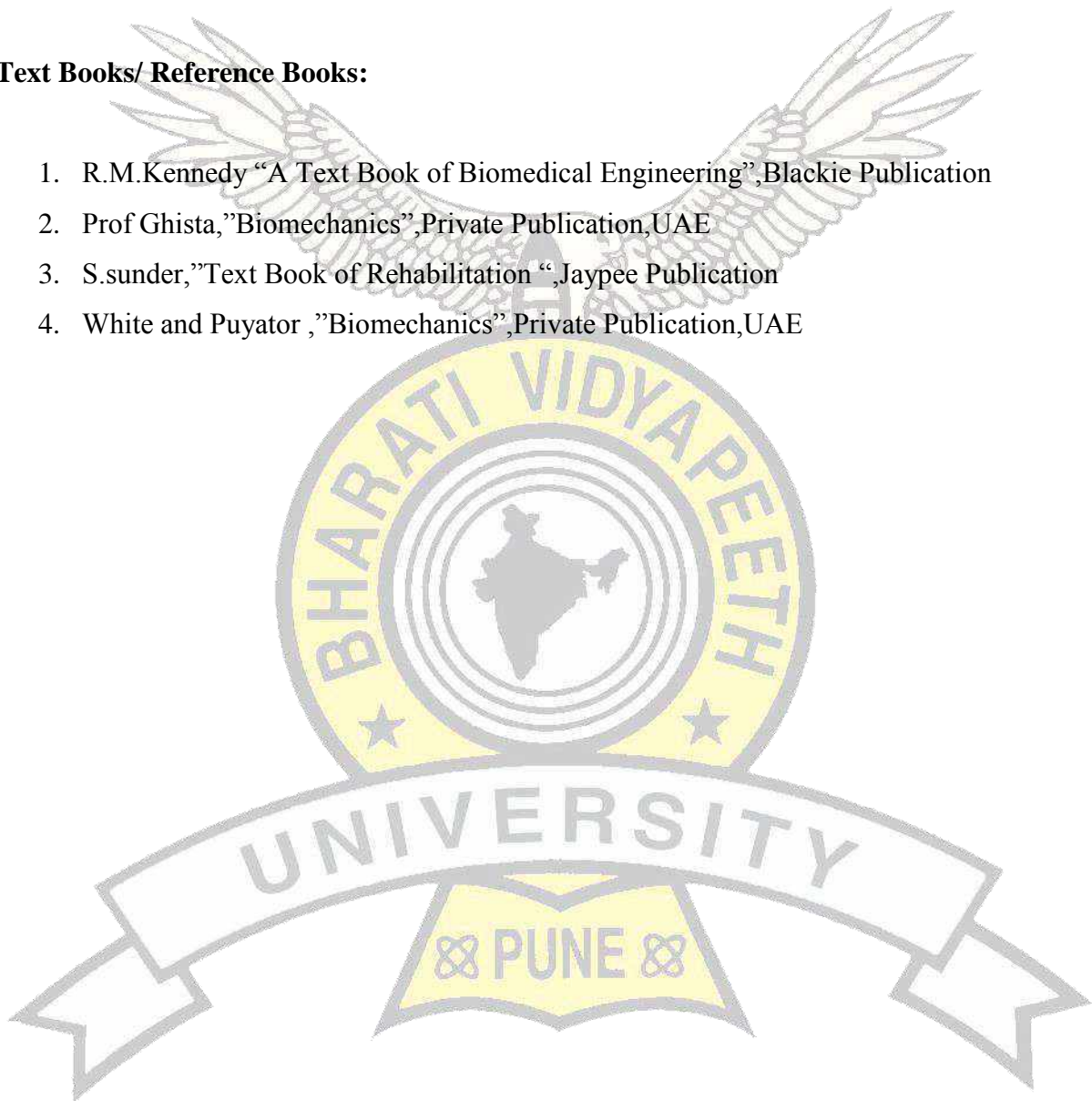
**Content Delivery Methods:** Chalk & talk, Models

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books/ Reference Books:**

1. R.M.Kennedy “A Text Book of Biomedical Engineering”,Blackie Publication
2. Prof Ghista,”Biomechanics”,Private Publication,UAE
3. S.sunder,”Text Book of Rehabilitation “,Jaypee Publication
4. White and Puyator ,”Biomechanics”,Private Publication,UAE



**Bharati Vidyapeeth**  
**Deemed University, Pune**  
**B. Tech. (Chemical) – 2014 Course**  
**Sem. - I**

<b>Total Duration : 29 Hours/week</b> <b>Total Credits : 25</b> <b>Total Marks : 700</b>													
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)							Credit
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW	Total		
							Unit Test	Assignments	Attendance				
1	Engineering Mathematics-I	3	-	1	4	60	20	10	10	-	100	4	
2	Fundamental of Civil Engineering	3	2	-	5	60	20	10	10	25	125	4	
3	Engineering Graphics	4	2	-	6	60	20	10	10	25	125	5	
4	Engineering Physics	4	2	-	6	60	20	10	10	25	125	5	
5	Chemical Engineering Materials	3	-	1	4	60	20	10	10	25	125	4	
6	Professional Skill Development-I	2	-	-	2	30	-	20	-	-	50	2	
7	Workshop Technology	-	2	-	2	-	-	-	-	50	50	1	
<b>Total</b>		<b>19</b>	<b>8</b>	<b>2</b>	<b>29</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>	



**Bharati Vidyapeeth**  
**Deemed University, Pune**  
**B. Tech. (Chemical) – 2014 Course**  
**Sem. – II**

<b>Total Duration : 30 Hours/week</b> <b>Total Credits : 25</b> <b>Total Marks : 700</b>													
Sr. No.	Subject	Teaching Scheme (Hours/week)				Examination Scheme (Marks)							Credit
		L	P/D	T	Total	End Semester Examination	Continuous Assessment			TW	Total		
							Unit Test	Assignments	Attendance				
8	Engineering Mathematics-II	3	-	1	4	60	20	10	10	-	100	4	
9	Fundamental of Mechanical Engineering	3	2	-	5	60	20	10	10	25	125	4	
10	Engineering Mechanics	4	2	-	6	60	20	10	10	25	125	5	
11	Engineering Chemistry	4	2	-	6	60	20	10	10	25	125	5	
12	Fundamental of Electrical Engineering	3	2	-	5	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	-	-	2	30	-	20	-	-	50	2	
14	Analytical Techniques in Chemical Engineering	-	2	-	2	-	-	-	-	50	50	1	
<b>Total</b>		<b>19</b>	<b>10</b>	<b>1</b>	<b>30</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>	

**Bharati Vidyapeeth**  
**Deemed University, Pune**  
**ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

**Bharati Vidyapeeth  
Deemed University, Pune**

**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

**Bharati Vidyapeeth  
Deemed University, Pune**

**02: Fundamentals of Civil Engineering**

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
<b>Course Objectives:</b>					
	To make student understand the scope and application of Civil Engineering				
<b>Course Outcomes:</b>					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
<b>UNIT - I</b>					
	<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>
	Civil Engineering scope, importance and applications to other				

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	disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
<b>UNIT - II</b>	<b>Surveying</b>	<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>	<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>	<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.  Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>	<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.  Railways- Types of gauges, section of railway track, components of	

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	<p>railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	

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<b>Reference Books:</b>	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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**ENGINEERING GRAPHICS**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b></p> <p>Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b></p> <p>Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b></p> <p>Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b></p> <p>Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b></p> <p>Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b></p> <p>Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)



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Unit VI	<b>Section of Solids</b>  Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)
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**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.  
Assignment 05 Problems on each unit in A3 size Drawing Book

**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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**ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

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**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08 hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

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**UNIT-VI**

**ARCHITECTURAL ACOUSTICS**

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

**QUANTUM MECHANICS**

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

**TERM WORK**

**Experiments**

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

**Assignments**

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.

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5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

**Reference Books:**

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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**Chemical Engineering Materials**

<b>Teaching Scheme</b>		<b>Examination Scheme</b>		<b>Credits</b>
<b>Lectures</b>	<b>: 3Hrs/week</b>	<b>End semester examination:60 Marks</b>		<b>3</b>
<b>Tutorials</b>	<b>: 1 Hr/week</b>	<b>Continuous assessment</b>	<b>: 40 Marks</b>	
		<b>Term work</b>	<b>: 25 Marks</b>	<b>1</b>
		<b>Total</b>	<b>: 125Marks</b>	<b>4</b>

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**Course Pre-requisite:** Basic understanding of chemistry of bonds

**Course Objectives:** To get knowledge of selection of material for process industry

**Course outcome:** Understand material properties, metal and their alloys, polymers, plastics, paints, coatings adhesives, ceramic, cement, glass, material failures and prevention measures.

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**Unit –I** **(06 Hours)**

**Introduction**

Materials and criteria for selection of material in process industries. Material properties: Mechanical, thermal, chemical, electrical, magnetic and technological properties, modification and control of material properties.

**Unit- II** **(06 Hours)**

**Metal and their alloys**

- A. Ferrous materials: Pure iron, cast iron, mild steel, stainless steels, special alloy steels-iron and iron carbide, phase diagram-heat treatment of plain-carbon steels.
- B. Nonferrous materials: Lead, Tin, aluminium, zinc, nickel, copper, Magnesium and their alloys. Properties and applications in process industries.

**Unit –III** **(06 Hours)**

**Hydrocarbon materials**

**Natural & synthetic polymeric materials**

Selection of polymeric materials for equipment linings, fiber reinforced plastic, application of special polymers like Nylon 66, Teflon in engineering. Polymer Composites and blends.

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**Paints, coatings and adhesives**

**Unit-IV**

**(06 Hours)**

**Ceramic, glasses and cement**

Definition of ceramics and glasses; interaction between structure, processing, and properties; Applications of ceramic and glass materials; Crystalline and non-crystalline ceramics, silicates, refractories, clays, glass, vitreous silica, and borosilicate

Cement and its properties- special cements, cement concrete, RCC- Pre stressed concrete.

**Unit- V**

**(06 Hours)**

**Material failure analysis**

**Thermal and mechanical failures:** Creep, stress, crystal structure and defects.

**Chemical failure:** acid base environment, water, Corrosion: Corrosion attack methods, Different types of corrosion: chemical, biochemical, and electrochemical; Internal and external factors affecting corrosion of chemical equipments; corrosion charts for process equipments.

**Unit-VI**

**(06 Hours)**

**Material failure prevention**

Property enhancement by electroplating, glass and ceramic linings, polymer lining, paints, coatings, alloy preparation, composite and blend formation.

**Unit tests** would follow as:

- |             |   |                   |
|-------------|---|-------------------|
| Unit test 1 | : | Unit 1 and unit 2 |
| Unit test 2 | : | Unit 3 and unit 4 |
| Unit test 3 | : | Unit 5 and unit 6 |

**Term work** includes assignments on

1. Basic criteria for material selection, material properties
2. Ferrous and non-ferrous material recent advanced material of actual application in industry
3. Polymeric advanced material presently applied in industry
4. Cement, ceramic and glass variety to be used in industry
5. Industrial example with analysis of thermal, mechanical and chemical failure.
6. Industrially applied case studies for prevention of material prevention

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**Text Books**

1. Kodgire V. D. "Material Science and Metallurgy for Engineers", Everest publication India
2. Gowarikar V. R., Vishwanath N V, JaydevShreedhar, "Polymer science", New age International publication, India

**References books**

1. Budinsky K G and Budinsky K M "Engineering materials- Properties and Selection", Prentice Hall of India.
2. Henry R Clauser, "Industrial and Engineering materials", McGraw Hill Book Co.
3. James F. Shackelford, Introduction to Material Science, Mc-Millan Publishing Company, New-York.
4. D.Z. Jestrzebaski, Properties of Engineering Materials, 3<sup>rd</sup> Ed. Toppers. Co. Ltd.
5. J.L. Lee and Evans, Selecting Engineering Materials for Chemical and Process Plants, Business Works.



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Workshop Technology**

**TEACHING SCHEME:**

Theory: -

Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -

Continuous Assessment: -

Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

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**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.

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**ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

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**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I, II, III**

**Unit Test II :- Unit IV, V, VI**

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**FUNDAMENTALS OF MECHANICAL ENGINEERING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: -60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b></p> <p>Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b></p> <p>Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines,</p> <p>Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b></p> <p>Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b></p> <p>Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b></p> <p>Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating</p>	(08)

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	materials and their properties, types of heat exchangers and their applications.	
UNIT-IV	<p><b>Properties of fluids-</b></p> <p>Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b></p> <p>Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b></p> <p>Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p><b>Mechanisms-</b></p> <p>Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p><b>Machine Tools-</b></p> <p>Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b></p> <p>Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.

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4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

**References-**

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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**10: Engineering Mechanics**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

**Course Pre-requisites:**

The Students should have knowledge of

- |    |   |
|----|---|
| 1. | Scalar and Vector   |
| 2. | Newton's law of motion  |
| 3. | Law of friction   |
| 4. | Concept of physical quantities, their units and conversion of units |
| 5. | Concept of differentiation and integration                          |

**Course Objectives:**

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

**Course Outcomes:**

**The student should be able to**

- |    |  |
|----|--|
| 1. | calculate resultant and apply conditions of equilibrium.                                       |
| 2. | analyze the truss and calculate friction force.  |
| 3. | calculate centroid and moment of inertia.  |
| 4. | solve problem on rectilinear motion.   |
| 5. | solve problems on curvilinear motion.  |
| 6. | use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle. |



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<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach..  Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.  Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	

**Term Work:**

**A)** The term-work shall consist of minimum **Five** experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

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B) The term-work shall also consist of minimum **Five** graphical solutions of the problems on different topics.

**Text Books:**

1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.

2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.

3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.

**Reference Books:**

1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.

2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.

3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.

4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.

5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.

6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I to III

Unit Test -2

UNIT – IV to VI

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**ENGINEERING CHEMISTRY**

**Teaching Scheme:**  
**Lectures: 4Hrs/Week**  
**Practical: 2Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory: 04**  
**Practical: 01**  
**Term Work: 25marks**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming

Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning  
Numerical based on the zeolite process **(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography :** Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement :** Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications. **(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV. **(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping. **(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles. **(08 Hours)**

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**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

1. Effect of hard water on boilers and heat exchangers
2. Hydraulic/ Non-hydraulic cementing materials
3. Analysis of coal a) Proximate b) ultimate analysis of coal
4. Wet corrosion-mechanism, Electroplating, Hot dipping
5. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
6. Fuel cells

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**References / Text Books :**

1. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
2. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
3. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
4. Applied Chemistry, O. P. Vidyanakar, J. Publications, Madurai, (1955)
5. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
6. Engineering Chemistry by Dara S. S. S Chand Publications
7. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**02: Fundamentals of Electrical Engineering**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

**Course Pre-requisites:**

The Students should have

- |    |             |
|----|-------------|
| 1. | Mathematics |
| 2. | Physics     |

**Course Objectives:**

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.

**Course Outcomes:**

- |    |  |
|----|--|
| 1. | Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems     |
| 2. | Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks                        |
| 3. | Describe construction, principle of operation, specifications and applications of capacitors and batteries                 |
| 4. | Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer |
| 5. | Define basic terms of single phase and three phase ac circuits and supply systems  |
| 6. | Know and use electrical safety rules   |

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<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit  Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling,  Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	

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<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	
<b><u>Term Work:</u></b>		
The term work shall consist of record of minimum eight exercises / experiments.		
<ol style="list-style-type: none"> <li>1. Determination of resistance temperature coefficient</li> <li>2. Verification of Superposition Theorem</li> <li>3. Verification of Thevenin's Theorem</li> <li>4. Verification of Kirchoff's Laws</li> <li>5. Verification of Maximum power transfer Theorem</li> <li>6. Time response of RC circuit</li> <li>7. Study of R-L-C series circuits for <math>X_L &gt; X_C</math>, <math>X_L &lt; X_C</math> &amp; <math>X_L = X_C</math></li> <li>8. Verification of current relations in three phase balanced star and delta connected loads.</li> <li>9. Direct loading test on Single phase transformer             <ol style="list-style-type: none"> <li>a) Voltage and current ratios.</li> <li>b) Efficiency and regulations .</li> </ol> </li> <li>10. Study of a Residential (L.T.) Bill</li> </ol>		
<b>Text Books:</b>		
1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd., New Delhi		
2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi		
3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd		
<b>Reference Books:</b>		
1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication		
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications		
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications		
4. Vincent Del Toro – "Principles of Electrical Engineering", PHI Publications		



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<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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**Deemed University, Pune**  
**Analytical Techniques in Chemical Engineering**

**Teaching Scheme:**

**Lectures: - -**

**Practical: 2 Hr/week**

**Examination Scheme:**

**Term work: 50 Marks**

**Credits:**

**01**

**Course pre-requisite:** Fundamental knowledge of chemistry involved in analytical techniques.

**Course objectives:**

1. To develop students acquaintance with various basic analytical techniques available in Chemical Engineering.
2. To provide a base for effective understanding of the core subjects of Chemical Engineering such as Stoichiometry, Environmental Engineering etc.

**Course outcome:**

After successful completion of the course the student will be able:

1. To independently prepare standard solutions and solutions for given normality/ molarity/ molality
2. To carry out preliminary water and fuel analysis.

**Minimum eight practicals should be conducted from the list given below:**

**I. Standardization**

1. To prepare standard alkaline and acidic solutions.

**II. Normality/ Molarity/ Molality Concepts**

3. Find the strength of given alkaline solution using acidic solution or vice versa.
4. Preparation of solutions for given normality/ molarity/ molality

**III. Water Analysis**

1. To determine free CO<sub>2</sub> in the given water Sample.
2. Determination of Dissolved oxygen in the given water sample.
3. To determine Acidity of a given water sample.
4. To determine alkalinity of a given water sample.

**IV. Fuel Analysis**

1. Determination of octane/cetane number
2. Determination of kinematic viscosity
3. Determination of calorific value

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4. Determination of moisture content
5. Ultimate/proximate analysis of solid fuel

**Text books/References:**

1. Practical organic chemistry, Arthur I. Vogel, Longman publication
2. Experiments in applied chemistry, Sunita Rattan, S. K. Kataria & Sons

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**College of Engineering**  
**Department of Chemical Engineering**

<b>Semester III</b>														<b>Total Duration : 28Hours/week</b>
														<b>Total Credits :25</b>
														<b>Total Marks : 750</b>
<b>Sr. No.</b>	<b>Subject</b>	<b>Teaching Scheme (Hours/week)</b>				<b>Examination Scheme (Marks)</b>							<b>Credit</b>	
		<b>L</b>	<b>P/D</b>	<b>T</b>	<b>Total</b>	<b>End Semester Examination</b>	<b>Continuous Assessment</b>			<b>TW/ O</b>	<b>TW/ P</b>	<b>Total</b>		
							<b>Unit Test</b>	<b>Assign-ments</b>	<b>Atten-dance</b>					
1	Chemical Engineering Thermodynamics I	3	-	1	<b>4</b>	60	20	10	10	-	-	<b>100</b>	<b>4</b>	
2	Strength of Material	3	2	-	<b>5</b>	60	20	10	10	-	25	<b>125</b>	<b>4</b>	
3	Physical Chemistry	3	2	-	<b>5</b>	60	20	10	10	-	50	<b>150</b>	<b>4</b>	
4	Chemical Process Calculations	3	-	1	<b>4</b>	60	20	10	10	25	-	<b>125</b>	<b>4</b>	
5	Mechanical Operation	4	2	-	<b>6</b>	60	20	10	10	-	50	<b>150</b>	<b>5</b>	
6	Professional Skill Development-III	4	-	-	<b>4</b>	60	-	40	-	-	-	<b>100</b>	<b>4</b>	
<b>Total</b>		<b>20</b>	<b>6</b>	<b>2</b>	<b>28</b>	<b>360</b>	<b>100</b>	<b>90</b>	<b>50</b>	<b>25</b>	<b>125</b>	<b>750</b>	<b>25</b>	

**Bharati Vidyapeeth University**  
**College of Engineering**  
**Department of Chemical Engineering**

<b>Semester IV</b>														<b>Total Duration : 28Hours/week</b>
														<b>Total Credits :25</b>
														<b>Total Marks : 750</b>
<b>Sr. No.</b>	<b>Subject</b>	<b>Teaching Scheme (Hours/week)</b>				<b>Examination Scheme (Marks)</b>								<b>Credit</b>
		<b>L</b>	<b>P/D</b>	<b>T</b>	<b>Total</b>	<b>End Semester Examination</b>	<b>Continuous Assessment</b>			<b>TW/ O</b>	<b>TW/ P</b>	<b>Total</b>		
							<b>Unit Test</b>	<b>Assign-ments</b>	<b>Atten-dance</b>					
7	Engineering Mathematics III	3	-	1	<b>4</b>	60	20	10	10	-	-	<b>100</b>	<b>4</b>	
8	Fluid Flow Operations	4	2	-	<b>6</b>	60	20	10	10	-	50	<b>150</b>	<b>5</b>	
9	Process Heat Transfer	4	2	-	<b>6</b>	60	20	10	10	-	50	<b>150</b>	<b>5</b>	
10	Chemical Engineering Thermodynamics II	3	-	1	<b>4</b>	60	20	10	10	25	-	<b>125</b>	<b>4</b>	
11	Chemical Process Industries	2	-	1	<b>3</b>	60	20	10	10	25	-	<b>125</b>	<b>3</b>	
12	Professional Skill Development-IV	4	-	-	<b>4</b>	60	-	40	-	-	-	<b>100</b>	<b>4</b>	
<b>Total</b>		<b>21</b>	<b>6</b>	<b>1</b>	<b>27</b>	<b>360</b>	<b>100</b>	<b>90</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>750</b>	<b>25</b>	

**BHARATI VIDYAPEETH**  
**DEEMED UNIVERSITY, PUNE**  
**B.Tech (Chemical) - 2014 Course**  
**Semester-III**

<b>CHEMICAL ENGINEERING THERMODYNAMICS-I</b>		
<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have knowledge of		
<b>1.</b>	Mathematics	
<b>2.</b>	Physics	
<b>3</b>	Chemistry	
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures : 3 <b>Hours/Week</b>	End Semester Examination : 60 Marks	Theory : 03
Tutorial : 1 Hour /Week	Unit Test : 20 marks	Tutorial : 01
Total : 4 <b>Hours/Week</b>	Continuous Assessment : 20 Marks	Total credits : 04
	Term Work/Oral : 25 Marks	
	Total : 125 Marks	
<b>Course Outcomes:</b>		
After completion of the course students will be able to		
<b>1.</b>	(a) Estimate energy requirement for a system	
<b>2.</b>	(a) Understand second law of thermodynamics and the concept of entropy (b) Calculate efficiency of heat engines and refrigerator, and calculate change in entropy for ideal gas.	
<b>3.</b>	(a) Understand P-T and P-V diagrams for pure fluids (b) Select appropriate equation of state for representing P-V-T behavior of gases and/or liquids.	
<b>4.</b>	(a) Calculate changes in internal energy, enthalpy, and entropy for ideal gases, and also for non-ideal gases through use of residual properties (b) Understand the criterion of phase equilibrium for a pure substance and use it to relate the enthalpy of phase change to the saturation pressure curve via Clausius- Clapeyron equation	
<b>5.</b>	(a) Understand refrigeration and liquefaction cycles.	
<b>6.</b>	(a) Estimate deviation from ideality for real gaseous mixtures and liquid solutions	
<b>Topics covered</b>		
<b>UNIT - I</b>	<b>First Law of Thermodynamics</b> Preliminary concepts of thermodynamics; Statement of first law of thermodynamics; Joules experiment and internal energy; Mathematical form of first law of thermodynamics; State function and path function; Intensive and extensive properties; Enthalpy; Steady state steady flow process; Equilibrium; Phase rule; Reversible and irreversible processes; Constant volume and constant pressure processes.	<b>(08 Hours)</b>

<b>UNIT - II</b>	<b>Second Law of Thermodynamics:</b> Necessity of second law of thermodynamics; Statements of second law of thermodynamics; Heat engine: Carnot approach; Kelvin-Planck statements; Thermodynamic temperature scale; Thermodynamic temperature and the ideal gas scale; Entropy: Clausius approach; Entropy change of ideal gas; Mathematical statement of second law of thermodynamics; Third law of thermodynamics and its mathematical statement	<b>(08 Hours)</b>
<b>UNIT - III</b>	<b>Volumetric Properties of Pure Fluids</b> PVT behavior of pure substance; Basic equation of state; Difference between Ideal gas and real gas; Equation governing PVT behavior of ideal gas; Development of thermodynamic relations for ideal gas for isochoric, isobaric, isothermal, adiabatic, and polytropic processes; Equations governing PVT behavior of real gas: (i) the virial equations, (ii) two parameter equations (van der Waal, and RedlichKwong equations), (iii) compressibility factor: two parameter theorem of corresponding state and three parameter theorem of corresponding state.	<b>(08 Hours)</b>
<b>UNIT - IV</b>	<b>Thermodynamic properties of Fluids:</b> Property relations for homogeneous phases: (i) Thermodynamic relations derived from laws of thermodynamics, Helmholtz energy, and Gibbs energy, (ii) Maxwell relationships; Two-phase systems: Clausius - Clapeyron equation and Antoine equation; Thermodynamic diagrams: (i) temperature-entropy, (ii) pressure-enthalpy, and (iii) enthalpy-entropy (the Mollier diagram).	<b>(08 Hours)</b>
<b>UNIT - V</b>	<b>Refrigeration and Liquefaction</b> The Carnot Cycle; The vapor- compression cycle; Comparison of refrigeration cycle; The Choice of refrigerant; Absorption refrigeration and power cycle; Organic Rankine cycle; Liquefaction processes	<b>(08 Hours)</b>
<b>UNIT - VI</b>	<b>Solution Thermodynamics</b> Fundamental property relation; Phase equilibrium using volumetric properties; Partial molal properties; Ideal gas mixtures and ideal solutions; Concept of fugacity and activity; Concept of residual and excess properties.	<b>(08 Hours)</b>
<b>Tutorials:</b>		
Tutorials will be based on the theoretical and/or numerical covered in six units		
<b>1</b>	Solving numerical in connection with the basic principles of thermodynamics	
<b>2</b>	Questions involving first law applied to pure component systems.	
<b>3</b>	Solving numerical in connection with entropy changes of ideal gas for various thermodynamic processes.	
<b>4</b>	Draw P-T and P-V diagrams for pure substances.	
<b>5</b>	Solving numerical based on application of thermodynamics to transient open and closed systems	
<b>6</b>	Numerical involving Pure Fluid Properties Coupled to 1st and 2nd Laws.	

7	Conducting surprise MCQ test for students
8	Solving numerical based on Refrigeration and Liquefaction.
9	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments.
10	Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.
11	Group discussions on any of the following topics: a) Importance of Chemical Engineering Thermodynamics in chemical industries. b) Practical applications involving various thermodynamic processes. c) Ideal Gas, Real Gas, Ideal gas mixture, Ideal solution.
12	Preparation of a brief report on applicability of equations of states (EOS) in chemical engineering systems.
13	Solve question papers of CET I of previous THREE years.
14	Unsolved numerical from the reference books on various topics studied
<b>Text Books/ References:</b>	
1.	J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw-Hill Publication
2.	T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
3.	B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
4.	S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
<b>Syllabus for Unit Test:</b>	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI



<b>STRENGTH OF MATERIAL</b>					
<b>Designation:</b> Breath					
<b>Course Pre-requisites:</b>					
Students should have					
1.	Basic knowledge of Engineering Mechanics				
<b>TEACHING SCHEME:</b>					
<b>EXAMINATION SCHEME:</b>					
<b>CREDITS ALLOTTED:</b>					
Lectures	: 3Hours/Week	End Semester Examination : 60 Marks	Theory	: 03	
Practical	: 2 Hour /Week	Unit Test	: 20 Marks	Practical	: 01
Total	: 5 Hours/Week	Continuous Assessment	: 20 Marks	Total credits	: 04
		Term Work/Practicalal	: 25 Marks		
		Total	: 125 Marks		
<b>Course Outcomes:</b>					
After completion of the course students will be able to					
1.	Calculate stresses due to axial force.				
2.	Calculate shear force and bending moment in the beam.				
3.	Calculate deflection and bending stress in the beam.				
4.	Calculate shear stress due to shear force and torsion.				
5.	Calculate critical load for column.				
6.	Calculate principal stresses.				
<b>Topics covered</b>					
<b>UNIT-I</b>	<p><b>Concept of stress and strain:</b> Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law;</p> <p><b>Stresses due to Axial Load and Temperature:</b> Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.</p>	<b>(06 Hours)</b>			
<b>UNIT-II</b>	<p><b>Shear Force and Bending Moment in Beams:</b></p> <p>Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments.</p>	<b>(06 Hours)</b>			
<b>UNIT-III</b>	<p><b>Deflection of Beams:</b></p> <p>Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.</p> <p><b>Flexural Stresses:</b> Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section.</p>	<b>(08 Hours)</b>			
<b>UNIT-IV</b>	<p><b>Shear Stresses:</b> Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section.</p> <p><b>Torsion of Circular Shafts:</b> Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting moment diagram; Shear</p>	<b>(06 Hours)</b>			

	stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.	
<b>UNIT-V</b>	<b>Combined Axial and Bending Stress:</b> Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. <b>Axially Loaded Long Columns:</b> Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Principal Stresses and Principal Planes:</b> Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method. (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	<b>(06 Hours)</b>

**Text Books/References:**

1.	R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,
2.	Rajput R. K., "Strength of Materials", S. Chand Publication
3.	Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.
4.	Ramamrutham S. & Narayan R., "Strength of Materials", DhanpatRai Publishing Co.
5.	Beer F.P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication
6.	GereJ.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors
7.	Singer F. L. &Pytel A., "Strength of Materials", Harper and Row Publication
8	Popov E. P., "Engineering Mechanics of Solids", Prentice Hall of India (P) Ltd.
9	Singer F. L. &Pytel A., "Strength of Materials", Harper and Row Publication

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

## PHYSICAL CHEMISTRY

<b>Designation:</b> Basic science		
<b>Course Pre-requisites:</b> Basic knowledge for chemistry		
<b>TEACHING SCHEME:</b>		
Lectures : 03 Hours/Week	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Practical : 02 Hours /Week	End Semester Examination : 60 Marks	Theory : 03
Total : 05 Hours/Week	Unit Test : 20 Marks	Practical : 01
	Continuous Assessment : 20 Marks	Total credits : 04
	Term Work/Practical : 50 Marks	
	Total : 150 Marks	
<b>Course Outcomes:</b>		
After completion of the course students will be able to		
1.	Explain the basic concepts of bond forming and reactivity.	
2.	Describe the principles and applications of spectroscopic techniques such as infra-red UV/Visible absorption spectrometry.	
3.	Demonstrate the principles and functions of the UV and IR spectroscopy for chemical investigations.	
4.	Recognize the use of catalysts for industrially important processes.	
5.	Comprehend Structure-Property Relationship.	
6.	Interpret concept of Surface and Interfacial Chemistry.	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Bonding and reactivity:</b> Aromaticity-conditions necessary for delocalization of electrons, resonance structures stability rules, resonance in phenol, aniline, benzaldehyde, nitrobenzene molecules, Effect of inductive effect and resonance on pKa and pKb values of acids and bases. Reaction intermediates –carbonations, carban ions, free radicals and their stability. Types of reagents, types of reactions.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Reaction mechanisms:</b> Substitution at saturated carbon (SN1, SN2)- mechanism, factors favoring. Electrophilic aromatic substitution in benzene and mono substituted benzenes, activating and deactivating groups , nitration, Friedal-Craft reactions, sulphonation, diazotization. Nucleophilic substitution on on carbonyl carbon. Addition of HX on C=C 1, 2-Eliminations- E1mechanism, E 2, (Saytzeff, Hoffman products), factors favoring. Rearrangements- Beckman, Claisen, Reformatsky.	<b>(06Hours)</b>
<b>UNIT-III</b>	<b>Instrumental methods of chemical analysis:</b> UV-Visible spectroscopy: Lambert-Beer law, $\lambda$ max, calculation of $\lambda$ max for olefinic and cyclic structures, instrumentation, interpretation of spectra, applications. IR Spectroscopy: Introduction, instrumentation (double beam spectrophotometer) characteristic absorption in functional and finger print regions, interpretation of spectra, applications.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Catalysis:</b> Introduction, types of catalyst, criteria or Characteristics of catalyst, adsorption theory of catalysis, catalytic promoters or activators, catalytic poisons, Enzyme catalysis, Applications of catalysts for industrially important processes.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Structure –Property Relationship:</b> Molecular interactions and bonds weaker than covalent bonds, e.g. hydrogen bond,dipole interaction,VDW forces etc.and there effects on various properties	<b>(06 Hours)</b>

	such as refractive index ,viscosity, surface tension, density, thermal conductivity, specific heat, diffusivity, melting point, boiling point, vapor pressure, heat of formation, latent of diffusion and vaporization, non ideal behavior in solutions, group contribution methods for estimation of these properties(including those of polymers and polymeric solutions).	
<b>UNIT-VI</b>	<b>Surface and Interfacial Chemistry:</b> Concept of surface /interfacial energy and surface /interfacial tension, Thermodynamics of surfaces, Gibbs adsorption equation and isotherm, Curved surfaces-Young, Laplace, Kelvin and Thompson equations contact angle and wetting phenomena, adhesion, cohesion, surface active agents: types and applications, surfactant aggregates, emulsions and micro emulsions preparation, stability and application.	<b>(06 Hours)</b>
<b>List of Experiments:</b>		
Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.		
1.	Preparation of benzoic acid from benzamide.	
2.	Preparation of aspirin from salicylic acid.	
3.	Conductometric titration between strong acid and strong base.	
4.	Determination of percentage purity of sodium Bicarbonate by gravimetry.	
5.	Estimation of Cu <sup>++</sup> ions by spectrophotometer/colorimeter.	
6.	Purification of organic compounds by crystallization and sublimation.	
7.	To determine the number of molecules of water of crystallization in BaCl <sub>2</sub> .2H <sub>2</sub> O by heating.	
8.	Volumetric estimation of aniline from the given solution.	
9.	Volumetric estimation of acetone from the given solution.	
10.	Determine viscosity of given liquids by Ostwald's viscometer.	
11.	To determine ΔH, ΔG,ΔS of the reaction, $Zn(s) + Cu^{2+} (aq) \longrightarrow Zn^{2+} (aq) + Cu(s)$	
12	Preparation of tetramine copper (II) sulphate.	
13	Preparation of potassiumtrioxalato aluminate.	
14	Preparation of crystal of potash alum.	
15	To determine the equivalent weight of the given metal (Zn or Mg) eudiometrically.	
<b>Assignments:</b>		
1	What is resonance effect? Draw resonating structure of aniline, phenol, phenoxide ion.	
2	Nucleophilic substitution.	
3	Conductometric titrations.	
4	Industrial applications of catalysts.	
5	Adsorption theory of catalysis.	
6	Gibbs adsorption equation and isotherm	
<b>Reference Books</b>		
1	Instrumental methods of chemical analysis ----B.K.Sharma, Goel publ.)	
2	Instrumental methods of chemical analysis ----Chatwal –Anand	
3	Organic chemistry –I L Finar volume I and II	
4	Engineering Chemistry ---S.S.Dara	
5	Physical chemistry –P L Soni	

6	Atkins P.W. and Paula., Physical Chemistry, 8 <sup>th</sup> Edn., Oxford University Press.	
7	Inorganic chemistry ----Cotton, Wilkinson	
8	Spectroscopy ---Kalsi	
9	Vogels text book of quantitative chemical analysis. (5 <sup>th</sup> Edn.)	
<b>Syllabus for Unit Test:</b>		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

## CHEMICAL PROCESS CALCULATIONS

<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have		
1.	Basic knowledge of chemistry	
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures	: 3Hours/Week	End Semester Examination : 60 Marks
Tutorial	: 1 Hour /Week	Unit Test : 20 Marks
Total	: 4 Hours/Week	Continuous Assessment : 20 Marks.
		Term Work/Oral : 25 Marks
		Total : 125 Marks
		Theory : 03
		Tutorial : 01
		Total credits : 04
<b>Course Outcomes:</b>		
After completion of the course students will be able to		
1.	Explain the concept of units and dimensions and solve the problems on basic chemical calculations.	
2.	Describe the concept of material balance without chemical reactions and solve the problems involved in various unit operations.	
3.	Explain the concept of material balance involving chemical reactions and solve the problems on unit processes carried out in chemical industry.	
4.	Explain the concept of recycle, bypass, purge operations and solve problems based on humidification, recycle, bypass and purge operations.	
5.	Interpret the concepts of energy balance and solve numerical based on them.	
6.	Apply the knowledge of gross and net calorific values of fuel and solve the problems based on them.	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Basic Chemical Calculations:</b> Units and dimensions for mass and energy calculation for solid, liquid and gas; Mole concept; Basic composition calculation for homogeneous, two phase and three phase systems,	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Material balances without Chemical Reactions:</b> Generalized law of conservation of mass; Mass conservation without chemical reaction; Mass balance for unit operations encountered in chemical process industry : Distillation, extraction, evaporation, blending etc.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Material balances involving Chemical Reactions:</b> Generalization of law of conservation of mass involving chemical reaction and its simplification; Chemical equations and stoichiometry; Some basic concepts: conversion, yield, selectivity; Material balance for unit processes encountered in chemical process industry: nitration, esterification, acylation, sulfonation etc.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Recycle, bypass and purge operations:</b> Necessity of recycle, bypass and purge streams; Basic calculations of recycle, bypass and purge streams for unit operations and unit processes. Industrial examples of recycling, bypassing and purging with complete mass balance viz. biofuel synthesis, food processing etc.; Humidification operation.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Energy Balance:</b> Basic concepts; heat capacity; Sensible heat and latent heat: Clausius-Clapeyron equation; standard heat of formation, combustion, reaction, Hess's law; General equation of energy balance; Energy balance approach and calculations for exothermic and endothermic reactions with industrial examples; Steam table and its utility; Utility	<b>(08 Hours)</b>

	energy balance calculations.	
<b>UNIT-VI</b>	<b>Fuels and Combustion:</b> Types of fuels: solid, liquid and gas; Calculations of energy content of fuel; Analysis of fuel; oxygen requirement and excessity; Adiabatic flame temperature calculations.	<b>(08 Hours)</b>
<b>Term Work/ Tutorial:</b>		
Term work includes numerical on the following topics.		
1.	Basic chemical calculations.	
2.	Material balances without chemical reactions.	
3.	Material balances involving chemical reactions.	
4.	Recycle, bypass, purge and humidification operation.	
5.	Energy balance.	
6.	Fuels and combustion.	
<b>Assignment:</b>		
1.	Mass and energy balance for any one of following unit operations for given system.	
	a) Distillation	
	b) Evaporation	
	c) Extraction	
	d) Crystallization	
	e) Drying. etc	
2.	Mass and energy balance for any one of following unit processes for given system. These assignment may include overall energy and/or mass balance or energy and/or mass balance over a given chemical process equipment.	
	a) Nitration	
	b) Esterification	
	c) Acylation	
	d) Fermentation	
	e) Sulfonation etc.	
3.	Students have to visit chemical industry and prepare a detailed report on various unit operations and unit processes used in industry.	
4.	Measurement of calorific values of any two types of fuel.	
5.	Group discussions on mass and energy balance for unit operations and unit processes carried out in chemical industry	
6.	Solve last five years GATE question papers with reference to chemical process calculations.	
7.	Students have to study any five NPTEL videos related to chemical process calculations and prepare/present power point presentation.	
8.	Numericals based on above six units.	
9.	Technical interview based on knowledge of chemical process calculations.	
10.	Prepare models for recycle, bypass and purge operations carried out in chemical industry.	
11.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.	
12.	Prepare a report on unit operations which are newly introduced in the current year.	
13.	Write a report on your visit to research and development laboratory of national/international repute.	
In addition to these above stated assignments concern faculty member may design his/her won.		
<b>Text Books/References:</b>		
1.	Bhatt, B. I. and Vora, S. M.; Stoichiometry (SI Units), Third Edition, Tata McGraw Hill Publishers, New Delhi.	
2.	Himmelblau, D. M.; Basic Principles and Calculations in Chemical Engineering, Prentice Hall Publications	

3.	Hougen, O. A.; Watson, K. M. and Ragatz, R A; Chemical Processes Principles, Part-I, Material and Energy Balances, Asia Publishing House, Bombay
4.	Felder, R.M. andRousseau, R.W.; Elementary Principles of Chemical Processes, 3 <sup>rd</sup> edition, WileyJohn& sons Publications
5.	Rudd, D.F.; Powers, G.J. and Sirola, J.F.; Process Synthesis, Prentice Hall Publications
6.	Shukla, S.D. and Pandey, G. N.; Chemical Engineering Calculations, Lion Press, Kanpur
7.	Ranz, W.E.; Describing Chemical Engineering Systems, McGraw Hill Publications.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI



## MECHANICAL OPERATION

**Designation:** Professional Core

**Course Pre-requisites:** None

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Lectures	: 4 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Practical	: 2 Hours /Week	Unit Test	: 20 Marks	Practical	: 01
Total	: 6 Hours/Week	Continuous Assessment	: 20 Marks	Total credits	: 05
		Term Work/Practical	: 50 Marks		
		Total	: 150 Marks		

### Course Outcomes:

After completion of the course students will be able to

1. Understand the concept of particle size measurement, distribution and analyze the performance of size reduction equipment.
2. Understand the concept of solid storage and solid conveying.
3. Understand the concept of mixing and Calculate the power requirement for agitator.
4. Understand the concept of particle mechanics and sedimentation
5. Understand the concepts of filtration.
6. Understand the concept of separation of solids from fluids.

### Topics covered

<b>UNIT-I</b>	<p><b>Properties of Solid and Size Reduction</b>  <b>Properties of solid:-</b> Particle size and shape, Mixtures of particles, Cumulative and differential screen analysis, Determination of particle size, Screen effectiveness and capacity, Industrial screening equipments.  <b>Size Reduction:-</b> Crushing efficiency, energy requirements calculations by using different crushing laws, Size reduction equipments: Primary crushers, secondary crushers, Intermediate &amp; fine grinders, Ultra fine grinders, Cutting machines, open circuit &amp; Closed circuit grinding.</p>	<b>(08 Hours)</b>
<b>UNIT-II</b>	<p><b>Handling and Transport of Solids</b>  <b>Storage of Solids:-</b> Bins, silos, hoppers, Janseen's equation, characteristics of Bulk solids.  <b>Transport of Solids:-</b> Conveyors: Working principles, Construction, Advantages, Disadvantages and design calculation of Screw conveyors, Belt Conveyors, Chain &amp; Flight conveyors, Bucket elevators, Pneumatic conveyors.</p>	<b>(08Hours)</b>
<b>UNIT-III</b>	<p><b>Mixing and Agitation</b>  Necessity of mixing &amp; agitation in chemical industries, Mixers for pastes and plastic masses. Mixers for dry powders. Criteria for mixer effectiveness. Mixing index in blending granular solids. Rate of mixing. Types of equipment, Mixing characteristics, Power consumption, Mixing index calculations, Agitator selection.</p>	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<p><b>Sedimentation</b>  Gravity settling method: Motion of particles in fluid, drag force, drag coefficients, effect of particle shape, Stock's law, hindered settling, Terminal velocity, sink and float method, differential settling. Batch sedimentation, equipments for sedimentation, Kynch theory of sedimentation, calculation of area and depth of batch thickeners and continuous thickeners.</p>	<b>(08 Hours)</b>
<b>UNIT-V</b>	<p><b>Filtration</b>  Filter media and filter aids, classification of filtration, pressure drop through filter cake, filter medium resistance, specific cake resistance, Continuous Filtration,</p>	<b>(08 Hours)</b>

	Washing and dewatering of filter cakes, Centrifugal filtration. Selection of filtration equipment.	
<b>UNIT-VI</b>	<b>Separation of solids from fluids</b> Froth flotation, magnetic separator, scrubbers, fiber and fabric filter, and electrostatic precipitators. Mineral jig, cyclone separator, hydro cyclone types and centrifuges, centrifugal clarifier.	<b>(08 Hours)</b>
<b>List of Experiments:</b>		
Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.		
1.	To determine effectiveness of given set of standard screen.	
2.	To determine energy consumption and crushing law constants for jaw crusher.	
3.	To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill.	
4.	To determine mixing Index of a mixture in Ribbon Blender. <b>OR</b> To determine mixing Index of mixture in Sigma Mixer.	
5.	To determine filter medium resistance and cake resistance by using Vacuum Leaf filter.	
6.	To determine filter medium resistance and cake resistance by using Plate & frame Filter Press <b>OR</b> by using centrifuge machine.	
7.	To determine area of batch thickener by conducting batch sedimentation test.	
8.	To determine separation efficiency by using froth flotation cell.	
9.	To determine separation efficiency by using magnetic separator.	
10.	To determine efficiency of Cyclone separator.	
<b>Assignments:</b>		
1	Pilot scale solid-liquid fluidization: Expansion characteristics of solids	
2	Estimate power consumption for homogeneous system	
3	Industry related unit operation (ANY ONE INDUSTRY) detailing of it.	
4	How does filtration fit into the water treatment process?	
5	How Does Filtration clean water?	
6	What types of filters are used for water treatment? Explain in brief	
7	Explain hand pump water filter	
8	How does sedimentation fit in to the waste water treatment process?	
9	What zones are present in sedimentation basin?	
10	How is sedimentation sludge disposed of?	
11	What is surface loading rate explain in brief. The flow into clarifier is 3.2 MGD in tank 80 feet long and 40 feet wide. what is surface loading rate?	
12	Recent trends in particle size technology.	
13	Watch the NPTEL video on this subject of any TWO modules and summarize it	
14	Solve numerical problems asked in previous THREE year question papers.	
15	Solve questions asked on filtration in previous THREE year question papers.	
16	If your particles are not spherical which equivalent particle size would be suitable to calculate for the purpose of filtration	
17	What media are used in filters? What factors affect filter efficiency?	
<b>Text Books/References:</b>		
1.	McCabe, W. L.; Smith, J. C. and Harriott, P.; Unit Operations of Chemical Engineering, 6 <sup>th</sup> edition, McGraw Hill Publications.	
2.	Coulson, J.M.; Richardson, J. F.; Backhurst, J. R.; Harker, J. H.; Chemical Engineering Volume 2, 6 <sup>th</sup> edition, Pergamon Press.	
3.	Badger W. L & Banchemo J.T. "Introduction to Chemical Engineering", McGraw Hill	

4.	Foust A. S “Principles of Unit Operation”.
5.	George G. Brown, “Unit operations”, CBS publishers and distributors.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**BHARATI VIDYAPEETH**  
**DEEMED UNIVERSITY, PUNE**  
**B.Tech (Chemical) - 2014 Course**  
**SEMESTER-IV**

<b>ENGINEERING MATHEMATICS- III</b>		
<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have		
Basic knowledge of Mathematics including derivative, integration etc.		
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures : 3Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Tutorial : 1 Hour /Week	Unit Test : 20 Marks	Total credits : 04
Total : 4 Hours/Week	Continuous Assessment : 20 Marks	
	Total : 100 Marks	
<b>Course Outcomes:</b>		
After completion of the course students will be able to		
1.	To develop an ability of mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient	
2.	To develop an ability to solve the Laplace, heat and wave equations for a variety of boundary conditions in domains of simple geometry and with simple boundary conditions; the techniques available will include, separation of variables	
3.	To develop an ability to solve problems on Fourier sine and cosine transform	
4.	To develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms	
5.	To develop an ability to calculate the gradients and directional derivatives of functions of several variables	
6.	To develop an ability to use Green's theorem to evaluate line integrals along simple closed contours on the plane	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Linear Differential Equations (LDE):</b> Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE. Applications of LDE to chemical engineering problems and allied engineering.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Partial Differential Equations (PDE):</b> Solution of Partial Differential Equations 1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ , 2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ , 3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$	<b>(08 Hours)</b>

	By separating variables only. Applications of PDE to problems of Chemical and allied engineering.	
<b>UNIT-III</b>	<b>Fourier Transform (FT):</b> Fourier Integral theorem. Sine & Cosine Integrals. Fourier Transform, Fourier Cosine Transform, Fourier Sine Transforms and their inverses. Finite FT, Application of FT to problems on one and two dimensional heat flow problems.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Laplace Transform (LT):</b> Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz. error, 1st order Bessel's, Periodic, Unit Step, Unit Impulse, ramp, jump, parabolic, Si(t) and Ei(t). Problems on finding LT & inverse LT. Applications of LT for solving ordinary differential equations, liquid level systems, consisting of single tank and two tanks in series (interacting and non-interacting systems), second order systems (damped vibrator).	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Vector Differentiation:</b> Physical Interpretation of Vector Differentiation. Radial, Transverse, Tangential & Normal components of Velocity and Acceleration. Vector differential operator. Gradient, Divergence & Curl. Directional derivative. Vector identities. Irrotational & Solenoidal fields. Application of vector differentiation to chemical engineering.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Vector Integration:</b> Line integral, Surface & Volume integrals. Work done, Green's Lemma, Gauss-Divergence and Stoke's Theorem, Applications of Vectors to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equation.	<b>(08 Hours)</b>

**Assignments:**

1	Linear differential equation with constants coefficients.
2	Application of LDE and partial differential equations.
3	Fourier transform and inverse fourier a function which is neither even nor odd ,for even and odd function
4	Laplace transform and invese laplace transform and its application to differential equation
5	Vector identities and application of vector differential in mechanics.
6	line integral, surface integral and volume integral.

**Text Books/References:**

1.	Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2.	Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
3.	Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
4.	Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
5.	Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
6.	Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
7.	Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
8.	Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

## FLUID FLOW OPERATIONS

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have knowledge of

1. Physics, Engineering Science and Engineering Mechanics.
2. Elements of Civil Engineering

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures	: 4 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 04
Practical	: 2 Hour /Week	Unit Test	: 20 Marks	Practical	: 01
Total	: 6 Hours/Week	Continuous Assessment	: 20 Marks.	Total credits	: 05
		Term Work/Practical	: 50 Marks		
		Total	: 150 Marks		

**Course Outcomes:**

After completion of the course students will be able to

1. Describe the various properties of fluids and basic concept of fluid flow.
2. Apply the basic equations of fluid flow like Continuity and Bernoulli's equation for solving numerical in fluid flow operations.
3. Apply the basics of turbulent flow and flow measuring devices for solving numerical in fluid flow operations
4. Identify and explain the various types of energy losses for fluid flowing through a pipe.
5. Identify and select various types of fluid moving equipments for fluid flow
6. Explain the construction and working of fluidized bed reactor.

### Topics covered

<b>UNIT - I</b>	<b>Basic Concepts of Fluid Flow:</b> Types of fluid: Newtonian and Non-Newtonian fluids; Properties of fluids; Concept of viscosity, calculation and measurement; Models for non-Newtonian fluids; Types of flow: laminar, transition and turbulent and their characteristics; Concept of fluid pressure, pressure measurement and calculation.	<b>(08 Hours)</b>
<b>UNIT - II</b>	<b>Equations of Fluid Flow:</b> Basic equations of fluid flow; Equation of continuity and motion (cartesian, cylindrical and spherical coordinates) in laminar flow and its applications for calculation of velocity profiles, shear stress distribution, volumetric flow rate, power etc. in engineering applications; Flow of incompressible fluids.	<b>(08 Hours)</b>
<b>UNIT - III</b>	<b>Turbulent Flow:</b> Basics of turbulent flow; Equations of continuity and motion for turbulent flows: Reynolds averaging, Boussinesq hypothesis, Prandtl mixing length theory, Turbulent models; Flow measurement: flow measuring devices; Velocity profile;	<b>(08 Hours)</b>
<b>UNIT - IV</b>	<b>Pressure Drop Calculation and Measurement in Pipe Flow:</b> Darcy-Weisbach equation; Bernoulli's equation; Friction factor: laminar, transition and turbulent flow; Models available to predict friction factor; Friction factor: valves, bends, fittings, sudden expansion and contraction, sudden obstruction etc.; Equivalent diameter concept for energy losses.	<b>(08 Hours)</b>

<b>UNIT - V</b>	<b>Flow Moving Equipments:</b> Pumps: Types; Selection and specifications; characteristic curves; cavitation phenomena; Net positive suction head (NPSH) calculations; System and operating parameters affecting pump performance; Calculation of power requirement. Blowers and compressor: Selection and specifications; Factors affecting performance; Power calculations for given duty.	<b>(08 Hours)</b>
<b>UNIT - VI</b>	<b>Flow Through Solids:</b> Expansion characteristics of solids: Drag and drag coefficient ( $C_D$ ), terminal settling velocity, settling in presence of other particles; voidage-superficial fluid velocity relationship, $C_D$ Vs $N_{Re}$ ; Boundary layer separation; Pressure drop calculation and measurement: skin and form friction, effect of system, operating and geometrical parameters, Ergun equation, experimental methods of measuring pressure drop. Applications of fluidization: catalytic cracking, chromatographic separation etc.	<b>(08 Hours)</b>

**Term Work:**

Term work will consist of the experiments listed below, out of which at least eight experiments should be performed in laboratory by the students.

1.	To determine kinematic viscosity and to study the effect of temperature on kinematic viscosity of given oil.
2.	To study flow characteristics using Reynolds apparatus and determine Reynolds number.
3.	To determine the coefficient of discharge for venturimeter.
4.	To determine the coefficient of discharge for orificemeter.
5.	To determine Darcy Weisbach coefficient of friction of laminar and turbulent flow for given pipe.
6.	To determine friction and pressure drop for flow through helical/spiral coils.
7.	To find losses due to sudden expansion and contraction in pipe.
8.	To calculate minimum fluidization velocity using fluidized bed reactor.
9.	To verify Bernoulli's theorem.
10.	To study characteristics of centrifugal pump.
11.	To Study Darcy's law.
12.	To study pressure drop in packed bed for different fluid velocities.
13.	To determine the coefficient of discharge for different notches like rectangular notch, $45^\circ$ V notch, $60^\circ$ V notch and trapezoidal notch.
14.	To determine terminal velocity of particles in fluids of different viscosity and plot a graph of drag coefficient ( $C_D$ ) as a function of $N_{Re}$ .

**Assignments:**

1.	Numericals based on above six units.
2.	Visit to suppliers and prepare a report on detailed specifications of following fluid moving equipments.
	a) Pumps.
	b) Blowers.
	c) Compressors.
3.	Visit to suppliers and prepare a report on detailed specifications of following flow measuring devices.
	a) Venturimeter.
	b) Orificemeter.
	c) Pitot tube.
	d) Roatameters.
4.	Students have to study any five NPTEL videos related to fluid flow operations and prepare/present power point presentation.

5.	Students have to visit chemical industry and make a detailed report on overall fluid flow operations.
6.	Group discussions on any one of the following topics.
	a) Importance of fluid flow operations in chemical industries.
	b) Pumps, blowers and compressors.
	c) Flow measuring devices.
7.	Prepare models for various types of valves and write industrial applications.
8.	Prepare models for various types of bends and write industrial applications.
9.	Prepare models for various types of fittings and write industrial applications.
10.	Prepare a report on fluid flow operations which are newly introduced in the current year.
11.	Solve last five years GATE question papers with reference to fluid flow operations subject.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Technical interview based on knowledge of fluid flow operations.
14.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
In addition to these above stated assignments concern faculty member may design his/her won.	
<b>Text Books/ References:</b>	
1.	McCabe, W. L.; Smith, J. C. and Harriott, P.; Unit Operations of Chemical Engineering, 5 <sup>th</sup> edition, McGraw Hill Publications.
2.	Coulson, J.M.; Richardson, J. F.; Backhurst, J. R.; Harker, J. H.; Chemical Engineering Volume 1, 6 <sup>th</sup> edition, Pergamon Press.
3.	Gupta, S.K.; Momentum transfer operations, Tata McGraw Hill Publishers.
4.	Bansal, R. K.; A text book of fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd, New Delhi.
5.	Bird, R.B.; Stewart, W.E.; Lightfoot, E.N.; Transport Phenomena, John Wiley & Sons, New York.
6.	Denn, M.M.; Process fluid mechanics, Prentice Hall Publications.
<b>Syllabus for Unit Test:</b>	
Unit Test - I	UNIT– I, II, III
Unit Test - II	UNIT– IV, V, VI



## PROCESS HEAT TRANSFER

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have

Basic knowledge of units and dimensions, mathematical concepts like differential and integral etc, fluid flow concepts like continuity equation, momentum balance.

**TEACHING SCHEME:**

Lectures : 4 Hours/Week

Practical : 2 Hour /Week

Total : 6 Hours/Week

**EXAMINATION SCHEME:**

End Semester Examination : 60 Marks

Unit Test : 20 Marks

Continuous Assessment : 20 Marks

Termwork / practical :50 Marks

Total :150 Marks

**CREDITS ALLOTTED:**

Theory : 04

Practical : 01

Total credits : 05

**Course Outcomes:**

After completion of the course students would be able to

1. Evaluate heat loss through pipe insulation, critical and optimum thickness for insulation.
2. Identify the importance of dimensional analysis and derive the dimensionless numbers.
3. Calculate the heat transfer coefficient and heat transfer rate for vertical, horizontal plate in case of film-wise condensation.
4. Apply appropriate empirical correlations to estimate critical heat flux in boiling.
5. Explain the evaporation phenomena and estimate economy of the evaporator.
6. Compute heat transfer rates in case of conduction, convection and radiation.

### Topics covered

<b>UNIT-I</b>	<p><b>Heat conduction</b> Thermal conductivity: solids, liquids, and gases; Generalized equation for heat conduction; Steady state heat conduction through: plane slab, composite slab, hollow cylinder, composite cylinder and hollow sphere; Heat loss through pipe: maximum loss, critical and optimum thickness of insulation; its application for the calculation of temperature profile, maximum temperature rise or drop, heat flow at surface; Heat transfer through extended surfaces of uniform cross section.</p>	<b>(08 Hours)</b>
<b>UNIT-II</b>	<p><b>Convection without phase change</b> Basic concepts of convection; Natural and forced convection; Dimensional analysis: dimensionless groups and their physical significance; Film coefficients; Factors affecting film coefficient; Fouling resistance; Empirical equations for convection heat transfer in turbulent flow through tubes, through annulus and over a flat plate; Steady state convection heat transfer equation to calculate temperature distribution in laminar and turbulent flows.</p>	<b>(08 Hours)</b>
<b>UNIT-III</b>	<p><b>Convection with phase change</b> Condensation basic concepts; Dropwise and filmwise condensation; Condensation on surfaces-Nusselt's theory: vertical surface, horizontal surface, and inclined surface. Boiling types; Effect of physical properties; Pool boiling curve; Correlations used in boiling; Concept of critical heat flux.</p>	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<p><b>Radiation</b> Basic concepts; Thermal radiation; Black body radiation; Properties and laws of radiation; The radiation shape factor; Laws of shape factor; Various cases of radiation between two surfaces; Radiation shields; Radiant heat exchange in an enclosure having black surfaces.</p>	<b>(08 Hours)</b>
<b>UNIT-V</b>	<p><b>Evaporation</b></p>	<b>(08 Hours)</b>

	Introduction; Types of evaporators; Material and energy balance; Boiling point elevation; Capacity and economy; Multiple effect evaporators.	
<b>UNIT-VI</b>	<b>Unsteady state processes</b> Unsteady state heat conduction: infinite slab, infinite cylinder, sphere. Heat transfer in agitated vessels: calculation of film coefficient in coil, jacket; heating and cooling times; Application to batch reactor and processes.	<b>(08 Hours)</b>
<b>Assignments</b>		
1.	Write a report on the recent advances in heat transfer processes with reference to the current year.	
2.	Solve old (last five years) question papers with reference to particular topic.	
3.	Prepare a model for any of the heat transfer equipment.	
4.	Prepare a report on heat transfer equipments which are newly introduced in the current year.	
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.	
6.	Evaluate capacity and economy for any industrial evaporator.	
7.	Estimate how much heat transfer rate is decreased due to the scale formation on surface of industrial heat transfer equipment?	
8.	By determining optimum thickness of insulation give solution to an industrial problem to minimize the heat loss.	
9.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.	
10.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.	
11.	Write a technical report on your visit to a process industry.	
12.	Solve old (last ten years) GATE question papers with reference to heat transfer subject.	
13.	Group discussion on the recent advances in heat transfer processes.	
14.	Write a report on your visit to research and development laboratory of national/international repute.	
15.	Technical interview based on the knowledge of heat transfer.	
In addition to these above stated assignments concerned faculty member may design his/her own assignments		
<b>Term Work:</b>		
Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.		
1.	To determine rate of heat flow and thermal conductivity of an insulating material.	
2.	To determine thermal conductivity of a metal bar.	
3.	To study Newton's law of cooling to find rate of heat flow.	
4.	To determine the local heat transfer coefficients using the various correlations in natural convection.	
5.	To determine heat transfer coefficient in forced convection.	
6.	To study film wise condensation.	
7.	To study drop wise condensation.	
8.	To determine the critical heat flux	
9.	To study Stefan-Boltzman law and find the value of its constant.	
10.	To study evaporators.	
11.	To determine emissivity of an aluminum plate.	
12.	To study unsteady state processes.	
<b>Text Books/References:</b>		
1.	McCabe, W. L., J. Smith, and Harriot: "Unit operations of chemical engineering," Tata McGraw Hill.	
2.	Kern, D. Q.: "Process Heat Transfer," 11 <sup>th</sup> ed., Tata McGraw Hill Publication, New Delhi.	
3.	Sukhatme, S. P.: "A Textbook on Heat Transfer," 4 <sup>th</sup> ed., Universities Press, India, 2005.	
4.	Richardson, J. F., and J. M. Coulson: "Chemical Engineering," Butterworth Heinemann, Volume 1.	
5.	Holman, J.P.: "Heat Transfer," 9 <sup>th</sup> ed., Tata McGraw Hill Publications, New Delhi, 2004.	

6.	Frank, K., M. Bohn: "Principles of Heat Transfer," 5 <sup>th</sup> edition, PWS Publishing company, Boston, 1997.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## CHEMICAL PROCESS INDUSTRIES

**Designation:** Professional Core

**Course Pre-requisites:** None

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Lectures	: 02 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Tutorial	: 01 Hours /Week	Unit Test	: 20 Marks	Total credits	: 03
Total	: 03 Hours/Week	Continuous Assessment	: 20 Marks		
		Term Work/Oral	: 50Marks		
		Total	: 150 Marks		

### Course Outcomes:

After completion of the course students will be able to

1. Understand the concept of Unit operation and Unit processes as well the significance of process flow diagram.
2. Understand the manufacturing processes for soda ash, caustic and chlorine and Indian scenario of chlor-alkali industries.
3. Understand manufacturing processes of sulfur and nitrogen industry
4. Understand nitration of hydrocarbons and typical industrial process for nitration
5. Understand sulfonation and sulfation process used in organic industry
6. Understand processes for various petrochemicals

### Topics covered

<b>UNIT-I</b>	<b>Concept of Unit Operation and Unit process:</b> Unit operations and unit processes, Concept of block diagram, process flow diagram (ASME guidelines). Water for the chemical process industry and its treatment: Boiler feed-water, Cooling tower water, Process Plant water.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Chlor -alkali industries:</b> current status (Indian and global), Production and consumption pattern, Different processes for the manufacture of Soda ash, Caustic and chlorine	<b>(08Hours)</b>
<b>UNIT-III</b>	<b>Sulfur Industry:</b> Current status (Indian and global), Production and consumption pattern Sulfur and Manufacture of sulfuric acid, Different processes and comparison. <b>Nitrogen Industry:</b> Current status (Indian and global), Production and consumption pattern Ammonia, Nitric acid, Urea and other nitrogen fertilizers, Mixed fertilizers.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Nitration:</b> Nitrating Agents, Kinetics and Mechanism of Aromatic Nitration, Nitration of Paraffinic hydrocarbons, Liquid phase nitration, Nitro compounds, and Commercial nitration process.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Sulfonation and Sulfation:</b> Sulfonating and sulfating agents and their principal applications, Sulfonation and Sulfation of aliphatic compounds, Sulfonation of aromatic compounds, Commercial sulfonation process.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Petrochemicals:</b> Production of petrochemical precursors - olefins and aromatics, Production of ethylene, propylene, formaldehyde, methanol, ethylene oxide, ethanolamine, cumene, ethylene glycol, ethyl benzene	<b>(08 Hours)</b>

### List of Practicals:

The practical shall include at least (6) assignments from the various units mentioned in the syllabus.

One industrial visit should be arranged to the process industry and students should prepare the report on the same as a part of the term work.

**Expert Interaction:**

Lecture(s) by eminent scholar(s) on the topic(s) mentioned in the syllabus.

**Assignments:**

1	One industrial visit should be arranged to the process industry and the students will prepare the report which includes the consumption pattern of the products produced, process flow diagram and process description, major engineering problems in the industry.
2	Students should prepare the plant-layout for the industry visited.
3	Students should visit one CETP (Central effluent Treatment Plant) nearby and prepare the report which includes different unit operations in CETP, Significance of each unit.
4	Students should visit one STP (Sewage treatment plant) and prepare the report which includes different unit operations in STP, block diagram.
5	Students should compile the list of vendors (manufacturers of pumps, contact, and address) along with the details like type, specifications, and costs and should prepare the comparative for the same.
6	Students should prepare the report on “Material of construction” for pumps for special applications using the data from assignment 4.
7	Students should make a report on “Indian scenario of inorganic industries” which will include the name of industries (from different chemical zones), products manufactured, and production capacity.
8	Students should make a report on “Fertilizer industries in Maharashtra and Gujarat” which will include the name of industries (from different chemical zones), products manufactured, and production capacity.
9	Model making of any one Unit operation used in chemical process industry.
10	Describe the different equipment used to run the process plant with different utilities.
11	Students should compile the list of Boiler manufacturers, contacts, and address along with their product range specifications.
12	Students should compile the list of vendors providing “water treatment plants” in chemical process industries along with their product specifications.
13	Give a presentation on “commercial aspects of petrochemical products”.
14	AutoCAD drawing of process flow diagram for any one process from the syllabus

**Text Books**

1.	Dryden, C. E. “Outlines of Chemical Technology” (Edited and Revised by M.Gopal Rao and Sittig .M) East West Press. ,New Delhi,3 rd Edition(1997).
2.	Austin G. T » Shreve’s Chemical Process Industries”, 5th ed., McGraw Hill.(1984)
3.	Groggins, Unit process in organic synthesis, Tata McGraw-Hill Education

**Reference Books**

1	Faith, W. L., Keyes, D. B. and Clark, R. L., “Industrial Chemicals” John Wiley.(1975).
2	Kirk and Othmer, "Encyclopaedia of Chemical Technology" Wiley (2004).
3	Pandey G.N &Shukla.S.D, “Chemical Technology Vol - I” Vikas publication.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

## CHEMICAL ENGINEERING THERMODYNAMICS-II

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have knowledge of

- |    |                                       |
|----|---------------------------------------|
| 1. | Chemical Engineering Thermodynamics I |
| 2. | Mathematics                           |
| 3. | Chemistry, Physics                    |

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures	: 3 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Tutorial	: 2 Hour /Week	Unit Test	: 20 Marks	Tutorial	: 01
		Continuous Assessment	: 20 Marks	Total credits	: 04
		Term Work/Oral	: 50 Marks		
		Total	: 150 Marks		

**Course Outcomes:**

After completion of the course students will be able to

- |    |   |
|----|---|
| 1. | a) Understand the concept of fugacity and its application to gaseous and liquid systems<br>b) Understand residual and excess properties to demarcate non- ideality in gaseous phase and liquid solution |
| 2. | a) Understand criteria of phase equilibrium and stability<br>b) Make typical phase equilibrium calculations pertaining to VLE, LLE, SLE, SVE, etc.  |
| 3. | a) Perform bubble P, dew P, bubble T, and dew T calculations for VLE<br>b) Carry out thermodynamic consistency test for experimental VLE data   |
| 4. | a) Understand the criterion for chemical reaction equilibrium<br>b) Establish relation of equilibrium constant to composition for gas phase and liquid phase reactions.                                 |
| 5. | a) Calculate equilibrium constant for heterogeneous system<br>b) Understand phase rule for reacting system and its physical significance  |
| 6. | Understand thermodynamics of liquid-liquid equilibrium.   |

### Topics covered

<b>UNIT - I</b>	<p><b>Solution Thermodynamics:</b></p> <p>Concept of chemical potential; chemical potential as a criterion of phase equilibria; Concept of non ideality in gaseous mixtures; Fugacity and fugacity coefficient for species in solution; Methods of determination of fugacity coefficient; Concept of non-ideality in liquid mixtures; Activity and</p>	<b>(06 Hours)</b>
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	activity coefficient for species in solution; Excess properties; Gibbs excess energy; Model for estimation of excess property; Property change of mixing and heat effects in mixing.	
<b>UNIT - II</b>	<b>Phase Equilibria:</b> Criteria of phase equilibrium; Criterion of stability; Phase equilibria in single and multi component system; Phase rule: Duhems theorem; LLE, VLLE, SLE, and SVE; Phase diagrams; Dilute solution laws: Nernst's law, osmotic equilibrium.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Vapor-liquid equilibrium (VLE):</b> Qualitative behavior of VLE; Basic equation for vapor- liquid equilibrium; Liquid phase properties from VLE data; VLE at low to moderate pressures: excess Gibbs free energy models; Azeotropic data; VLE at high pressures; Multicomponent vapor- liquid equilibria; Bubble point and dew point calculations; Thermodynamic consistency test for VLE data.	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<b>Chemical reaction equilibria:</b> The reaction coordinate; Application of equilibrium criteria to chemical reactions; The standard Gibbs energy change and the equilibrium constant; Effect of temperature on the equilibrium constant; Evaluation of equilibrium constant; Relation of equilibrium constants to composition; Phase rule for reacting systems; Multi-reaction equilibria.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Heterogeneous reaction equilibrium:</b> Notable industrial heterogeneous systems and thermodynamic role; The Gibbs energy change and equilibrium constant; Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved; Pressure of decomposition; Simultaneous reactions; Combined physical and chemical equilibria.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Liquid-liquid Equilibria (LLE):</b>	<b>(06 Hours)</b>

	Quantitative behavior of LLE; Basic equation governing LLE; Distribution coefficient (Partition Coefficient); Activity coefficient and its determination; Selection of extractant; Solubility parameters and estimation.	
<b>Tutorials/Assignments:</b>		
1	Questions involving fugacity and activity for the species in solution.	
2	Solving numerical in connection with phase equilibria.	
3	Solving numerical based on application of Rault's law for the calculation of dew point and bubble point	
4	Conducting surprise MCQ test for students.	
5	Draw P-xy and T-xy diagrams.	
6	Solving numerical based on chemical reaction equilibrium.	
7	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments.	
8	Students have to study any five NPTEL videos related to Chemical Engineering Thermodynamics I and prepare/present power point presentation.	
9	Group discussions on any of the following topics: a) Importance of Phase equilibria in chemical industries. b) Thermodynamic properties for pure species and species in solution	
10	Preparation of a brief report on applicability of liquid-liquid equilibrium (LLE) in chemical engineering systems.	
11	Solve question papers of CET II of previous THREE years.	
12	Unsolved numerical from the reference books on various topics studied.	
<b>Term Work:</b>		
Term work includes minimum 08 assignments/problems on each unit covered		
<b>Text Books/ References:</b>		
1.	J. M. Smith and H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics", McGraw- Hill Publication	
2.	T. E. Daubert, "Chemical Engineering Thermodynamics", McGraw- Hill Publication	
3.	K.V. Narayanan, "Chemical Engineering Thermodynamics", PHI Learning Pvt. Ltd.	
4.	B. F. Dodge, "Chemical Engineering Thermodynamics", McGraw- Hill Publication	



5.	M. D. Koretsky, "Engineering and Chemical Thermodynamics", 2nd Edition, John Wiley & Sons
6.	S. I. Sandler, "Chemical Engineering Thermodynamics", McGraw- Hill Publication
7.	S. Glasstone, "Thermodynamics for Chemists", Affiliated East West Press Pvt.Ltd.

**Syllabus for Unit Test:**

Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

**Bharati Vidyapeeth University**  
**Faculty of Engineering and Technology**  
**Programme: B. Tech. (Chemical) - Semester V - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
1	Elective-I	3	-	-	60	20	10	10	-	-	<b>100</b>	3	-	<b>3</b>
2	Mass Transfer Operation	4	2	-	60	20	10	10	-	50	<b>150</b>	4	1	<b>5</b>
3	Chemical Reaction Engineering- I	4	2	-	60	20	10	10	-	50	<b>150</b>	4	1	<b>5</b>
4	Chemical Engineering Mathematics	3	-	1	60	20	10	10	50	-	<b>150</b>	4	-	<b>4</b>
5	Computer Programming for Chemical Engineers –I	3	2	-	60	20	10	10	-	50	<b>150</b>	3	1	<b>4</b>
6	Professional Skill Development-V	4	-	-	100	-	-	-	-	-	<b>100</b>	4	-	<b>4</b>
<b>Total</b>		<b>21</b>	<b>6</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	22	3	<b>25</b>

**Bharati Vidyapeeth University**  
**Faculty of Engineering and Technology**  
**Programme: B. Tech. (Chemical) - Semester VI - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
7	Elective-II	3	-	-	60	20	10	10	-	-	100	3	-	3
8	Separation Techniques	4	2	-	60	20	10	10	-	50	150	4	1	5
9	Chemical Process Equipment Design- I	3	2	-	60	20	10	10	-	25	125	3	1	4
10	Chemical Reaction Engineering – II	3	2	-	60	20	10	10	-	50	150	3	1	4
11	Process Instrumentation and Instrumental Methods of Analysis	3	2	-	60	20	10	10	-	25	125	3	1	4
12	Professional Skill Development-VI	4	-	-	100	-	-	-	-	-	100	4	-	4
13	Computer Programming For Chemical Engineering-II	-	2	-	-	-	-	-	-	50	50	-	1	1
<b>Total</b>		<b>20</b>	<b>10</b>	<b>-</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>-</b>	<b>200</b>	<b>800</b>	<b>20</b>	<b>5</b>	<b>25</b>

Total Credits  
Semester V : 25  
Semester VI : 25  
**Grand Total : 50**

**Elective I: Advanced Material Science**

**Designation:** Elective

**Course Pre-requisites:**

- |           |  |
|-----------|--|
| <b>1.</b> | Basic chemistry, Basic physics, Chemical Engineering Materials, Physical chemistry, Chemical Reaction Engineering, Chemical Engineering Thermodynamics |
|-----------|--|

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3 Hours/Week

End Semester Examination: 60 marks

Theory : 03

Continuous Assessment: 40 marks

**Course Outcomes:**

- |           |   |
|-----------|---|
| <b>1.</b> | Explain basics of polymers and their classifications                                    |
| <b>2.</b> | Explain various polymer properties and the their effect on engineering properties       |
| <b>3.</b> | Determine suitable process for polymer synthesis and describe its mechanism             |
| <b>4.</b> | Understand the basics of polymer characterizations and discuss its effect on properties |
| <b>5.</b> | Explain the formation of composites and blends in polymers                              |
| <b>6.</b> | Explain the methods of polymer compounding and processing                               |

**Topics covered**

<b>UNIT-I</b>	<b>Material composites</b> Introduction to composite materials, factors influencing the properties of composite materials like fiber parameter, matrix, interface & molding methods. Phase selection criteria. Reinforcing mechanisms. Interfaces, advantages and disadvantages. Polymer composites. Reinforcing and matrix materials, prepregs, fiber winding techniques, fabrication techniques, laminates, mechanical behavior, etc.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Composite and reinforcement</b> Metal composites, types of reinforcement, chemical compatibility, fabrication processes, mechanical behavior and properties, ceramic composites. Matrices and reinforcement. Why to reinforce ceramics, fabrication methods, crack propagation and mechanical behavior.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Carbon composites</b> Carbon composites, their properties, fabrication methods and their applications, ablative polymers, their applications, air craft materials, introduction to nonmaterial, synthesis & characterization of nonmaterial, application of nonmaterial with special reference to chemical engineering.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Nuclear materials</b> Atomic structure, atomic number, mass number, isotopes, nuclear energy and nuclear forces, binding energy, nuclear stability, radioactivity, nuclear reactions, nuclear fissions, nuclear fusion, Types of waste –disposal – radiation hazards and prevention	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Biomaterials</b>	<b>(06 Hours)</b>

	Properties of biomaterials: Physical, thermal, electrical and optical properties of bio-materials and their application to processing. Novel Biomaterials and Uses in Engineering and Tissue Engineering: Hydrogels, self-assembling peptides, Implants materials: Metallic implant materials, hydroxyapatite glass ceramics carbons, Polymeric implant, medical applications.	<b>Hours)</b>
<b>UNIT-VI</b>	<b>Nanomaterials</b> Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube (CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications	<b>(06 Hours)</b>

**Assignments:**

1. Prepare the report on any advanced material comprising its significance, preparation, characterization, processing, properties and application

**References/Text Books:**

1. L.C. Merrite, "Basic principles of Nuclear science and Reactors" Wiley Eastern 1977.
2. Polymers of high technology, electronics and photonics, Bowden M.J & Turner S.R., ACS Symp. Ser. 346, 1987.
3. Composite Materials , Chawala K.K., Springer Science & Business Media.
4. Buddy D. Ratner Allan S. HoffmanFrederick J. SchoenJack E. Lemons Biomaterials Science, Second Edition: Wiley Science 2004.
5. "An Introduction to Materials Engineering and Science for Chemical and Materials Engineers," by Brian S. Mitchell; Wiley-Interscience, 2003; ISBN 0471436232.
6. Carl C. Koch (ed.), "Nanostructured Materials", Processing, Properties and Potential Applications, Noyes Publications, Norwich, New York, U.S.A.
7. Bhusan, Bharat (Ed), "Springer Handbook of Nanotechnology", 2nd Edition, 2007.

**Syllabus for Unit Test:**

Unit Test –I	UNIT – I ,II,III
Unit Test –II	UNIT – IV,V,VI

## ELECTIVE I COMBUSTION ENGINEERING

<b>Designation:</b> Elective		
<b>Course Pre-requisites:</b>		
Students should have		
1.	Basic knowledge of chemistry	
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures: 3Hours/Week	End Semester Examination: 60 Marks	Theory : 03
	Unit Test: 20 Marks	Total credits: 03
	Continuous Assessment: 20 Marks.	
	Total : 100 Marks	
<b>Course Outcomes:</b>		
After completion of the course students will be able to		
1.	Identify the fundamental definitions, properties and various measurement techniques for fuels.	
2.	Describe the combustion techniques of solid fuel i.e. coal.	
3.	Explain the concept of exploration of crude petroleum and refinery equipments.	
4.	Explain about different important gaseous fuels	
5.	Emphasis is given to combustion of various fuels in the light of thermodynamics and applies the knowledge of gross and net calorific values of fuel and solves the problems based on them.	
6.	Describe the incineration technology.	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction:</b> History of Fuels : History of solid fuel, History of liquid fuels and gaseous fuels, Production, present scenario and consumption pattern of fuels, Fundamental definitions, properties and various measurements: Definitions and properties of solid fuels, Definitions and properties of liquid and gaseous fuels, Various measurement techniques.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Solid Fossil Fuel (Coal):</b> Coal classification, composition and basis, Coal mining, Coal preparation and washing, Combustion of coal and coke making (Action of heat on different coal samples, Different types of coal combustion techniques, Coal tar distillation), Coal liquefaction (Direct liquefaction, Indirect liquefaction), Coal gasification	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Liquid Fossil Fuel (Petroleum):</b> Exploration of crude petroleum, Evaluation of crude, Distillation (Atmospheric distillation, Vacuum distillation), Secondary processing (Cracking, Thermal cracking, Visbreaking, Coking, Catalytic cracking, Reforming of naphtha, Hydrotreatment, dewaxing, deasphalting), Refinery equipments.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Gaseous Fuels:</b> Natural gas and LPG, Producer gas, Water gas, Hydrogen, Acetylene, Other fuel gases	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Combustion Technology:</b> Fundamentals of thermochemistry, Combustion air calculation, Calculation of calorific value of fuels, Adiabatic flame temperature calculation, Mechanism and kinetics of combustion, Flame properties, Combustion burners, Combustion furnaces, Internal combustion engines	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Incineration Technology:</b> Classification, Key Issues, Pretreatment of Waste, Sorting, Homogenization, Moving Grate Incineration, Rotary Kiln Incineration, Fluidized Bed Incineration, advantages, disadvantages and applications of incineration. Furnaces and Boilers.	<b>(06 Hours)</b>

<b>Assignment:</b>	
1.	Presentations on any topic of combustion engineering.
2.	Recent trends in combustion technology.
3.	Alternative fuel for engines.
4.	Measurement of calorific values of any two types of fuel.
5.	Detail study on solid fossil fuel.
6.	Solve last five years GATE question papers with reference to combustion engineering.
7.	Students have to study any five NPTEL videos related to combustion engineering and prepare/present power point presentation.
8.	Numerical based on above fifth unit.
9.	Detail study on liquid fossil fuel.
10.	Detail study on gaseous fuels.
11.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
12.	Prepare a report on combustion technology which is newly introduced in the current year.
13.	Write a report on incineration technology.
In addition to these above stated assignments concern faculty member may design his/her won.	
<b>Text Books/References:</b>	
1.	Richard A. Dave, "Modern Petroleum Technology", Vol 1 , Upstream, 6th ed., John Wiley & Sons. Ltd.2002.
2.	Alan G. Lucas, "Modern Petroleum Technology", Vol 2, Downstream, 6th ed., John Wiley & Sons. Ltd.2002.
3.	Irvin Glassman, "Combustion", 2nd ed., Academic Press.2009.
4.	B.K. Bhaskar Rao, "Modern Petroleum Refining Processes", 5th ed., Oxford & IBH Publishing Co. Pvt. Ltd.2007.
5.	John Griswold ,"Fuels Combustion and Furnaces" , Mc-Graw Hill Book Company Inc.1988.
6.	Samir Sarkar, "Fuels and Combustion", 3rd. ed Universities Press.2009.
7.	W.L. Nelson, "Petroleum Refinery Engineering", 4th ed. Mc-Graw Hill Book Company.1958.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**ELECTIVE-I : MULTIPHASE FLOW**

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Fluid Flow Operations

2 | Process Heat Transfer

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
	Continuous Assessment : 40 Marks	Total credits : 03
	Total : 100 Marks	

**Course Outcomes:**

After completion of the course students will be able to

1. Explain the concept of two phase flow and describe the flow types, flow regimes in horizontal and vertical flow
2. Describe the two phase flow classifications.
3. Explain the mixing power correlations.
4. Identify and explain packed bed, fluidized bed, bubble column and its design aspects.
5. Explain the concept of multiphase flow and identify the flow regimes.
6. Explain cavitation and RTD in multiphase flow system.

**Topics covered**

<b>UNIT-I</b>	<b>Gas/liquid and liquid/liquid Two phase flow:</b> Scope and significance of multiphase flows, Dimensionless numbers in multiphase flows; Flow types and regimes in horizontal and vertical flow, Regime maps, Behaviour of non-Newtonian fluids in two phase flow.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Flow Classification:</b> Two-phase Co-current flow of Gas-Liquid, Gas-Solid and Liquid-Liquid, Upward and Downward Flow in Vertical pipes. Suspensions of Solid and their transport in Horizontal Pipes. Drag Reduction Phenomena, Laminar, Turbulent and Creeping Flow Regimes.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Mixing Power Correlations:</b> Theories of Intensity and Scale of Turbulence. Calculation of Circulation Velocities and Power Consumption in Agitated Vessels for Newtonian and Non-Newtonian Fluids. Blending and Mixing of Phases, flow patterns. Power requires for aeration to suspend to an Immiscible Liquid or Solids in Slurry Reactors, Prediction of optimum speed of Impeller Rotor. Mixing equipments.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Quantification of Flow System:</b> Prediction of Holdup, Pressure Drop and bubble size in pipe flow, Lockhart – Martinelli Parameters, Bubble Column and its Design aspects; Flow through Packed Bed and Fluidized Bed, Minimum Carryover Velocity. Holdup Ratios, Pressure Drop and Transport Velocities and their prediction. Solid-Fluid Conveying and Settling.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Flow in Three - Phase Systems:</b>	<b>(06 Hours)</b>



	Introduction to three phase flow; Flow regime identification, pressure drop, void fraction and flow rate measurement, Prediction of Holdup, Pressure Drop and throughput velocities in three –phase system. phase separation and settling behaviour, analysis of stratified and bubble flow, formation of bubbles and drops and their size distribution and hold up in different flow system, momentum and energy relations.	
<b>UNIT-VI</b>	<p><b>RTD in multiphase flow system:</b> Non-Ideal Flow: Residence time distribution of fluid in vessel, non-ideal flow patterns, E, F, C curve, Mean and variance, residence time, Models for non-ideal flow.</p> <p><b>Cavitation:</b> Introduction, types of cavitation, mechanism of cavitation. Key features of bubble cavitation: cavitation inception, cavitation bubble collapse, shape distortion during bubble collapse, cavitation damage. Cavitation bubbles: observations of cavitating bubbles, cavitation noise and cavitation luminescence.</p>	<b>(06 Hours)</b>

### Assignments

1	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
2	Students have to study any five NPTEL videos related to multiphase flow and prepare/present power point presentation.
3	Students have to visit chemical industry and make a detailed report on multiphase flow.
4	Write a report on the recent advances in multiphase flow with reference to the current year.
5	Prepare models for bubble column, packed bed and fluidized bed reactors.
6	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
7	Write a report on your visit to research and development laboratory of national/international repute.
8	Solve old (last five years) GATE question papers with reference to multiphase flow.
9	Group discussions on any one topic from above six units.
10	Technical interview based on the knowledge of multiphase flow.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Text Books/References:

1.	Wallis, G.B.; One Dimensional Two Phase Flow, McGraw Hill Book Co., New York, 1969.
2.	Hewitt, G.F.; Measurement of Two Phase Flow Parameters.
3.	Govier, G. W. and Aziz, K.; The Flow of Complex Mixture in Pipes, Richardson, Tex.: Society of Petroleum Engineers 2008.
4.	Butterworth and Hewitt, Two Phase Flow
5.	John, G. Collier and John, R.Thome,; Convective Boiling and Condensation, Oxford University Press, 3rd Edition, 2002.
6.	Levenspiel, O.; Chemical Reaction Engineering, 3 <sup>rd</sup> Ed , John Wiley & Sons, Singapore (1999).
7.	Doraiswamy, L.K., and Sharma, M.M.; Heterogeneous Reactions: Volume 2 Fluid-Fluid-Solid Reaction, John Wiley & Sons, 1984, Singapore
8.	Coulson, J.M. and Richardson, J.F.; Chemical Engineering, Vol I, 6 <sup>th</sup> edition, Oxford, 1999.
9.	D.G. Knudsan and D. L. Katz. Fluid Dynamics and Heat transfer. Mc-Graw Hill, 1958
10.	A.H. P. Skelland “Non Newtonian flow and Heat transfer” John Wiley 1867

11.	Brodkey, R. S.; The Phenomena of Fluid Motions”, Addison –Wesley, New York, 1967.
12.	Hestroni, G., (Ed.) ; Hand book of Multiphase systems, Hemisphere Publishing, Washington, 1982.
13.	Christopher, E. Brenner,; Fundamentals of multiphase flows, Cambridge University Press 2005.

<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## Elective I Rheology

**Designation:** Elective

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : ---	Unit Test: 20 Marks	Practical: ---
Total: 3Hours/Week	Continuous Assessment: 20 Marks	Total credits: 03
	Total :100 Marks	

### Course Outcomes:

After completion of the course students would be able to

1.	Apply the rheological models to study the rheology of non-Newtonian fluids
2.	Describe the operation of instruments used for measurements of rheological properties
3.	Obtain the rheological behavior of non-Newtonian fluids
4.	Explain the rheological models for rubber compounds
5.	Describe the models to represent behavior of polymer liquids
6.	Obtain the variable influencing the rheology of fluids

### Topics covered

<b>UNIT-I</b>	<b>Introduction</b> Types of fluid flow, time dependant fluids, shear rate dependant fluids, Newtonian and Non Newtonian fluids, Definition of Rheology, Rheological Perspective, The importance of nonlinearity, Solids and liquids, Components of rheological research: Rheometry, Constitutive equations.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Rheological Models</b> Power law fluid Model, Eyring Model, Bingham Plastic fluid model, Ellis fluid model, Eyring-Powel model , Reiner-Phillipoff model , Meter model. <b>Instruments used for measurements of Rheological properties</b> capillary rheometer, melt flow index, cone and plate viscometer, Torque rheometer, Mooney viscometer	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Experimental Studies of Rheological Behavior :</b> Steady Shear Flow: Elongation Flow, Oscillating Flow: Stress Relaxation, Temperature Dependence: Processability, Test & Dependence upon Polymer Structure, Shear Flow Boundary Conditions and Slippage, Flow induced Degradation & Mechanochemistry.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Rheology of Rubber</b> Rheological Models and Approaches to Flow Analysis: One Dimensional Rheological Models for Rubber Compounds: Plastic Viscous Model, Plastic Viscoelastic Model, Thixotropic Model, Equation of Motion and Dimensional Analysis of Non-Newtonian Fluids: General, Viscoelastic Fluids, Plastic Fluids, Energy Equation & Non Isothermal Flow :Energy Equation, Dimensional Analysis, Classification of Flows :Internal & External Flow, Hydrodynamic Lubrication Theory.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Rheology of polymers</b> <b>Introduction</b>	<b>(08 Hours)</b>

	Elastic materials ,Viscous materials, Viscoelasticity, Effect of rate of strain, temperature and time on mechanical behavior of polymeric materials, creep, stress relaxation <b>Models to represent behavior of Polymer Liquids</b> Mechanical models, stress strain response of spring and dashpot Viscoelastic models, Maxwell element, Voigt Oelvin element, response to creep and stress relaxation, Four parameter model, dynamic mechanical properties, behavior of Maxwell element and relaxation spectra	
<b>UNIT-VI</b>	<b>Variable influencing the Rheology of fluids</b> Effect of Temperature, Effect of Pressure, Effect of Molecular weight & Molecular structure, effect of entanglement of molecules & molecular motions.	<b>(08 Hours)</b>

### Assignments

1.	Group discussion on the recent advances in rheology.
2.	Presentation on a instruments used for measurements of rheological properties.
3.	Group discussion on importance of studying this elective.
4.	Technical interview based on the knowledge of rheology.
5.	Presentation on rheological models for rubber compounds.
6.	Write a report on your visit to research and development laboratory of national/international repute.
7.	Technical interview based on the knowledge of rheology.
8.	Preparation of report on recent trends in rheology of polymers.
9.	Group discussion on variable influencing the rheology of fluids

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Text Books/References:

1.	R. B. Bird, W. E. Stewart, E. N. Lightfoot, “ Transport Phenomena” Wiley- India, New Delhi
2.	Dr. B. R.Gupta, “Rheology of Elastomers”
3.	H.A. Barnes, J. F. Hutton and K. Walters, “An Introduction to Rheology”
4.	R. P. Chhabra & J. F. Richardson , “Non-Newtonian Flow and Applied Rheology”
5.	Chang Dae Han, “Rheology in Polymer Processing”, Academic Press, New York
6.	R.S. Lenk, “Polymer Rheology”, Applied Science, London

### Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV, V,VI

## MASS TRANSFER OPERATION

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

- |   |                                   |
|---|-----------------------------------|
| 1 | Heat Transfer operation           |
| 2 | Unit Operations and stoichiometry |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 4 Hours/Week	End Semester Examination : 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test : 20 Marks	Practical : 01
Total : 6Hours/Week	Continuous Assessment : 20 Marks	Total credits : 05
	Term work / practical : 50 Marks	
	Total : 150 Marks	

**Course Outcomes:**

After completion of the course students would be able to

- |    |   |
|----|---|
| 1. | Evaluate diffusivity and rate of diffusion.   |
| 2. | Evaluate mass transfer coefficients and understand interphase mass transfer.          |
| 3. | Calculate the height of transfer unit, number of transfer unit, in absorption column. |
| 4. | Calculate rate of mass transfer in humidification.                                    |
| 5. | Estimate rate and time of drying.   |
| 6. | Analyze type of crystallization and estimate yield of crystallization.                |

### Topics covered

<b>UNIT-I</b>	<p><b>Diffusion</b> Molecular diffusion in fluids: Steady state diffusion in fluids at rest and in laminar flow, Steady state diffusion of A through nondiffusing B , equimolar counter diffusion, steady state diffusion in multicomponent mixture , molecular diffusion in fluids, diffusivity of liquids and gases, effect of temperature and pressure on diffusivity, diffusion in solids. Laws of diffusion and empirical equations – Maxwell’s law, Stefan’s law, Winkle man’s method.</p>	<b>(08 Hours)</b>
<b>UNIT-II</b>	<p><b>Mass transfer Coefficient and Interphase Mass Transfer:</b> a) <b>Mass transfer coefficients:</b> Mass transfer coefficient in laminar flow and in turbulent flow. Relation of individual and overall mass transfer coefficient. Theories of mass transfer. Mass, heat and momentum transfer analogies. b) <b>Interphase mass transfer.</b> Equilibrium in mass transfer, two resistance concept. diffusion between phases. Steady state co-current and counter current processes. continuous crosscurrent, counter-current, crosscurrent cascade operations and mass balances.</p>	<b>(08 Hours)</b>
<b>UNIT-III</b>	<p><b>Absorption:</b> Introduction to absorption, types of tower packing’s, contact between liquid and gas, pressure drop and limiting flow rates, material balances for each flow , limiting gas-liquid ratio, rate of absorption, calculation of HTU, NTU and</p>	<b>(08 Hours)</b>

	HETP. Alternate forms of transfer coefficients and their relations. Tray Efficiencies, absorption in plate columns, absorption with chemical reaction. Equipments for absorption column.	
<b>UNIT-IV</b>	<b>Humidification:</b> Vapor-liquid equilibrium, enthalpy for pure substances, definitions of humidity terms, adiabatic saturation temperature, wet bulb and dry bulb temperatures, study of humidity charts, lewis relation. method of adiabatic humidification and dehumidification. Equipments for humidification, cooling tower design.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Drying:</b> Basic principles of drying. equilibrium in drying. definitions of terms in drying, types of moisture binding, rate of drying curve, mechanism of batch drying and continuous drying, time requirement for drying, mechanism of moisture movement in solids. Equipments used for drying: Classification of dryers, solids handling in dryers, equipments for batch and continuous drying processes: working principle of tray driers, tower driers, rotary driers, spray driers. Concept of freeze drying	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Crystallisation:</b> Introduction to the process, principal rate of crystallization, Mier's supersaturation theory, growth and properties of crystals, crystallisation rate, calculations of yield, mass and enthalpy balances. Equipments used in crystallization.	<b>(08 Hours)</b>

### Assignments

1.	Write a report on the recent advances in mass transfer processes with reference to the current year.
2.	Solve old (last five years) question papers with reference to particular topic.
3.	Prepare a model for any of the Mass transfer equipment.
4.	Prepare a report on Mass transfer equipments which are newly introduced in the current year.
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
6.	Evaluate efficiencies of different Gas-liquid contact equipment. .
7.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
8.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
9.	Compare working and principles for different mass transfer operations.
10.	Solve numerical for any industrial data.
11.	Write a technical report on your visit to a process industry.
12.	Solve old (last ten years) GATE question papers with reference to Mass transfer-I subject.
13.	Group discussion on the recent advances in mass Transfer equipments.
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of Mass transfer.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be

performed in laboratory by the students.	
1.	To calculate diffusion coefficient in Liquid-Liquid diffusion.
2.	To calculate diffusion coefficient in still air..
3.	To study characteristics of Wetted Wall Column.
4.	To calculate individual and overall interface mass transfer coefficient.
5.	To estimate efficiency of cooling Tower.
6.	To estimate rate of drying in tray drier/rotary drier
7.	To study the crystallization process by air, water cooling and seeding.
8.	Humidification and Dehumidification experiment.
9.	To study agitated batch crystallizer
10.	Study of Spray drier
<b>Text Books/References:</b>	
1.	McCabe, W. L., J. Smith, and Harriot: "Unit operations of chemical engineering," Tata McGraw Hill.
2.	Treybal R.E., Mass Transfer Operations, 3 <sup>rd</sup> Ed., McGrawHill, 1981.
3.	King C. J. "Separation Techniques," McGraw Hill Publications
4.	Richardson, J. F., and J. M. Coulson: "Chemical Engineering," Butterworth Heinemann, Volume 1.
5.	E. L. Cussler, "Diffusion Mass Transfer in fluid systems " 3 <sup>rd</sup> Ed. Cambridge Series in Chemical Engineering.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>CHEMICAL REACTION ENGINEERING-I</b>		
<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have basic knowledge of		
1	Analytical and physical Chemistry	
2	Process Calculation	
3	Mathematics including integration and derivation	
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6Hours/Week	Continuous Assessment: 20 Marks	Total credits: 05
	Termwork / practical:50 Marks	
	Total :150 Marks	
<b>Course Outcomes:</b>		
After completion of the course students would be able to		
1.	Define rates of homogeneous chemical reactions and express the temperature dependent term of a rate equation with Arrhenius' Law and other theories	
2.	Design experiments, analyze and interpret data, and apply the results to chemical systems and processes.	
3.	Design ideal batch reactors, ideal CSTR reactors and ideal plug flow reactors.	
4.	Analyze multiple reactor system, autocatalytic and recycle reactors.	
5.	Specify operating conditions to produce desired products from parallel and series chemical reactions.	
6.	Evaluate effect of temperature on reaction.	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Chemical Kinetics:</b> Classification of reactions, rate laws and stoichiometry, relative rates of reaction, reaction order, rate limiting step, half life, concentration-dependent term of a rate equation, temperature-dependent term of a rate equation, Temperature dependency from Arrhenius law, Transition state theory, collision theory, rate equation using partial pressure and concentration, their interrelation, searching for a reaction mechanism.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Interpretation of Batch reactor data:</b> Interpretation of batch experimental kinetics data using integral and differential analysis, constant volume batch reactor system, design equation for zero, first, second and third order irreversible and reversible reactions, graphical interpretation of these equations and their limitations, variable volume batch reactors, design equation for zero, first and second order irreversible and reversible reactions, graphical interpretation of their limitations.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Introduction to Reactor Design</b> Single ideal reactors under steady state conditions, design equations for batch,	<b>(08 Hours)</b>



	mixed flow & plug flow reactor, development of rate expression for mean holding time for a plug flow reactor, space time and space velocity, Introduction to Semi-batch reactor.	
<b>UNIT-IV</b>	<b>Isothermal flow reactors</b> Size comparison of reactor performance, sequences of reactors, reactors with recycle. optimum size determination, reactors in series and parallel, performance of infinite number of back mix reactors in series, back mix and plug flow reactors of different sizes in series and their optimum way of staging, optimum recycle ratio for auto –catalytic (recycle) reactors.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Design of reactors for Single and Multiple reactions</b> Parallel and consecutive reactions in batch, CSTR and PFR, qualitative discussion about product distribution, quantitative treatment of product distribution and reactor size, factors affecting such as choice, optimum yield, conversion, selectivity, reactivity on consecutive and parallel reactions in reactors.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Non-Isothermal reactor for homogeneous reactor systems</b> Energy balances in reactors, adiabatic operations, non-adiabatic operations, stability of reactors, non-isothermal homogeneous reactor systems, rates of heat exchanges for different reactors, adiabatic operations for batch and continuous reactors, optimum temperature progression, rate, temperature and conversion profiles for exothermic and endothermic reactions.	<b>(08 Hours)</b>

#### Assignments

1.	Write a report on the recent advances in chemical reaction engineering with reference to the current year.
2.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
3.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
4.	Derive the rate equations for various combinations of reactors.
5.	Suggest best suitable reactor arrangement for zero, first and second order reaction.
6.	Explain in detail use of kinetics in equipment/reactor design.
7.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
8.	Solve old (last five years) question papers with reference to particular topic.
9.	Prepare a model for any of the reactor.
10.	Solve old (last ten years) GATE question papers with reference to chemical reaction engineering subject.
11.	Group discussion on the recent advances in reaction engineering.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Technical interview based on the knowledge of chemical reaction engineering.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

#### Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Study of first order reaction.
2.	Study of PFR & CSTR combination in second order reaction.

3.	Rate constant of hydrolysis of methyl acetate by dilute HCl.
4.	Energy of activation of a reaction between $K_2S_2O_8$ and KI
5.	Study of homogeneous catalytic reaction, decomposition of hydrogen peroxide, acid catalysed ester hydrolysis.
6.	Hydrolysis of ester (e.g. ethyl acetate) by alkali (NaOH).
7.	Study of CSTR combination in first order reactions.
8.	Determination of Arrhenius parameters.
9.	Rate constant for saponification of ethyl acetate with NaOH using CSTR.
10.	Rate constant for saponification of ethyl acetate with NaOH at ambient conditions using PFR.
11.	Rate constant for saponification of ethyl acetate with NaOH at ambient conditions using (i) Isothermal batch reactor (ii) Isothermal CSTR.
12.	Study and operation of an adiabatic batch reactor.
13.	Study of a reversible reaction in a batch reactor.
14.	To determine energy of activation of reaction of ethyl acetate with sodium hydroxide.
15.	Find out specific rate constant and activation energy of a reaction in a plug flow reactor.
16.	Use MATLAB software to simulate Batch / CSTR / Plug flow reactor data.

**Text Books/References:**

1.	Octave Levenspiel, "Chemical Reaction Engineering", 3rd Edition, John Wiley and sons, New Delhi, 2007. (ISBN 9788126510009).
2.	Scott Fogler H, "Elements of Chemical Reaction Engineering", 4th Edition, Prentice Hall of India, New Delhi, 2006. (ISBN : 9788120334168).
3.	Keith J. Laidler, "Chemical Kinetics", 3rd Edition, Pearson Education Inc. (ISBN: 9788131709726).
4.	Smith J.M., "Chemical Engineering kinetics", 3rd Edition, McGraw Hill, 1981. (ISBN: 0070665745).

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## CHEMICAL ENGINEERING MATHEMATICS

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have

Basic knowledge of Mathematics including derivative, integration etc.

**TEACHING SCHEME:**

Lectures: 3Hours/Week

Tutorial : 1Hour/Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Continuous Assessment: 20 Marks

Term work / Oral:50 Marks

Total: 150

**CREDITS ALLOTTED:**

Theory : 03

Tutorial : 01

Total credits: 04

**Course Outcomes:**

After completion of the course students will be able to

1. Compute the roots of the equation using methods like Secant method, Bisection method, False position method etc.
2. Apply Numerical differentiation methods such Euler's method, Modified Euler's method, Runge-Kutta methods etc.
3. Apply Numerical integration methods such as Trapezoidal rule, Simpson method, Romberg method etc.
4. Evaluate the problems on special matrices using Matrix inversion method, LU decomposition etc.
5. Evaluate curve fitting problems.
6. Optimize Linear programming problems.

### Topics covered

<b>UNIT-I</b>	<p><b>Root of equation</b> Solve Fluid flow, heat transfer problems using Picard method, Secant method, Bisection method, False position method, Newton-Rapson method, modified Newton-Rapson method, Muller method.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>Numerical Differentiation</b> Solve mass transfer, chemical reaction engineering, heat transfer problems using Euler's method, Modified Euler's method, Runge-Kutta methods, Milne's predictor-corrector method, Richardson Extrapolation.</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<p><b>Numerical Integration</b> Trapezoidal rule, Simpson 1/3 and 3/8 rule, Multiple integrals, Romberg integration, Stirlings formula, LaGarange method, Cauchys integral formula.</p>	<b>(06 Hours)</b>

<b>UNIT-IV</b>	<b>Multiple algebraic equations using Matrix</b> Matrix inversion method, Gauss elimination, Gauss Jordan method, LU decomposition method, Gauss Seidal method, Jacobian method.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Curve fitting and Statistics</b> Linear regression, multiple linear regressions, polynomial regression, general linear least squares, Non-linear regression. Introduction to Statistics, application of Statistics, histogram method, measuring centre values by median, mode methods.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Optimization</b> Graphical method, Simplex method, Golden section search method, Linear programming case studies such as least cost design of tank, least cost treatment of wastewater, chemical Process e.g. reactors, heat exchangers, evaporators etc.	<b>(06 Hours)</b>

**Assignments:**

There will be six (6) assignments from various units mentioned in the syllabus. Each assignment will carry 10 marks.

List of assignments

1. Finding the roots of polymeric equations mentioned in the fluid mechanics. Equations such as buoyancy of ball, liquid level in manometer etc.
2. Solving the equations from mass transfer, Momentum transfer using Numerical differentiation methods.
3. Evaluating the integrals from heat transfer using Numerical integral methods.
4. Solving linear problems from process calculation using matrix methods.
5. Finding rate equation, equilibrium curve using experimental data.
6. Applying optimization method for equation of cost for various equipments, insulation thickness etc.
7. With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry
8. Solve old (last five years) question papers with reference to particular topic.
9. Solve old (last ten years) GATE question papers with reference to chemical engineering mathematics subject.

**Tutorials / Term work**

1. Solving problems on roots of equation.
2. Use numerical differential methods for problems on chemical reaction engineering, mass transfer, heat transfer etc.
3. Use numerical integration methods for problems on chemical reaction engineering, mass transfer, heat transfer etc.
4. Solve problems on multiple algebraic equations using Matrix.
5. Analyze and solve the problems on curve fitting.
6. Applying optimization method for industrial problems.

<b>Text Books/References:</b>	
1.	Chapra S. C., R.P. Canale, “Numerical Methods for Engineers”, Tata-McGraw Hill Publications.
2.	T. F. Edgar, D. M. Himmblblau. , “Optimization of Chemical Processes”, Tata-McGraw Hill Publications.
3.	M. K. Jain, S. R .K. Iyengar, R. K. Jain. , “Numerical methods for Scientific and Engineering Computational”, new age international Publishers.
4.	S. S. Sastri. , “Introductory methods of Numerical analysis”, Prentice-Hall India.
5.	S. Pushpavanam, “Mathematical Methods for Chemical Engineering”, Printice-Hall of India.
6.	E. Balagurusamy. , “Numerical Methods”, McGraw Hill Education (India) Private Limited.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

## COMPUTER PROGRAMMING FOR CHEMICAL ENGINEERS - I

**Designation:** Computing

**Course Pre-requisites:**

Students should have basic knowledge of

Computer fundamentals

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Lectures	: 3 Hours/Week	End Semester Examination	: 60 Marks	Theory	: 03
Practical	: 2 Hour /Week	Continuous Assessment	: 40 Marks	Practical	: 01
Total	: 5Hours/Week	Term work / practical	: 50 Marks	Total credits	: 04
		Total	:150 Marks		

**Course Outcomes:**

After completion of the course students will be able to

1. Apply the knowledge of constant, variables and data types used in visual basic and write programs.
2. Write coding in VB and prepare interface using various controls like option button, check box, list box, text box, command button etc.
3. Apply the knowledge of Visual Basic to various chemical engineering calculations.
4. Explain and apply the HTML tags for web page.
5. Design a web page and apply dynamic effects to the page using the knowledge of HTML.
6. Explain and apply the various DHTML tags and object models for web page.

### Topics covered

<b>UNIT-I</b>	<b>Visual Basic:</b> Introduction to visual basic, object oriented programming and Graphics User Interface (GUI). Editions of visual basic. Variable: Types of variable declaration, scope of variable. Data Types, conversion of data types, array of controls. Control constructs and loop statements used in visual basic.	<b>(06 Hours)</b>
<b>UNIT-II</b>	Important Visual Basic controls like Text box, command button, option button, check box, list box, combo box, frame, label and Timer control. Events: mouse, key and focus events. Working with menus, toolbars, status bars. Scope of variables and procedures. Data controls. Creating MDI applications.	<b>(06 Hours)</b>
<b>UNIT-III</b>	Application of Visual Basic for Chemical Engineering: Various calculations and solutions in chemical engineering like calculation of LMTD for co-current and counter current heat exchangers, Design of distillation column, evaporator, dryer, mixed flow reactor etc.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>HTML:</b> Introduction to HTML, components of HTML, structure tags, block level tags, text level tags, horizontal rules, colours in web page. Design parameters. List: ordered, unordered and definition list, generating lists.	<b>(06 Hours)</b>
<b>UNIT-V</b>	Web page designing parameters. Adding graphics/images. Hyperlinks. Tables. Frames. Style sheets. Applying dynamic effects to the page. Working with forms in a web page	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>DHTML:</b>	<b>(06 Hours)</b>

	Introduction to DHTML, DHTML Object Model. Events. Handling text attributes. Dynamically changing style. Dynamically changing content. Dynamically altering the placement of elements	
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### Assignments

1.	Discuss the client-server applications with appropriate example
2.	Discuss web applications with appropriate example
3.	Explain e-commerce applications
4.	Design your own home page using various HTML tags
5.	Design your own blog for technical discussion.
6.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
7.	To create various animations using Timer control.
8.	Design various unit operations used in chemical industry using knowledge of visual basic.
9.	Students have to study any five NPTEL videos related to HTML, DHTML and visual basic and prepare/present power point presentation.
10.	Programs based on above six units.
11.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
12.	Group discussion on the recent advances in HTML, DHTML and visual basic.
13.	Technical interview based on the knowledge of HTML, DHTML and visual basic.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Term Work:

Term work will consist of the programs/practicals listed below, out of which any eight programs/practicals are to be performed in laboratory by the students.

1.	Development of visual basic interface and programs using click events.
2.	Development of visual basic interface and programs using option button.
3.	Development of visual basic interface and programs using list box control.
4.	Development of visual basic interface and programs using various control statements
5.	Development of visual basic interface and programs using various loop statements
6.	Development of visual basic interface and programs using Timer control.
7.	Application of visual basic to various chemical engineering calculations.
8.	To create table and use of table tags in HTML to design a web page.
9.	Web page design as per given output
10.	Design a web page using the image and hyperlink.
11.	Design a web page using ordered list, unordered list and definition list.
12.	HTML code to display given form.

### Text Books/References:

1.	Holzschlag, M. E.; Using HTML – 4, Eastern Economy Publication
2.	Holzner, S. ; HTML Black Book, Dreamtech Press
3.	Thomas Powell; HTML& CSS: The Complete reference, 5 <sup>th</sup> edition,” BPB Publications
4.	Gurewich; Learn VB In 21 Days, San's Publications
5.	Cornell; Visual Basic 6 from the ground, Tata McGraw Hill Publishers
6.	Hollis; Visual Basic 6 : Design, specification & Objects, Longman Publications

7.	Ivan Bayross; Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, Perl CGI, PBP Publications.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,IV
Unit Test -II	UNIT – III,V,VI



## ELECTIVE II BIOFUEL TECHNOLOGY

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Biology

2 | Basics of Chemical Engineering

**TEACHING SCHEME:**

Lectures: 3 Hours/Week

Practical : -

Total : 3 Hours/Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Continuous Assessment: 20 Marks

Total :100 Marks

**CREDITS ALLOTTED:**

Theory : 03

Total credits: 03

**Course Outcomes:**

After completion of the course students would be able to describe

1. How petroleum and bio-based fuels affect the global carbon cycle

2. The attributes of biofuels that make them suitable as a fuel for a specific application

3. Limitations of petroleum fuel and biofuel and importance of biodiesel

4. Global impacts of bioethanol and biobutanol on energy sector

5. Technological advances and challenges to be overcome for biohydrogen production

6. Importance and aspects of manufacturing processes of microbial fuel cells

### Topics covered

<b>UNIT-I</b>	<p><b>Introduction to Biofuels:</b> Biofuels, energy use and efficiency, generations of biofuels, alternative energies, types of biofuels, advantages and disadvantages of different biofuels, economics, and policies.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>Renewable Feedstocks:</b> Feedstocks: Biomass, starch, sugar, lignocellulosic, agro and industrial by-products, pretreatment of feedstock, biomass production for fuel – algal cultures, yeasts (lipid and carbohydrate), sources of oils – edible and non edible</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<p><b>Production of biodiesel:</b>  Chemical, thermodynamic and reaction kinetic aspects of biodiesel production: esterification and transesterification, free fatty acids; saponification; single step and two step biodiesel production, catalysts for biodiesel production – homogeneous (alkali/acidic) and heterogeneous, general procedure of biodiesel production and purification. algal biodiesel production, quality control aspects, methods to improve the biodiesel yield, process flow diagrams</p>	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<p><b>Production of bioethanol and biobutanol:</b> Process technology for ABE using different feedstocks; by-products of biofuel industry as feedstock; selection of micro-organisms and feedstock – ethanol/butanol tolerance; determination of ABE yield; recovery of biofuels, process integration, advances in bioethanol and biobutanol production.</p>	<b>(06 Hours)</b>

<b>UNIT-V</b>	<p><b>Production of Biohydrogen:</b></p> <p>Enzymes involved in H<sub>2</sub> production; photobiological H<sub>2</sub> production: biophotolysis and photo-fermentation; H<sub>2</sub> production by fermentation: biochemical pathway, batch fermentation, factors affecting H<sub>2</sub> production, carbon sources, process and culture parameters; detection and quantification of H<sub>2</sub>, reactors for biohydrogen production. <b>Biogas:</b></p> <p>Use of different feedstock to produce biogas, methods of biogas generation, equipment design to improve the yield, application of biogas as fuel</p>	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<p><b>Microbial Fuel Cells (MFC):</b></p> <p>Biochemical basis; components of MFC fuel cell design, microbial cultures, MFC performance methods: substrate and biomass measurements, basic power calculations, MFC performance, single vs two-chamber designs, Applications of MFC</p>	<b>(06 Hours)</b>

**Text Books/References:**

1.	C.M. Drapcho, N.P. Nhuan, T.H. Walker. Biofuels Engineering Process Technology, Mc Graw Hill Publishers, New York, 2008.
2.	R.M. Jonathan. Biofuels – Methods and Protocols (Methods in Molecular Biology Series), Humana Press, New York, 2009.
3.	L. Olsson (Ed.), Biofuels (Advances in Biochemical Engineering/Biotechnology Series, Springer-Verlag Publishers, Berlin, 2007.
4.	A.N. Glazer, H. Nikaido, Microbial Biotechnology – Fundamentals of Applied Microbiology, 2 Ed., Cambridge University Press, 2007.
5.	R. C. Brown, Biorenewable Resources: Engineering New Products from Agriculture, Wiley-Blackwell Publishing (2003)

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV,V,VI

## ELECTIVE II FOOD TECHNOLOGY

**Designation:** Elective

**Course Pre-requisites:**

Basic knowledge of microbiology and biochemistry

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Lectures	: 3 Hours/Week	End Semester Examination	: 60	Theory	: 03
		Marks			
Seminar	: -	Unit Test	: 20	Seminar	: -
		Marks			
Total	: 3 Hours/Week	Continuous Assessment	: 20	Total credits	: 03
		Marks			
		Total	: 100		
		Marks			

**Course Outcomes:**

After completion of the course students would be able to

1. Evaluate analysis of suitable chemical constitute and their significance in food products.
2. Identify the significance of fluid flow and rheological properties of food; develop the Process and equipment design aspect for food processing.
3. Draw basic flow sheet development for food processing, construction and plant layout.
4. Implement suitable equipment design and their design parameters for canning and retort processing.
5. Chose and apply suitable food preservation technique, give details of preservation, significance and estimate economy of the food preservation.
6. Select and do the packaging of fresh food and processed food, implement newer trends in packaging.

### Topics covered

<b>UNIT-I</b>	<b>Introduction to food technology :</b> Introduction to food technology, different types of food products, Application of Engineering in Food industries. Analysis of chemical constituents in food products, their characterization and significance.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Food Engineering:</b> Principles of mass and energy balance in food processing operations. Transport phenomena with respect to foods. Fluid dynamics, Rheological properties of foods. Process design aspects. Concentration with thermal and membranes processes. Process and equipment design for food processing.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Food Process Engineering:</b> Important aspects of product and process development. Basic flow sheet development for food processing. Other food processing such as Bakery machines and equipment; Food processing plant layout, material of construction, corrosion, waste utilization.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Thermal processing:</b> Canning and retort processing – process design and equipment. Equipment design aspects, dryers and their design parameters. Construction of cold	<b>(06 Hours)</b>

	storages, Types of freezers and their design parameters	
<b>UNIT-V</b>	<b>Principles of food preservation:</b> Aims and objectives of preservation and processing of foods. Preservation by high temperature, Preservation by low temperature, Preservation by water removal. Different preservation technique: chemical preservatives. Controlled and modified atmospheric storage.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Food Packaging Technology:</b> Concept of packaging, Functions of a Food Package, Aseptic Packaging. Packaging as a method for conservation and protection of foods. Different packaging materials and their properties, Environmental friendly food packing material, Food product characteristics and package requirement, Evaluation of quality and safety of packaging materials.	<b>(06 Hours)</b>

**Text Books/References:**

1.	The Fundamentals of Food Engineering, Charm SE, 1963, The Avi Publishing Co.
2.	S. Saclarow and R.C. Griffin. Principles of Food Packaging
3.	RS Kirk and R. Sawyer.1991. Pearson's Chemical Analysis of Foods. 9th Ed. Harlow, UK, Longman Scientific and Technical.
4.	M. Mathlouthi. Food Packaging and Preservation : theory and practice, Springer Science
5.	R.T. Toledo. Fundamentals of Food Process Engineering, 2000, Chapman and Hall.
6.	N.W. Desrosier. The Technology of Food Preservation, 1977, The AVI Publishing Co. Inc.
7.	P.J. Fellows. Food Processing Technology: Principles and Practice, 2005, CBS Publishers.
8.	D.R. Heldman and R.P. Singh. Food Process Engineering, 1984, Chapman and Hall.
9.	J.M. Apple. Plant Layout and Material Handling, 1977, John Wiley & Sons.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

## ELECTIVE-II NANOMATERIALS

**Designation:** Elective

**Course Pre-requisites:**

Students should have knowledge of

1. Chemistry, Physics

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures : 3 Hours/Week

End Semester Examination : 60 Marks

Theory : 03

Unit Test : 20 Marks

Total credits : 03

Continuous Assessment : 20 Marks

Total : 100 Marks

**Course Outcomes:**

After completion of the course students will be able to

1. Define the concept of nanomaterials and Nanotechnology
2. Express various types of nanomaterials and characterization techniques
3. Distinguish between the synthesis techniques for nanomaterials and apply the appropriate synthesis technique.
4. Recognize the properties of nanomaterials and effect on them due to nanoscale.
5. Express the Chemical and Catalytic Aspects of Nanomaterials
6. Recognize the various modes and methods for synthesis of polymer nanocomposite

### Topics covered

<b>UNIT - I</b>	<p><b>Introduction to Nanomaterials</b> Basic definitions: Nanoscience, Nanotechnology, Nanomaterial, Nanostructure, Nanomachine; Historical perspective on nanomaterials, Advantages of nanomaterials, Importance of nanomaterials, Top down and bottom up approaches to manufacture nanomaterials. Applications of Nanomaterials</p> <p><b>Types of nanomaterial/Nanostructures</b> Classification of nanomaterial based on the number of dimensions: 0-D, 1-D, 2-D, and 3-D nanostructures; Quantum dots, Quantum wire, Core/Shell structures, Nanotubes, nanorodes, nanowires, nanofibers.</p>	<b>(06 Hours)</b>
<b>UNIT - II</b>	<p><b>Characterization Techniques:</b> X-ray Diffraction, Scanning Electron Microscopy (SEM), Transmission Electron microscopy (TEM), Optical spectroscopy, Atomic Force Micrograph (AFM), Partical Size Analyzer.</p> <p><b>Synthesis of Nanomaterials:</b> Classification of Nanoparticle Synthesis Techniques, Solid-State Synthesis of Nanoparticles, Vapor-Phase Synthesis of Nanoparticles, Inert Gas Condensation of Nanoparticles, Chemical Vapor Condensation (CVC),</p>	<b>(06 Hours)</b>
<b>UNIT - III</b>	<p><b>Technology of Nanoparticles Synthesis:</b> Plasma-Based Synthesis of Nanoparticles, Flame-Based Synthesis of Nanoparticles, Spray Pyrolysis of Nanoparticles; Solution Processing of Nanoparticles, Sol-Gel Processing, Solution Precipitation, Water–Oil</p>	<b>(06 Hours)</b>

	Microemulsion (Reverse Micelle) Method.	
<b>UNIT - IV</b>	<b>Nanomaterial properties</b> Physical properties of nanostructured materials, Chemical properties, Mechanical properties, Magnetic and structural properties, Optical properties, Thermal properties; Influence of nano structuring on mechanical, optical, electronic, magnetic and chemical properties; Gramsize effects on strength of metals optical properties of quantum dots and quantum wires, carbon nano tubes: magnetic behavior.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Chemical and Catalytic Aspects of Nanomaterials</b> Nanomaterials in catalysis, Importance of surface to volume ratios, nanocrystal shapes and defects as they relate to heterogeneous catalysis, Controlled pore size materials, nanoparticles as chemical reagents; Examples of metal, metal oxide and metal sulfide nanoparticles in catalytic processes	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Polymer Nanocomposites</b> Generalities on polymer composites, From “Micro” to “Nano” composites: Effect of particle dimensions, Nanocomposites preparation pathways: Importance of the interfacial compatibilization, Current scientific and technical advances in polymer nanocomposites	<b>(06 Hours)</b>
<b>Tutorials/Assignments:</b>		
The internal assessment shall consist of minimum SIX assignments from the following list		
1.	Questions involving classification of nanomaterial	
2.	Prepare one assignment considering any one nanomaterial on: Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties	
3.	Conducting surprise MCQ test for students	
4.	Questions involving various techniques employed for nanomaterial characterization	
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments	
6.	Students have to study any five research papers related to specific topic in nanomaterials and prepare/present power point presentation	
7.	Brief report on ‘Environmental, health and ethical concerns that are associated with nanomaterials	
8.	Group discussions on any of the following topics: a) Importance of Nanomaterials in chemical industries. b) Current scientific and technical advances in Nanomaterials c) Methods of synthesis for nanomaterials	
9.	Preparation of a brief report on applicability of nanomaterials in chemical engineering operations	
10.	Conducting open-book class test	
<b>Text Books/ References:</b>		
1.	Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience	
2.	B S Murty, P Shankar, Baldev Raj, B B Rath, James Murday, “Textbook of Nanoscience and Nanotechnology” Universities Press (India) Private Limited	
3.	Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall, 1 <sup>st</sup> Edition	

4.	Yury Gogotsi, "Nanomaterials Handbook", CRC Press, Taylor & Francis Group
5.	Gu`nter Schmid, "Nanoparticles From Theory to Application", Wiley-VCH Verlag GmbH & Co
6.	C. Br´echignac P. Houdy M. Lahmani, "Nanomaterials and Nanochemistry", Springer Berlin Heidelberg New York
7.	Kenneth J. Klabunde, "Nanoscale Materials in Chemistry", John Wiley & Sons, Inc
8.	Alain Nouailhat, "An Introduction to Nanoscience and Nanotechnology", Wiley-ISTE; 1 <sup>st</sup> Edition
<b>Syllabus for Unit Test:</b>	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

<b>Elective I: Polymer Technology</b>		
<b>Designation:</b> Elective		
<b>Course Pre-requisites:</b>		
<b>1.</b>	Basic chemistry, Physical chemistry, Chemical Reaction Engineering, Chemical Engineering Thermodynamics	
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures: 3 Hours/Week	End Semester Examination: 60 marks	Theory : 03
	Continuous Assessment: 40 marks	
<b>Course Outcomes:</b>		
<b>1.</b>	Explain basics of polymers and their classifications	
<b>2.</b>	Explain various polymer properties and the their effect on engineering properties	
<b>3.</b>	Determine suitable process for polymer synthesis and describe its mechanism	
<b>4.</b>	Understand the basics of polymer characterizations and discuss its effect on properties	
<b>5.</b>	Explain the formation of composites and blends in polymers	
<b>6.</b>	Explain the methods of polymer compounding and processing	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction to polymers</b> Introduction, polymer microstructure, homopolymers-heteropolymers, monomers as building block of polymers, historical development, classifications of polymers and polymerization reactions, chain growth and step growth polymerization, mechanism of polymerization, polymer liquids and polymer solids	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Polymer properties</b> Molecular weight of polymers (Mw, Mn, Mv), Molecular weight distribution, determination of molecular weights, polymer morphology, polymer structure – linear, branched and crosslinked, presence of functionality, chemical bonding in polymers, stereoisomerism, effect these factors on chemical, thermal and mechanical properties of polymers	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Synthesis of polymers</b> Polymerization techniques: bulk, solution, suspension, emulsion polymerization with their merits and demerits, kinetics of polymerization; free radical chain polymerization, cationic polymerization, anionic polymerization, polycondensation, co-polymerization and its kinetics, Smith Ewarts kinetics for emulsion polymerization, continuous emulsion polymerization, Ziegler-Natta catalyst	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Polymer structure and effect on properties</b> Chemical and geometrical structure of polymer molecules, microstructure based on chemical structure, microstructure based on geometrical structure, Glass transition temperature, factors influencing glass transition – molecular	<b>(06 Hours)</b>



	weight, plasticisers, copolymer concentration, and their effect on polymer properties; crystallinity, effect of presence of crystallinity on polymer properties	
<b>UNIT-V</b>	<b>Polymer composite and blends</b> Difference between blends and composites, their significance, choice of polymers for blending, blend miscibility-miscible and immiscible blends, thermodynamics, phase morphology, polymer alloys, polymer eutectics, plastic-plastic, rubber-plastic and rubber-rubber blends, FRP, particulate, long and short fibre reinforced composites.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Polymer processing and compounding</b> Polymer compounding-need and significance, different compounding ingredients for rubber and plastics, crosslinking and vulcanization. Methods of processing: Compression molding, transfer molding, injection molding, blow molding, reaction injection molding, extrusion, pultrusion, calendaring, rotational molding, thermoforming, rubber processing in two-roll mill, internal mixer.	<b>(06 Hours)</b>
<b>Assignments:</b>		
1.	Prepare the report on any one polymer comprising its significance, preparation, characterization, processing and properties	
<b>References/Text Books:</b>		
1.	Text book for polymer science; F. W. Billmeyer, Wiley Interscience Publications (John Wiley and Sons)	
2.	Polymer Science, V. R. Gowarikar, N. V. Viswanathan, J. Shreedhar; Wiley Estern Limited	
3.	Principles of Polymerizations; Odion G. G.; Mc-Graw Hill	
4.	Fundamentals of polymer Engineering, Arie Ram, Plenum Press	
5.	Polymer Physics, Michael Rubinstein, Ralph H. Colby, Wiley Interscience Publications (John Wiley and Sons)	
6.	Polymer data handbook, James E. Mark (Ed.), Oxford University Press	
<b>Syllabus for Unit Test:</b>		
Unit Test –I	UNIT – I ,II,III	
Unit Test –II	UNIT – IV,V,VI	

<b>SEPARATION TECHNIQUES</b>		
<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have basic knowledge of		
1	Fundamentals of mass transfer	
2	Fundamentals of heat transfer	
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6Hours/Week	Continuous Assessment: 20 Marks	Total credits: 05
	Term work / practical:50 Marks	
	Total :150 Marks	
<b>Course Outcomes:</b>		
After completion of the course students would be able to		
1.	Apply the basics of distillation for the binary separation of ideal and nonideal mixture and determine the extent of separation obtained.	
2.	Describe the operation of continuous rectification and determine the number of stages required for distillation.	
3.	Determine the number of stages required for separation using liquid-liquid extraction and describe the extractors used industrially.	
4.	Obtain the requirement of solvent in leaching operation and obtain the extent of separation.	
5.	Plot the adsorption isotherms and estimate the amount of adsorption using single and multistage operations.	
6.	Explain the operation and applications of novel separation techniques	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction:</b> Review of various separation techniques, Selection of the technique of separation, pros and cons of various methods. <b>Basics of Distillation:</b> Equilibrium of vapor and liquid, relative volatility, Raoult's law, Ideal and Non-ideal behavior study, Azeotropes, positive and negative deviation from ideality, Methods of distillation - simple, flash distillation, Rayleigh's equation, Graphical and analytical method for determination of the compositions, Introduction to reactive distillation, Azeotropic distillation, Molecular or low pressure distillation, Extractive distillation.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Rectification:</b> Continuous rectification for binary systems, Tray towers, McCabe Thiele's method of calculation of number of trays, Method of Ponchon Savarit, Enthalpy concentration diagrams, Tray efficiencies, Concept of reflux, cold reflux, partial and total cold reflux, Effect of feed temperature and q-line equation derivation, Total reflux, Optimum reflux, Fenske Underwood equation, Condenser and reboilers used in distillation, Use of open steam for	<b>(08 Hours)</b>

	distillation, Rectification of Azeotropic mixtures. Distillation in packed towers: HETP concept, HTU and NTU calculations, Distillation column internals: Type of trays, Type of packing used.	
<b>UNIT-III</b>	<b>Adsorption:</b> Types of adsorption, Nature of adsorbents, Equilibria in adsorption- Single gases and vapors, adsorption hysteresis, Effect of temperature, Heat of adsorption, adsorption of liquids, Langmuir isotherms, Freundlich isotherms, Introduction to pressure swing and temperature swing adsorption, Equipment: Continuous contact, Steady state moving bed absorbers. <b>Ion exchange process:</b> Basic principles and chemical reactions, Techniques and applications, Equilibria and rate of ion exchange, Equipment studies.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Liquid- Liquid Extraction:</b> Introduction, Choice of solvent, Ternary equilibrium, Binodal solubility curve, Single stage extraction, Multistage crosscurrent and countercurrent extraction, extraction calculations using triangular and rectangular coordinates, Solvent free basis calculations, Nxy diagrams, Material balances, Continuous countercurrent extraction with reflux, stage efficiency. Continuous countercurrent extraction in packed columns: HTU and NTU calculations. Types of extractors: Stage type and differential extractors.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Leaching (Solid Liquid Extraction):</b> Introduction: Classification of leaching processes, Factors affecting the leaching process, Solid –liquid equilibria. Methods of calculation: Single stage leaching, multistage cross-current leaching, Continuous countercurrent leaching. Leaching Equipments: Unsteady state and steady state equipment.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Novel separation techniques:</b> Membrane separation techniques- Ultrafiltration, Nano-filtration, Reverse osmosis process, Electro dialysis, Rate based processes such as diffusion coefficient based inert gas generating from air by carbon molecular sieves.	<b>(08 Hours)</b>

### Assignments

1.	Group discussion on the recent advances in mass transfer operations.
2.	Solve previous university question papers with reference to particular topic of this subject.
3.	Seminar presentation on a particular topic specified in the syllabus and submission of report based on it.
4.	Estimation of composition of vapor and liquid in flash distillation
5.	Compute the composition of residue and distillate in simple distillation.
6.	Evaluation of number of stages using McCabe Thiele and Ponchon Savarit method.
7.	HTU and NTU calculation for distillation in packed columns.
8.	Group discussion on equipments used for extraction.
9.	Estimate the number of stages required for single and multistage extraction operation.
10.	Estimate the number of stages required for single and multistage leaching operation.
11.	Group discussion on ion exchange technique and its application.
12.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.

13.	Presentation on novel separation techniques.
14.	Solve old GATE question papers with reference to this subject.
15.	Group discussion on the recent advances in separation techniques.
16.	Write a report on your visit to research and development laboratory of national/international repute.
17.	Technical interview based on the knowledge of separation techniques.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

**Term Work:**

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Simple distillation
2.	Distillation with total reflux
3.	Steam distillation
4.	Equilibrium diagrams for liquid -liquid extraction
5.	Cross current multistage extraction
6.	York Schiebel column for extraction
7.	Bubble cap distillation column
8.	Sieve tray distillation column
9.	Vapour liquid equilibria
10.	Solid liquid extraction of oil
11.	Langmuir and Freundlich adsorption isotherm

**Text Books/References:**

1.	Treybal R. E., "Mass Transfer Operation", McGraw Hill publication.
2.	Coulson J. M. Richardson, "Chemical engineering", Vol, I and II, Pergamon Press.
3.	King C. J., "Separation Techniques", McGraw Hill publication.
4.	Smith B. D., "Design of Equilibrium stage process", McGraw Hill publication.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV, V, VI

## CHEMICAL PROCESS EQUIPMENT DESIGN-I

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

- |   |  |
|---|--|
| 1 | Unit Operations involved in chemical engineering                     |
| 2 | Heat transfer and Mass transfer and Mechanical operation equipments. |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Drawing : 2 Hour /Week	Unit Test: 20 Marks	Drawing: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:25 Marks	
	Total :125 Marks	

**Course Outcomes:**

After completion of the course students would be able to

- |    |  |
|----|--|
| 1. | Apply and understand different codes for equipment design.   |
| 2. | Design different heads used for equipments   |
| 3. | Identify and design different supports used for process equipments.  |
| 4. | Study and design process and mechanical aspect of heat exchangers  |
| 5. | Calculate various stresses acting on vessels   |
| 6. | Design different equipments like cyclone separator, gravity thickener, decanter, fluid –fluid separator, electrostatic precipitator, cooling towers, evaporators, dryers, crystallizers. |

### Topics covered

<b>UNIT-I</b>	<p><b>Introduction to Process Equipment Design:</b> Introduction to various mechanical properties of materials to be used as material of construction, resistance of metals to corrosion under varying conditions of temperature and pressure etc. Theories of failures, application and use of various codes and standards in design. Representation of different utilities and symbols, General design procedure, equipment classification, study of design parameters such as maximum working pressure, design pressure, design temperature, design stress &amp; factor of safety, design of wall thickness &amp; minimum actual thickness, corrosion allowance, design loading, poissions ratio.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>Design of pressure vessels and storage tank:</b> Design of pressure vessels and storage tank: Vessels subjected to internal pressure and combined loading, cylindrical and spherical shell, resultant stresses induced in pressure vessel, stresses in high pressure vessels, optimum vessel size, design of various heads &amp; closures such as flat head, torrispherical head, elliptical head, hemispherical head, and conical head. Design of storage tank, types of storage tank, types of roof for storage tank, types of losses in floating roof tank, estimation of nozzle diameter for drain in storage tank.</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Introduction to various Supports :</b>	<b>(06 Hours)</b>

	Introduction to various Supports, design of various supports such as skirt support, skirt bearing plate, leg support, bracket support, saddle support, design of tall vertical column, anchor bolts, base ring, ring stiffeners, wind girders, flanges & nozzles, detail design of number of bolts & nozzles. Stresses induced in supports like dead weight, wind load, seismic load.	
<b>UNIT-IV</b>	<b>Design of Heat exchangers :</b> Classification of heat exchangers, flow arrangements, types of heat exchanger, LMTD and effectiveness NTU method, Process design of shell and tube heat exchanger - heat transfer coefficient calculations, number of tube calculation, pressure drop calculation on tube side and shell side. Process design of double pipe heat exchanger, types of fouling, fouling resistance in heat exchangers. Mechanical design aspects of heat exchanger. Differential expansion and thermal stresses in heat exchanger. Introduction to fin type, plate type heat exchanger.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Design of Agitators :</b> Design of Agitators: types of agitators, selection criteria, design of blades, power calculation, flow patterns, calculation of bending moment, twisting moment, and combined effect.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Design of some separation equipments :</b> Design of some separation equipment like cyclone separator, gravity thickener, decanter, fluid –fluid separator, electrostatic precipitator, evaporators.	<b>(06 Hours)</b>

### Assignments

1.	Write a report on different codes and symbols used in design.
2.	Solve old (last five years) question papers with reference to particular topic.
3.	Prepare a model for any of the equipment
4.	Prepare a report on advance equipments which are newly introduced in the current year.
5.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
6.	Prepare model for different roofs used in storage vessels.
7.	Prepare a chart for different construction of materials in equipment design.
8.	Prepare a presentations on newly introduced equipments in current year
9.	Design laboratory manuals better than existing ones with clearly shown specimen calculations.
10.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in designing a economic plant layout for any industry.
11.	Write a technical report on your visit to a process industry.
12.	Solve old (last ten years) GATE question papers with reference to design subject.
13.	Group discussion on the recent advances in equipment design
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of design

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Term Work:

Term work will consist of the Practicals and drawings listed below, out of which any eight are to be done by students. Any one drawing in Autocad.

1.	Detailed design and drawing of enclosures and supports
2.	Design of pressure vessels.
3.	Calculation of heat transfer coefficient, No of tubes and rate of heat flow in shell and tube heat exchanger
4	Calculate pressure drop for tube and shell side heat exchanger.
5.	Detailed design and drawing of agitated vessel.
6.	Detailed design and drawing of cyclone separator.
7.	Detailed design and drawing of cooling towers
8.	Detailed design and drawing of crystallizer
9.	Detailed design and drawing of gravity thickener.
10.	Design of storage tanks.
11.	Design of Supports.
12	Calculation of heat transfer coefficient,rate of heat flow and effectiveness in Double pipe heat exchanger.
13	Calculation of heat transfer coefficient,rate of heat flow and effectiveness in fin type heat exchanger.

**Text Books/References:**

1.	Joshi. M.V, and Mahajani. V.V, "Process Equipment Design," 3rd Edn. Macmillan India Limited, New Delhi, 1996
2.	Bownell, L.E., and Young, E.M., " <i>Process Equipment Design</i> ", Wiley Eastern, 1968.
3.	Sinnott. R.K, Coulson & Richardson's, "Chemical Engineering", Volume 6, 3rd Edn., Butterworth Heinemann, New Delhi, 1999.
4.	Bhattacharya B C, Chemical Equipment Design , CBS publishers.
5.	Dawande S D, " Process Equipment Design" DENETT publishers

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>CHEMICAL REACTION ENGINEERING-II</b>		
<b>Designation:</b> Professional Core		
<b>Course Pre-requisites:</b>		
Students should have basic knowledge of		
1	Chemical reaction engineering-I	
2	Stoichiometry	
3.	Mass transfer	
<b>TEACHING SCHEME:</b>		
<b>EXAMINATION SCHEME:</b>		
<b>CREDITS ALLOTTED:</b>		
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / Oral :50 Marks	
	Total :150 Marks	
<b>Course Outcomes:</b>		
After completion of the course students would be able to		
1.	a) Write the overall rate equation for heterogeneous reactions. b) Study kinetics and design of fluid solid non catalytic reactions.	
2.	Define the mechanism of catalytic reactions.	
3.	Calculate the height of fluid fluid non catalytic reactions.	
4.	Learn the kinetics and design of solid catalyzed reactions.	
5.	Learn the diffusion and reaction kinetics for porous catalyst.	
6.	Develop the kinetics of nonideal flow.	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction to heterogeneous reaction systems:</b> <b>Fluid-solid non catalytic reactions:</b> Types of heterogeneous reactions. Steps involved in developing overall rate equation. Linearizing a nonlinear rate equation and contacting patterns for heterogeneous reaction systems. Proposed models i.e. progressive conversion model and unreacted core model. Steps/resistance involved in these models. Individual and overall/global rate equation. Determination of rate controlling step. Application to design of fluid solid reactor by identifying the type of flow of phases.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Fluid-fluid non catalytic reactions:</b> Kinetic regimes for mass transfer and reaction. Rate equation for different cases/regimes. Clues to kinetic regimes using different methods. Application to design of packed bed reactor.	<b>(06Hours)</b>
<b>UNIT-III</b>	<b>Catalysis ( fluid-solid catalytic reactions):</b> The nature of catalytic reactions. The mechanism of catalytic reactions. Steps involved in catalytic reactions. Types of adsorption, Langmuir adsorption isotherm. Synthesizing a rate law rate limiting step, preparation of catalyst and its deactivation, poisoning and regeneration. Nature and mechanism of catalyst reactions.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Solid catalyzed reactions:</b>	<b>(06Hours)</b>



	Introduction, Rate equation, Film resistance controlling, surface flow controlling, Pore diffusion controlling, Experimental methods for finding rates, construction, operation and design of Catalytic reactors : Fixed bed reactor, Fluidized bed reactor.	
<b>UNIT-V</b>	<b>Diffusion and reaction in porous catalysts:</b> Diffusion and reaction in spherical catalyst pellets. Internal effectiveness factor. Overall effectiveness factor. Estimation of diffusion- and reaction-limited regimes. Mass transfer and reaction in a packed-bed. Chemical vapor decomposition (CVD) reactors.	<b>(06Hours)</b>
<b>UNIT-VI</b>	<b>Basics of Non-ideal Flow:</b> The Residence Time Distribution Functions and their Relationships Role of RTD in determining reactor behavior Experimental methods for finding E, the pulse experiment, the step experiment, relationship between E, F & C curve. Introduction to Dispersion Model, Tank in series model.	<b>(06Hours)</b>

### Assignments

1.	List different types of heterogeneous reactions in chemical industry.
2.	Write a report on “ Importance of heterogeneous reactions in Chemical Industry”
3.	Select any five industrial heterogeneous reactions and write rate equations for the reactions.
4.	Give power point presentation on models for heterogeneous reactions.
5.	Design a reactor for fluid solid non catalytic reactions.
6.	Do the experiments on Reactor lab software.
7.	Give power point presentation on different types of adsorption isotherms.
8.	Solve any five old question papers.
9.	Solve ten problems on kinetics and design of fluid fluid non catalytic reactions.
10.	List out different types of industrial catalyst with characteristics.
11.	Draw different types of contacting patterns for heterogeneous reactions used in industry.
12.	Give a presentation on any reactor used for heterogeneous reactions in industry
13.	Write a report on research (review) paper on reactors used for heterogeneous reactions.
14.	Industrial visit to a chemical industry.
15.	Write a report on industrial visit. Give emphasis on details of reactor.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

### Term Work:

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	To study residence time distribution in packed bed reactor.
2.	To study residence time distribution in plug flow reactor.
3.	To study residence time distribution in continuous stirred tank reactor.
4.	To study CSTR PFR in series.
5.	To study CSTR in series.
6.	Determination Surface area of catalysts.
7.	Determination of bulk density, apparent density, and true density of catalyst.
8.	Determination Pore volume of catalysts.

<b>Text Books/References:</b>	
1.	Levenspiel Octave. "Chemical Reaction Engineering," Wiley Eastern Publications
2.	Smith J.M. "Chemical Engineering Kinetics," McGraw-Hill Publications
3.	Fogler H.S. "Elements of Chemical Reaction Engineering," Eastern Economy Publications
4.	Carberry & Verma "Chemical and Catalytic Reaction Engineering"
5.	H. Scott Fogler "Elements of Chemical Reaction Engineering"
6.	Doraiswamy L.K. and Sharma M.M. "Heterogeneous Reactions: Analysis Examples and reactor design." Vol.1 & 2.
7.	C.G. Hill. "An Introduction to Chemical Reaction Kinetics & Reactor Design."
8.	Dawande, "Principles of Reaction Engineering." Denett publications
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## PROCESS INSTRUMENTATION AND INSTRUMENTAL METHODS OF ANALYSIS

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have

Basic knowledge of Mathematics.

**TEACHING SCHEME:**

Lectures: 3 Hour/Week

Tutorial : 2 Hour /Week

Total: 5 Hour /Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Continuous Assessment: 20 Marks

TW/Practical: 25 marks

Total : 125 Marks

**CREDITS ALLOTTED:**

Theory : 03

Practical : 01

Total credits: 04

**Course Outcomes:**

After completion of the course students will be able to

1. To explain the need of process instrumentation and process control in chemical industries.
2. To describe various chemical analysis instruments.
3. To explain conductometry, turbidimetry and refractometry.
4. To describe chromatography methods.
5. To develop an ability to use theorems to compute the Laplace transform, inverse Laplace transforms. To calculate the transfer functions for first order and second order systems.
6. To explain various control action for first order and second order system.

**Topics covered**

<b>UNIT-I</b>	<p><b>Introduction:</b> Basic Concepts and characteristics of measurement system, various elements of instrument, performance characteristics.</p> <p><b>Temperature measurement:</b> Introduction, methods of temperature measurement by expansion thermometers, filled system thermometers, electrical temperature instruments, pyrometers. Calibration of Thermometers</p> <p><b>Level measurement:</b> Displacers, ultrasonic, microwaves, laser light.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>Introduction to instrumental methods of analysis:</b> General Introduction, classification of instrumental methods, spectroscopy, properties of electromagnetic radiation, <b>pH metry, Karl Fischer Titration.</b></p> <p><b>Visible Spectrophotometry &amp; Colorimetry:</b> Deviation from Beer's law, instrumentation applications. Molar compositions of complexes, examples.</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<p><b>Conductometry:</b> Introduction, laws, conductance, measurements, types of conductometric titrations, applications, advantages and disadvantages.</p> <p><b>Nephelometry and Turbidimetry:</b> Introduction, theory, comparison with spectrophotometry, instrumentation, applications.</p> <p><b>Refractometry:</b> Introduction, Abbe refractometer, instrumentation, applications.</p>	<b>(06 Hours)</b>

<b>UNIT-IV</b>	<p><b>Chromatography:</b> Introduction, types, theoretical principles, theories of chromatography, development of chromatography, qualitative and quantitative analysis, applications and numerical.</p> <p><b>Gas Chromatography:</b> Introduction, principles of gas chromatography, gas liquid chromatography, instrumentation, evaluation, retention volume, resolution. Branches of gas chromatography, applications and numerical.</p> <p><b>High Performance (Pressure) Liquid Chromatography:</b> Introduction, principles, instrumentation, apparatus &amp; materials, column efficiency and selectivity, applications.</p> <p><b>GC-MS, LC-MS.</b></p>	<b>(06 Hours)</b>
<b>UNIT-V</b>	<p><b>Process dynamics:</b> Introduction, tools of dynamics analysis, ideal forcing function, input output model, transfer function models, proportion of transfer function, poles &amp; zeros of transfer function with qualitative response, dynamic behavior of pure integrator, pure gain, first order &amp; second order systems (with or without dead time), physical example of these systems.</p>	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<p><b>Introduction to feedback control:</b> Final Control Elements - Valve characteristics. Instrumentation symbols. Introduction to Process Flow Diagram (PFD) and Piping &amp; Instrumentation Diagram (P&amp;ID).</p> <p><b>Control theory basics:</b> The control loops, process control terms, components of control loops, basic control action i.e. on-off, P, I, D, PI, PD, PID for 1st order process control loops and 2nd order response.</p>	<b>(06 Hours)</b>

#### List of Experiments:

Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.

1.	To Study the characteristics of On-Off Controller.
2.	Calibration of Bimetallic thermometer.
3.	Gas Chromatography.
4.	High Performance Liquid Chromatography.
5.	UV Spectrophotometer.
6.	Dynamic behavior of non interacting system.
7.	Dynamic behavior of interacting system.
8.	Mercury Thermometer With well and Without Well.
9.	Conductivity meter.
10.	PH meter analysis.
11.	Manometer Tuning.
12.	To Study the Thermocouple.
13.	Calibration of RTD.

#### Assignments:

1.	Students have to visit chemical industry and prepare a detailed report on various instruments used for process variable measurement.
2.	Students have to visit chemical industry and prepare a detailed report on various instruments used

	for chemical analysis.
3.	Watch NPTEL video and make report on various instruments used for process variable measurement.
4.	Presentation on instruments used for process variable measurement.
5.	Group discussions on instruments used for process variable measurement.
6.	To find Transfer Function for 1 <sup>st</sup> order and 2 <sup>nd</sup> order Instrument or process.
7.	Draw the Control Loop for HE for different process variable control.
8.	Draw the Control Loop for Batch Reactor for different process variable control.
9.	Draw the Control Loop for CSTR for different process variable control.

**Text Books/References:**

1	S.K.Singh, "Industrial Instrumentation & Control", Tata McGraw Hill publishing company ltd, New Delhi, 2000
2	D. Pastranabis, "Principals of industrial instrumentation", 2nd edition, Tata McGraw 4 Hill publishing company ltd, New Delhi, 2003
3	Eckman D.P. "Industrial Instrumentation", Willey Eastern Ltd, New Delhi, 1984.
4	A.C. Shrivastav "Techniques in Instrumentation", New Delhi, 1984.
5	W.Boltan, "Instrumentation and Process Measurement", Orient Longman Ltd, Hyderabad, 1st Edition, 1993.
6	Willard H.H, "Instrumental methods of analysis", 6th Edition, CBS Publication New Delhi 1986
7	Galen W. Ewing, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw Hill Book Company, Singapore, 1990
8	D. A. Skoog, "Principal of Instrumental Analysis", Southern Collage Publication, Japan 1984
9	G. R. Chatwal, S.K. Anand, "Instrumental method of chemical analysis", 5th Edition, Himalaya Publishing House, Mumbai 2002.
10	Ray Choudhuri and Ray Choudhuri "Process Instrumentation, Dynamics and control for Engineers", 1st Edition, Asian Books Pvt Ltd, New Delhi, 2003.
11	B.G. Liptak, "Instrument Engineers Handbook" , 4 <sup>th</sup> Edition , CRC Press, 2005.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

## COMPUTER PROGRAMMING FOR CHEMICAL ENGINEERING - II

**Designation:** Computing

**Course Pre-requisites:**

Students should have basic knowledge of

- |   |   |
|---|---|
| 1 | Computer fundamentals                           |
| 2 | Computer Programming for Chemical Engineering-I |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical : 2 Hour /Week	Term work / practical : 50 Marks	Practical : 01
		Total credits : 01

**Course Outcomes:**

After completion of the course students will be able to

- |    |  |
|----|--|
| 1. | Apply the knowledge of constant, variables, data types and various standard input output functions to write C-programs.                            |
| 2. | Prepare a flow chart and write C-programs using control constructs and looping statements.   |
| 3. | Explain the concept of single dimensional and multidimensional arrays and write C-programs for single dimensional arrays, multidimensional arrays. |
| 4. | Write C-programs using string.   |
| 5. | Explain the concept of pointer and write C-programs using pointers.  |
| 6. | Apply the knowledge of C-programming language, CHEMCAD, MATLAB for chemical engineering calculations.  |

**Term Work:**

Term work will consist of the programs/practicals listed below, out of which any eight programs/practicals are to be performed in laboratory by the students.

- |   |   |
|---|---|
| ➤ | <p><b>C-Programming Language:</b> Introduction, Character sets, constant, variables and <u>Data Types</u>: integer, float, double, char, string. <u>Operators</u>: arithmetic, relational, logical, increment and decrement, assignment, conditional. Standard input-output functions: printf ( ), scanf ( ), getch ( ) or getchar( ).</p> <p>1. Programs based on standard input-output functions used in C-Programming.</p> |
| ➤ | <p><u>Control statements</u>: programs using if statement, if-else statement, goto statement and switch-case statement.</p> <p>2. Programs based on if-else statements.<br/>3. Programs based on goto statements.<br/>4. Programs based on switch-case statements.</p>  |
| ➤ | <p><u>Loop statements</u>: programs using while loop, do-while loop and for loop.</p> <p>5. Programs based on while loop.<br/>6. Programs based on do-while loop.<br/>7. Programs based on for loop.<br/>8. Programs to solve chemical engineering problems.</p>  |
| ➤ | <p><u>Arrays</u>: single dimensional and multi-dimensional arrays.</p>  |

	9. Programs based on single dimensional arrays. 10. Programs based on multi-dimensional arrays.
➤	<u>String:</u> programs using string. String functions: strlen( )/ strcpy( )/ strrev( )/ strcat ( )/strlwr ( )/strupr ( )/ strcmp ( ).  11. Programs based on strings and string functions. 12. Programs based on string functions.
➤	<u>Pointers:</u> programs using pointers. Use of * and & operators. Pointer arithmetic's. Use of pointers <u>Pointer and function:</u> parameter passing to function by reference and by value. File handling, Linked list  13. Programs based on pointers and function
➤	<u>Application of C-programming language, CHEMCAD and MATLAB for Chemical Engineering:</u> various calculations and solutions in Chemical Engineering.  Term work includes programs based on following unit operations 13. Design of co-current and counter current heat exchanger 14. Design of Distillation column 15. Design of Mixed Flow Reactor 16. Design of Evaporator etc.
In addition to these above stated programs / practicals concern faculty member may design his/her own programs / practicals.	
<b>Text Books/References:</b>	
1.	Kanetkar, Y.C.; Let Us C, 4 <sup>th</sup> revised edition, BPB Publications
2.	Cooper, M.; The Spirit of 'C' – An introduction to modern programming, Jaico Publisher
3.	Rajaraman, V.; Fundamentals of Computers, Prentice Hall of India
4.	Balagurusamy, E.; Programming in ANSY C, 2 <sup>nd</sup> Edition, McGraw Hill Publication
5.	Sanders, D. H.; Computers Today, McGraw Hill Publications

**Bharati Vidyapeeth University**  
**College of Engineering**  
**Department of Chemical Engineering**  
**CBCS Structure: 2014- 2015**  
**Sem VII and Sem VIII**



**Bharati Vidyapeeth University**  
**Faculty of Engineering and Technology**  
**Programme: B. Tech. (Chemical) - Semester VII - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
1	Elective-III	3	2	-	60	20	10	10	50	-	150	3	1	4
2	Chemical Process Equipment Design- II	3	2	-	60	20	10	10	50	-	150	3	1	4
3	Plant Utilities and Process Safety	3	-	-	60	20	10	10	-	-	100	3	-	3
4	Process Dynamics and Control	3	2	-	60	20	10	10	-	50	150	3	1	4
5	Multiphase Reaction Engineering	3	-	-	60	20	10	10	-	-	100	3	-	3
6	Industrial Training	-	-	-	-	-	-	-	50	-	50	-	3	3
7	Project [Stage I]	-	4	-	-	-	-	-	100	-	100	-	4	4
<b>Total</b>		<b>15</b>	<b>10</b>	<b>-</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>250</b>	<b>50</b>	<b>800</b>	<b>15</b>	<b>10</b>	<b>25</b>

**Bharati Vidyapeeth University**  
**Faculty of Engineering and Technology**  
**Programme: B. Tech. (Chemical) - Semester VIII - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hours/week)			Examination Scheme (Marks)							Credit		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW/O	TW/P	Total	Theory	P/D	Total
						Unit Test	Attendance	Assignments						
8	Elective-IV	3	2	-	60	20	10	10	50	-	150	3	1	4
9	Plant Design, Project Engineering and Costing	3	2	-	60	20	10	10	50	-	150	3	1	4
10	Industrial Management	3	-	-	60	20	10	10	-	-	100	3	-	3
11	Chemical Process Modeling and Simulation	3	2	-	60	20	10	10	-	50	150	3	1	4
12	Seminar	-	-	2	-	-	-	-	50	-	50	2	-	2
13	Project [Stage II]	-	6	-	-	-	-	-	200	-	200	-	8	8
<b>Total</b>		<b>15</b>	<b>6</b>	<b>8</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>350</b>	<b>50</b>	<b>800</b>	14	11	25

Total Credits

Semester VII : 25

Semester VIII : 25

**Grand Total : 50**

<b>Elective-I</b>	<b>Elective-II</b>
<ol style="list-style-type: none"> <li>1. Combustion Engineering</li> <li>2. Advanced Material Science</li> <li>3. Multiphase Flow</li> <li>4. Rheology</li> </ol>	<ol style="list-style-type: none"> <li>1. Biofuel Technology</li> <li>2. Polymer Technology</li> <li>3. Food Technology</li> <li>4. Nanomaterials</li> </ol>
<b>Elective-III</b>	<b>Elective-VI</b>
<ol style="list-style-type: none"> <li>1. Petroleum Refinery Engineering</li> <li>2. Membrane Separation</li> <li>3. Fuel Cell Technology</li> <li>4. Advanced Oxidation Processes</li> </ol>	<ol style="list-style-type: none"> <li>1. Hazardous Waste Management</li> <li>2. Bio-separations</li> <li>3. Energy Engineering</li> <li>4. Green Technology</li> </ol>

**Bharati Vidyapeeth University**  
**College of Engineering**  
**Department of Chemical Engineering**  
**CBCS Syllabus: 2014-2015**  
**Sem VII and Sem VIII**

## CHEMICAL PROCESS EQUIPMENT DESIGN-II

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

- |   |  |
|---|--|
| 1 | Unit Operations involved in chemical engineering                     |
| 2 | Heat transfer and Mass transfer and Mechanical operation equipments. |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Drawing : 2 Hour /Week	Unit Test: 20 Marks	Drawing: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:50 Marks	
	Total :150 Marks	

**Course Outcomes:**

After completion of the course, students would be able to

- |    |   |
|----|---|
| 1. | Design evaporator and crystallizers.                            |
| 2. | Design Dryers and Filters.                                      |
| 3. | Design different columns used in distillation/Absorption.       |
| 4. | Identify and design different packings used in packed columns.  |
| 5. | Calculate height of packing, column diameter in packed columns. |
| 6. | Understand importance of process safety and Hazard Analysis.    |

### Topics covered

<b>UNIT-I</b>	<p><b>Evaporators &amp; Crystallizers</b></p> <p>Classification of vaporizing equipment, evaporators such as kettle, thermosiphon, vertical, horizontal etc., Chemical evaporators, natural circulation &amp; forced circulation evaporators, the calculation of chemical evaporators, crystallizers, types of crystallizers, design considerations. Case studies on evaporators.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>Filters &amp; Dryers:</b></p>	<b>(06 Hours)</b>

	Various types of filters like vacuum filters, pressure filters, centrifuges and rotary drum filters, design of rotary drum filters, including design of drum, shaft, bearing and drive system. Types of dryers, batch type dryers, continuous dryers.	
<b>UNIT-III</b>	<b>Tray Column Design</b> Design of plate column- distillation columns, design variables in distillation, design methods for binary systems, plate efficiency, approximate column sizing, plate Contactors, plate hydraulic design.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Packed Column Design</b> Choices of packing, types of packing, packed bed height (distillation and absorption), HETP, HTU, NTU, Cornell's method, Onda's method, column diameter, column internals, column auxiliaries.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Piping Design I</b> Definition and Application of Piping, Classification of pipe, Piping Material Specifications, Manufacturing Method, Weight and Size Standards STD , Extra Strong XS , Double Extra Strong XXS etc. Pressure Temperature Rating System, Pipe Fittings, Types of Flanges, Types of Valves,	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Piping Design II</b> Codes and Standards, Piping elements, Pipe Hydraulics and Sizing, Mechanical Design, Fundamentals Piping Drawing, Basics Development of Plot Plan, Equipment and Piping Layout, Stress Analysis Static and Dynamic, Selection and Design of Supports and Expansion Joints, Transient Fluid flow Analysis. Friction Factor, Moody Diagram, Minor Losses in Piping ,Equivalent Length Method & Loss Coefficient Method,	<b>(06 Hours)</b>

**Assignments**

1.	Write a report on different evaporators and crystallizer
2.	Types of Dryers and filters.
3.	Designing of Distillation column.
4.	Designing of Absorption column.
5.	Importance of piping design.

6.	Pipe sizing and supports
7.	Report on Equivalent Length Method & Loss Coefficient Method,
8.	Solve old (last five years) question papers with reference to particular topic.
9.	Prepare a model for any of the equipment
10.	Prepare a report on advance equipments which are newly introduced in the current year.
11.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
12.	Solve old (last ten years) GATE question papers with reference to design subject.
13.	Group discussion on the recent advances in equipment design
14.	Write a report on your visit to research and development laboratory of national/international repute.
15.	Technical interview based on the knowledge of design

In addition to these above stated assignments concerned faculty member may design his/her own assignments

**Term Work:**

Term work will consist of the Practicals and drawings listed below, out of which any eight are to be done by students. Any one drawing in Autocad.

1.	Design and drawing of evaporator.
2.	Design and drawing of crystallizer.
3.	Design and drawing of rotary filter.
4.	Detailed design and drawing of piping layout.
5.	Detailed design and drawing of spray dryer..
6.	Detailed design and drawing of distillation column.
7.	Detailed design and drawing of absorption column..
8.	Study various packings.
9.	Design and calculations of packed column.
10.	Study the contains of stress analysis of pipes.
11.	Detailed design and drawing of piping supports.

**Text Books/References:**

1.	Joshi. M.V, and Mahajani. V.V, "Process Equipment Design," 3rd Edn. Macmillan India Limited, New Delhi, 1996
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2.	Bownell, L.E., and Young, E.M., “ <i>Process Equipment Design</i> ”, Wiley Eastern, 1968.
3.	Sinnott. R.K, Coulson & Richardson's, “Chemical Engineering”, Volume 6, 3rd Edn., Butterworth Heinemann, New Delhi, 1999.
4.	Bhattacharya B C, Chemical Equipment Design , CBS publishers.
5.	Dawande S D, “ Process Equipment Design” DENETT publishers

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<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI



<b>MULTIPHASE REACTION ENGINEERING</b>		
Designation: Professional Core		
Course Pre-requisites:		
Students should have basic knowledge of		
1	Thermodynamics	
2	Transport Processes	
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
	Unit Test : 20 Marks	Practical: 01
	Continuous Assessment : 20 Marks	Total credits: 04
	Total :100 Marks	
<b>Course Outcomes:</b>		
After completion of the course students would be able to		
1	Recognize the importance of multiphase reactors.	
2	Determine chemical reaction equilibrium constant and rate controlling step for heterogeneous system.	
3	Recognize the effect of system and operating parameters on the hydrodynamics of multiphase reactors.	
4	Recognize the significance of mixing and determine extent of mixing in multiphase system	
5	Determine the effect of system, geometric, and operating parameters on heat and mass transfer coefficients.	
6	Enumerate the effect of hold up in the design of multiphase reactors	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction to Multiphase Reactor Engineering</b> Types, Classification, Application of Industrial Importance. Two case studies	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Thermodynamics and kinetics</b> Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Hydrodynamic Characteristics</b> Hydrodynamic characteristics of different multiphase reactors: Mechanically	<b>(06 Hours)</b>

	Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions	
<b>UNIT-IV</b>	<b>Mixing Studies</b> Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Heat Transfer and Mass Transfer Studies</b> Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Design Aspects of Multiphase Reactors</b> Pressure drop, Fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	<b>(06 Hours)</b>

**Assignments:**

1.	Enumerate any one industrial relevant multiphase system
2.	Refer any one recently published article related to multiphase system and make presentation
3.	Estimate the power requirement for a given impeller
4.	Visit to any chemical process industry to study atleast one multiphase system
5.	List the pressure measurement tools available in the market
6.	List and enumerate physical significance of the empirical correlations available in the literature to estimate liquid dispersion coefficient.
7.	List and enumerate physical significance the empirical correlations available in the literature to estimate mass transfer coefficient.
8.	Refer any review article perati
9.	Technical interview based on the knowledge of analytical techniques.
10.	List out all the principles of the analytical techniques.
11.	Perform any one chromatographic technique.
12.	Find out different types of proteins with structure.
13.	Prepare a report on downstream processing.

In addition to these above stated assignments concerned faculty member may design his/her own

assignments.

**Text Books/References:**

1	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 <sup>nd</sup> Edition, Volume I and II.
2	G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 <sup>th</sup> Edition, Academic Press, London, 1994
3	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000
4	DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 <sup>nd</sup> Edition, Butterworth Heinemann, 1991.
5	J. F. Devidson and Harrison, "Fluidization", 10 <sup>th</sup> Edition, Academic Press, London, 1994

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## PLANT UTILITIES AND PROCESS SAFETY

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have knowledge of

1. Chemical Technology, Chemical Process Industries

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
	Unit Test : 20 Marks	Total credits : 03
	Continuous Assessment : 20 Marks	
	Total : 100 Marks	

**Course Outcomes:**

After completion of the course students will be able to

1. Identify the common utilities required for Chemical Plant.
2. Express various types of boilers and their selection.
3. Analyze the importance of insulation and air pressure in process.
4. Identify and analyze the hazards.
5. Integrate the theoretical and practice knowledge to understand hazards activities.
6. Implement the safety designs and procedures.

### Topics covered

<b>UNIT - I</b>	<p><b>Identification of common plant utilities</b></p> <p>Role and importance of plant utilities in chemical plants, Water, compressed air, steam, vacuum, refrigeration, venting, flaring and pollution abating. Water and its quality, storage and distribution for cooling and fire fighting, Water resource management.</p>	<b>(06 Hours)</b>
<b>UNIT - II</b>	<p><b>Steam Generation and Utilization</b></p> <p>Steam generation and its application in chemical process plants, distribution and utilization; Types of boilers and their operation; steam economy, Steam condensers and condensate utilization, Steam generation by utilizing process waste heat using thermic fluids, Selection and sizing of boilers; waste heat</p>	<b>(06 Hours)</b>

	boilers.	
<b>UNIT - III</b>	<p><b>Compressors, blowers and Vacuum Pumps</b></p> <p>Compressors, blowers and vacuum pumps and their performance characteristics; Methods of developing vacuum and their limitations, material handling under vacuum, Creation of low pressure/vacuum by pumps and ejectors.</p> <p><b>Refrigeration and HVAC</b></p> <p>fundamentals of refrigeration, refrigerant management and safety, Selection of refrigerants; Processes of HVAC, Psychometric Chart and Air-Conditioning System, Ventilation and Indoor Air Quality.</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Elements of Safety</b></p> <p>Elements of safety, safety and site selection; Plant layout and unit plot planning; Definition of risk and hazard, Identification and assessment of the hazards, distinction between hazards and risk, Industrial hygiene, toxicological studies, Hazard operability (HAZOP) hazard analysis (HAZAN); Safety Integrity Level (SIL) Studies; Technology selection and transfer, choosing the right process.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Safety in Chemical Processes</b></p> <p>Introduction, Chemical Process classification, Process design and safety parameters. Safety parameters in the process design of phenol from cumene, safety in polyvinyl chloride plant.</p> <p><b>Chemicals and their Hazards</b></p> <p>Acetonitrile, acetyl chloride, butyl amine, acrylamide, acrylonitrile, allyl alcohol, benzene, bromine, isopropyl alcohol, acetaldehyde, ethylene oxide, butane, n-hexane, anhydrous ammonia, acetone, toluene, p-xylene, acetic acid, monochloro benzene, oleum, carbon monoxide.</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Safety Procedures and Designs</b></p> <p>Process Safety Hierarchy, Process Safety Strategies, Managing Safety, Safety Reviews and Accident Investigations, Designs for Process Safety, Inherently Safer Designs, Controls: Double Block and Bleed, Safeguards or Redundancy, Block Valves, Explosion Suppression, Designs for Runaway Reactions.</p>	<b>(06 Hours)</b>

<b>Tutorials/Assignments:</b>	
The internal assessment shall consist of minimum SIX assignments from the following list	
1.	Prepare a report on safety issues of any one particular industry.
2.	Prepare Utility Line Diagram (ULD) for typical process.
3.	Write a report on HAZOP study of one particular hazard.
4.	Prepare a report on the color codes for utility pipelines in chemical plants.
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments
6.	Write a report on “ Importance of Industrial Hygiene in Chemical Industry”
7.	Group discussions on any of the following topics: <ul style="list-style-type: none"> <li>a) Importance of various utilities in chemical industries.</li> <li>b) Process safety in petroleum industry</li> <li>c) HAZOP Vs HAZAN</li> </ul>
8.	Design a manual for application of utilities for various plants.
9.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
10.	Write a technical report on HAZAN study of any one particular threat.
11.	Elaborate the role of safety engineer in Chemical industry.
12.	Organizing a industrial visit to nearby industry to understand the plant utilities and safety measures.
13.	Write a report on your visit to research and development laboratory of national/international repute.
<b>Text Books/ References:</b>	
1.	Chemical Process Plants-Managing Plant Utilities, Volume One
2.	Chemical Process Plants-Managing Plant Utilities, Volume Two
3.	Robert McDowall, “Fundamentals of HVAC Systems”, Butterworth-Heinemann Elsevier, First edition 2006
4.	John J. McKetta, “Encyclopedia of Chemical Processing and Design“, Volume 44 CRC Press, 1993

5.	Daniel A. Crowl, Joseph F. Louvar, "Chemical Process Safety Fundamentals with Applications", Prentice Hall, Third Edition, 2011
6.	Trevor A. Kletz, "Hazop & Hazan: Identifying and Assessing Process Industry Hazards", Fourth Edition, CRC Press, 1999.
<b>Syllabus for Unit Test:</b>	
Unit Test - I	UNIT– I, II, and III
Unit Test - II	UNIT– IV, V, and VI

## PROCESS DYNAMICS AND CONTROL

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have

1. Basic knowledge of Mathematics.
2. Process Instrumentation and Instrumental Methods of Analysis

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Tutorial : 2 Hour /Week	Unit Test: 20 Marks	Practical : 01
Total: 5 Hour /Week	Continuous Assessment: 20 Marks	Total credits: 04
	TW/Practical: 50 marks	
	Total : 150 Marks	

**Course Outcomes:**

After completion of the course students will be able to

1. To give details of basic control action and develop mathematical models for control purpose.
2. To illustrate behavior of chemical processes.
3. To elucidate transient response of system.
4. To describe stability of the system.
5. To analyze frequency response of process.
6. To apply knowledge for controller selection and tuning.

### Topics covered

<b>UNIT-I</b>	<p><b>Introduction:</b> Block diagrams, closed loop and open loop control systems, Basic control actions.</p> <p><b>Open Loop Response of Simple Systems:</b> Dynamics of first order systems using transfer functions; Various first order responses such as, a thermometer bulb. General response to step, ramp, impulse, and sinusoidal inputs; Concentration and temperature responses of a stirred tank</p>	<b>(06 Hours)</b>
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<b>UNIT-II</b>	<b>Dynamic Behavior of Chemical Processes:</b> Linearization of liquid level systems: Response of a pressure system, second order systems, the manometer; Response of interacting and non interacting systems. Transfer functions and the input-output models. Dynamics and analysis of first, second and higher order systems.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Transient Response of Control Systems:</b> Servo and regulated operation, General equations for the transient response, proportional control of a signal capacity process; Integral control, Proportional-integral control and derivative action.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Stability:</b> Concept of stability, Stability criterion, Routh test for stability. <b>Root Locus Analysis:</b> Concept of root locus, Locus diagram.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Frequency Response Analysis:</b> First order systems, Bode diagram, and Complex numbers to get frequency response. Nyquist plot.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Advanced Control Schemes:</b> Controller selection and tuning, Control valve characteristics and sizing, cascade control, Feed forward and ratio control. Introduction of digital control system.	<b>(06 Hours)</b>

#### List of Experiments:

Term work will consist of the experiments listed below, of which at least eight should be performed in laboratory by the students.

1.	To study the closed loop pressure control for P control action and calculate offset.
2.	To study the closed loop pressure control for PI action PID action.
3.	To study optimizing performance for pressure control trainer by using tuning technique with help of PID action.
4.	To study closed loop system for servo problem having PI action consideration.
5.	To study the closed loop flow controller
6.	To study the closed loop level controller

7.	To study the ratio controller
8.	To study the cascade controller
9.	Root locus analysis on software (Ex. MATLAB)
10.	Bode plot on software (Ex. MATLAB)
11.	Nyquist plot on software (Ex. MATLAB)
12.	PID control loop simulation for a first order process (Ex. SIMULINK)

**Assignments:**

1.	Students have to visit chemical industry and prepare a detailed report on various controllers used in industry.
2.	Watch NPTEL video and make report on various topics in process dynamics and control
3.	Group discussions on controllers used for chemical processes.
4.	To find Transfer Function for 1 <sup>st</sup> order and 2 <sup>nd</sup> order process.
5.	Draw the Control Loop and Block Diagram for different chemical processes.
6.	Solve numerical questions in last three year question papers.
7.	Write note on Advance Controllers.
8.	Explain Digital Controllers.
9.	Explain IMC Controller in Detail.
10.	Explain MPC Controller in Detail.
11.	Explain process Identification of any Chemical Process in detail
12.	Explain Optimal control of any one Chemical Process.

**Text Books/References:**

1	G. Stephanopoulos, <i>Chemical Process Control: An introduction to theory and practice</i> , Prentice Hall, New Jersey, 1984.
2	P. Harriott, <i>Process Control, Reprint of text</i> , ed. Tata McGraw Hill, 1983.
3	D. R. Coughanowr, <i>Process system analysis and control</i> , 2nd ed, McGraw Hill, 1991.
4	Seborg, D.E., Edgar, T.F. and Mellichamp, "Process dynamics and control," Wiley, New York, D.A. 2003.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I , II, III
Unit Test -II	UNIT – IV, V, VI

## CHEMICAL PROCESS MODELING AND SIMULATION

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

- |   |   |
|---|---|
| 1 | Heat transfer, Mass transfer, Chemical reaction engineering, Process Dynamics and Control |
| 2 | Process Calculation   |
| 3 | Mathematics including integration and derivation  |

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hours/Week	End Semester Examination: 60 Marks	Theory : 03
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 5Hours/Week	Continuous Assessment: 20 Marks	Total credits: 04
	Term work / practical:50 Marks	
	Total :150 Marks	

**Course Outcomes:**

After completion of the course students would be able to

- |   |   |
|---|---|
| 1 | Express mass balance, energy balance and momentum balance equation for various chemical process systems.            |
| 2 | Express models for heat transfer equipment such as double pipe heat exchangers, shell and tube heat exchanger, etc. |
| 3 | Develop models for distillation columns, etc.   |
| 4 | Develop models for reaction equipment such as batch reactor, CSTR, etc.   |
| 5 | Recognize simulation approaches.  |
| 6 | Simulate model equations using numerical methods.   |

### Topics covered

<b>UNIT-I</b>	<p><b>Introduction to modeling:</b> Introduction, definition of modeling, different types of models, applications of mathematical modeling, principles of formation, lumped model, distributed parameter model, Fundamental laws: continuity equation, energy equation,</p>	<b>(06 Hours)</b>
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	equations of motions, transport equations, equations of state, chemical kinetics.	
<b>UNIT-II</b>	<b>Modeling of Heat transfer equipment:</b> Double pipe heat exchanger, shell and tube heat exchanger, two heated tanks, single component vaporizer, steady-state heat Conduction through a hollow cylindrical pipe, heat transfer with coil	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Modeling of distillation columns:</b> Ideal binary distillation column, multi component non-ideal distillation column, batch distillation with holdup, flash distillation, packed column design	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Modeling of reactors:</b> Two phase CSTR with heat removal, series of isothermal constant holdup CSTRs, CSTRs with variable holdups, Gas phase-pressurized CSTR, Non-Isothermal CSTR, Batch reactor, gas liquid bubble reactor, semi-batch reactor.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Introduction to simulation:</b> Introduction to simulation, definition of simulation, approaches of simulation: modular approaches, equation-solving approach, decomposition of networks: tearing algorithms, algorithms based on the signal flow graph, algorithms based on reduced digraph.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Simulations using numerical methods:</b> Use of numerical methods to solve mathematical model equations of Gravity flow tank, Three CSTRs in series, Non-isothermal CSTR, Binary distillation column, Multi-component distillation column, Batch reactor.	<b>(06 Hours)</b>

<b>Assignments</b>	
1	Write a report on the importance of modeling with reference to the process industries.
2	Solve old (last five years) question papers with reference to particular topic.
3	Discuss the importance of modeling and simulation w. r. t. science and engineering
4	Prepare a report on application of modeling and simulation.
5	Give fifteen minute presentation (seminar) on particular topic and prepare a report.
6	Obtain any industrial data for modeling and simulation.
7	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.

8	Discuss different software available for modeling and simulation.
9	Write a technical report on your visit to a process industry with respect to modeling.
10	Group discussion on the recent advances in simulation software.
11	Prepare a report on modeling and simulation of all different chemicals reactors.
12	Technical interview based on the knowledge of Modeling simulation.
13	Students may take any industrial case e.g. manufacturing of Maleic anhydride and solve this case using standard simulation software like Aspen Plus, HYSIS
In addition to these above stated assignments concerned faculty member may design his/her own assignments.	
<b>Term Work:</b>	
Term work will consist of the practicals listed below, out of which any eight practicals are to be performed in laboratory by the students.	
1	Study of gravity flow tank.
2	Study of Batch reactor
3	Simulation of CSTR
4	Simulation of bubble point temperature
5	Simulation of distillation column.
6	Simulation of heat exchanger
7	Simulation of first order reaction system in batch reactor.
8	Simulation of first order reaction system in CSTR
9	Study of a reversible reaction in a batch reactor.
10	Simulation of any model equation.
11	Study of CSTR combination in first order reactions.
For simulation, faculty member may use any suitable simulation software like MATLAB, ASPEN, CHEMCAD, etc. In addition to these above stated practicals concerned faculty member may design his/her own practicals.	
<b>Text Books/References:</b>	
1	W. L. Luyben, Process Modeling Simulation and Control for Chemical Engineers, McGraw Hill, 1990.

2	S.C. Chapra, R.P. Canale, Numerical Methods for Engineers, 6th Edition, Tata-McGraw Hill Publications, 2012.
3	R.E.G. Franks, Modeling and Simulation in Chemical Engineering, Wiley-Interscience, NY, 1972.
4	B.V. Babu, Process Plant Simulation, Oxford University Press, NY 2004.
5	D. Himmelblau, K.B. Bischoff, Process Analysis and Simulation, John Wiley & Sons, 1968

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<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## INDUSTRIAL MANAGEMENT

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

1	Concept of Management.
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**TEACHING SCHEME:**

Lectures: 3 Hours/Week

Total: 3 Hours/Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Continuous Assessment: 20 Marks

Total : 100 Marks

**CREDITS ALLOTTED:**

Theory : 03

Drawing: 00

Total credits: 03

**Course Outcomes:**

After completion of the course, students would be able to

- |    |   |
|----|---|
| 1. | Know the types of business.               |
| 2. | Understand the types of organization      |
| 3. | Understand the forms of ownership.        |
| 4. | Know the concepts of material management. |
| 5. | Know the concepts quality management.     |
| 6. | Know the various acts.                    |

### Topics covered

	<b>Outline of Business</b>	
<b>UNIT-I</b>	Types of Business, Industrial sectors Globalization Management Process, Principles of Management, Functions of Management	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Organizational Management</b> Organization, Types of organization, Departmentation, Principles of Organization, Forms of ownership	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Financial Management</b> Financial Management- Objectives & Functions, Capital Generation &	<b>(06 Hours)</b>



	Management, Budgets and accounts, Taxation (Excise Tax, Service Tax, Income Tax, Value Added Tax and Custom Duty)	
<b>UNIT-IV</b>	<b>Materials Management</b> Inventory Concept, its classification, functions of inventory, ABC Analysis, Economic Order Quantity Concept, graphical representation, determination of EOQ, Standard steps in Purchasing, Modern Techniques of Material Management, Material Resource Planning (MRP), Enterprise Resource Planning (ERP)	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Quality Management</b> Quality Management System, Quality Control, Quality Circle, Quality Assurance, Total Quality and TQM, Kaizen, 5'S', 6 Sigma	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Industrial Legislation and Industrial Safety</b> Safety Management, Causes of accidents, Types of Industrial Accidents, Preventive measures, Safety procedures Factory Act, Air (Prevention and Control of Pollution) Act, Minimum Wages Act, Workman Compensation Act.	<b>(06 Hours)</b>

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<b>Assignments</b>		
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1.	Types of business.
2.	Globalization in India
3.	Different principals of management.
4.	Various types of organization
5.	Various forms of ownership
6.	Capital Generation for an organization.
7.	ABC Analysis.
8.	Standard purchase
9.	Material Resource Planning (MRP), Enterprise Resource Planning (ERP)
10.	Concepts of quality management.
11.	Total Quality Management (TQM)
12.	Kaizen approach in Quality management.
13.	5'S', 6 Sigma

14.	Factory Act
15.	Minimum Wages Act, Workman Compensation Act
In addition to these above stated assignments concerned faculty member may design his/her own assignments	
<b>Text Books/References:</b>	
1.	Khanna. O.P., “Industrial Engineering & Management” Dhanpat Rai & Sons New Delhi.
2.	Banga T. R. and Sharma S.C. “Industrial Engineering & Management” Khanna Publication
3.	<i>Saxena, S.C.</i> ” Business Administration & Management” SahityaBhavan Agra
4.	Newman W.H., Warren E. K. and McGil A. R., “The process of Management” Prentice- Hall
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## PLANT DESIGN PROJECT ENGINEERING AND COSTING

**Designation:** Professional Core

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Chemical Process Industry

2 | Chemical design

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Termwork / Oral :50 Marks

Total :150 Marks

**Course Outcomes:**

After completion of the course students would be able to

1. | Select appropriate process for a project.
2. | Differentiate the equipment and able to prepare specification sheet.
3. | Learn basic economic concept, to understand and apply this concepts in the project works undertaken and to chemical engineering situation by solving problem.
4. | Evaluate the project cost including capital investment, product cost and the total project cost.
5. | Solve problem on profitability and breakeven analysis.
6. | Control and schedule of the project using CPME/PERT technique, calculations.

### Topics covered

<b>UNIT-I</b>	<p><b>Introduction:</b>                  Plant design : Design basis, process selection, material of construction, plant location ,plant layout and installation, safety ,start up ,shut down and operating guidelines ,Preliminary techno economic feasibility report .Complete engineering flowsheet drawing.</p>	<b>(06Hours)</b>
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<b>UNIT-II</b>	Optimization and feasibility of plant design, selection of process equipments: Standard versus special equipment selection criteria, and specification sheets. Importance of Laboratory development pilot plant, Indian boiler regulations, factories act.	<b>(06Hours)</b>
<b>UNIT-III</b>	Cost estimation: Cash flow and cumulative cash position for industrial operations, factors affecting estimation of investment and production cost, total capital investment, fixed and working capital investment & their estimations, type of estimates, cost indexes, method for estimating capital investment. Insurance.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	Estimation of total product cost, Estimation of total product cost: manufacturing cost, general expenses, Manufacturing cost: direct production cost, fixed charges, plant overhead cost. Types of depreciation, Method for determining depreciation: straight line method, decline balance method, sum of the year digit method, shrinking fund method etc, payout period.	<b>(06 Hours)</b>
<b>UNIT-V</b>	Profitability, alternative investments and replacement: Methods for profitability evaluation, Evaluation of Break Even Point and its significance, % rate of return, Practical factors in alternative investment and replacement Studies	<b>(06 Hours)</b>
<b>UNIT-VI</b>	Scheduling and Networking of Project Planning of project schedule by BAR CHART, Inventory control scheduling project using CPM/PERT methods. Network diagramming, earliest start time and earliest finish time, Advantages of CPM, Cost to finish the project earlier than normal cost.	<b>(06 Hours)</b>

### Assignments

1.	Write a report on plant design for any company for current year.
2.	Write preliminary feasibility report for any industry.
3.	Draw complete engineering drawing for any process industry.
4.	Prepare specification sheet for equipments for any particular industry.
5.	Give power point presentation of different types of cost for industry.
6.	Draw a chart of how cash flow takes place in chemical industry.

7.	Analyze cost index for last ten years and how it changes.
8.	Understand basic concept of depreciation and apply to any chemical industry and calculate the values.
9.	Apply a critical-thinking and problem-solving approach towards factories act.
10.	Specify materials for construction and estimate the cost of investments for chemical industry.
11.	Write complete report for a chemical industry which should include all the factors related to cost estimation.
12.	Give power point presentation on knowledge of safety in chemical industry.
13.	Give power point presentation on importance of break even analysis.
14.	Prepare one network diagramming by using CPM method.
15.	Gove a power point presentation on CPM and PERT for any particular industry.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

**Term Work:**

Term work will consist of drawing of sheets

	Standard symbols as per IS code
1	Process flow diagram
2	Piping and Instrumentation diagram
3	Plant layout and elevations
4	Utility diagram
5	Piping GA drawing
6	Piping isometrics
7.	Draw any sheet by using Autocad.

**Text Books/References:**

1.	M.S.Peters and Timmerhaus, "Plant design and Economics for Chemical Engineers", McGraw Hill 3rd Edition.
2.	F.C. Vibrandt and C.E. Dryden, "Chemical Engineering Plant Design", McGraw Hill Fifth Edition..
3.	Coulson & Richardson's Chemical Engineering Volume 6, Butterworth-Heinemann, 1999, 3rd Edition.

4.	Industrial Engineering and Management by O. P. Khanna Dhanpat Rai & Sons, 1985 7 <sup>th</sup> Edition
5.	Project Engineering: Suhas Mokashi ,Mcmillan Publisher .
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**Bharati Vidyapeeth University**  
**College of Engineering**  
**Elective**

### Elective III: Advanced Oxidation Processes

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Waste water treatment

2 | Engineering Chemistry

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Term work / Oral :50 Marks

Total :150 Marks

**Course Outcomes:**

After completion of the course students would be able to

1. | Demonstrate the mechanism of various advanced oxidation processes (AOPs)

2. | Understand the method of ozonation and photon induced AOPs

3. | Learn the method of heterogeneous photocatalysis and its mechanism

4. | Know the method of homogeneous and heterogeneous Fenton processes and its mechanism

5. | Analyze emerging AOPs and their mechanism

6. | Demonstrate the industrial applications of AOPs

**Topics covered**

<b>UNIT-I</b>	<p><b>Introduction to advanced oxidation processes (AOPs)</b>                  Conventional waste water treatment processes, Fundamentals and background of AOPs for water and wastewater treatment, basic reaction mechanism of AOPs, Role of hydroxyl radicals and their generation, Reaction kinetics and degradation mechanisms of organic pollutants by hydroxyl radicals, Effects of</p>	<b>(06 Hours)</b>
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	process parameters and scavenging media on degradation efficiency, oxidation potential of AOPs, merits and demerits of various AOPs	
<b>UNIT-II</b>	<p><b>Ozonation and Photo induced AOPs:</b></p> <p>Ozonation: background and fundamentals, reaction kinetics and mechanisms, Application of homogeneous and heterogeneous catalytic ozonation in water treatment</p> <p>Fundamentals of UV irradiation, Absorption and bond dissociation energy, UV sources and their characteristics, choice of photo source–used in AOPs and their spectral distributions, mechanism of photo induced AOPs.</p> <p>Photo induced AOPs: Oxidation using ultraviolet irradiation and hydrogen peroxide (UV/H<sub>2</sub>O<sub>2</sub>), oxidation using ultraviolet irradiation and ozone (UV/Ozone), oxidation using combination of ultraviolet irradiation, hydrogen peroxide and ozone (UV/ H<sub>2</sub>O<sub>2</sub> /Ozone).</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<p><b>Heterogeneous photo-catalysis</b></p> <p>Fundamentals of semiconductor photo-catalysis, various semiconductor particles used in photocatalytic applications, visible light driven photo-catalysts, photocatalytic reactions and kinetic studies and introduction to nano photo-catalysis.</p> <p>Photocatalytic reactors, solar energy driven or artificial light photo reactors, solar collectors, design of slurry or supported catalyst reactors, comparing reactor efficiencies and reuse of catalyst.</p>	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<p><b>Homogeneous and heterogeneous Fenton processes</b></p> <p>Fenton process, photo-fenton process, advanced fenton process, the mechanism of fenton based processes, merits and demerits of homogeneous and heterogeneous Fenton processes.</p>	<b>(06Hours)</b>
<b>UNIT-V</b>	<p><b>Emerging AOPs</b></p> <p>Electrochemical oxidation, Ultrasound processes; principles of sonochemistry and acoustic cavitation, ultrasound cavitation and its combination with other AOPs, synergistic and antagonistic effects, hydrodynamic cavitation and its combination with other AOPs.</p>	<b>(06 Hours)</b>

<b>UNIT-VI</b>	<b>Industrial applications of AOPs</b> Application of AOPs for industries such as textile, petroleum, pharmaceutical, petrochemical industry etc., decontamination of ground water, cost or economic analysis of various AOPs	<b>(06 Hours)</b>
<b>Assignments</b>		
1.	Write a report on current scenario of advanced oxidation processes.	
2.	Evaluate the use of solar or visible light driven photocatalysts.	
3.	Estimate synergistic effect of combining AOPs with cavitation based processes	
4.	Give power point presentation on semiconductor photocatalysis	
5.	Analyze the industrial applications of AOPs.	
6.	Understand the reaction mechanism of AOPs	
7.	Apply a critical-thinking towards scale-up aspects of AOPs.	
8.	Analyze recent advances in synthesis of mixed oxide photocatalysts.	
9.	Write a technical report on your visit to a waste water treatment plant.	
10.	Give power point presentation on the applications of emerging AOPs	
11.	Group discussion on the recent advances in advanced oxidation processes.	
12.	Make a complete chart of various operations involved in waste water treatment.	
13.	Assess the environmental or safety norms for disposal of waste water.	
In addition to these above stated assignments concerned faculty member may design his/her own assignments		
<b>Term Work:</b>		
Term work will consist of the Seminar :		
	Seminar should be based on recent advances in AOPs. Students may undertake studies in water and waste water treatment using AOPs. Design and scale-up aspects can be studied in detail. Termwork should be based on the technical report on these studies carried out by individual or small group of students.	
<b>Text Books/References:</b>		
1.	Simon Parsons, Advanced oxidation processes for water and wastewater treatment, IWA Publishing,	

	2004.
2.	Thomas Oppenlander, Photochemical Purification of Water and Air: Advanced Oxidation Processes (AOPs): Principles, Reaction Mechanisms, Reactor Concepts, Wiley-VCH Publishing, 2003.
3.	Vincenzo Belgiorno, Vincenzo Naddeo and Luigi Rizzo, Water, wastewater and soil treatment by Advanced Oxidation Processes (AOP), Lulu Enterprises, 2011.
4.	Jean-Pierre Franc, Jean-Marie Michel, "Fundamentals of Cavitation", Kluwer Academic Publishers, Dordrecht.
5.	T. J. Mason and J. P. Lorimer, "Applied sonochemistry: Uses of power ultrasound in chemistry and processing", Wiley-VCH publishers.

<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## ELECTIVE III: FUEL CELL TECHNOLOGY

**Designation:** Elective

**Course Pre-requisites:**

Students should have knowledge of

1. Chemistry, Physics, Thermodynamics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures : 3 Hours/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 2 Hour /Week	Continuous Assessment : 40 Marks	Practical : 01
	Term Work/Oral : 50 Marks	Total credits : 04
	Total : 150 Marks	

**Course Outcomes:**

After completion of the course students will be able to

1. Define the concept of fuel cell.
2. Express various types of fuel cell.
3. Distinguish between the fuel cell and electrochemical cell.
4. Express the thermodynamics of fuel cell system.
5. Learn the process of fuel processing
6. Develop enough skills to design systems or components of fuel cells.

### Topics covered

<b>UNIT - I</b>	<p><b>Introduction to Fuel Cell Technology</b></p> <p>Fuel cell definitions, Need of fuel Cell, Principal of fuel cell technology, Basics Electrochemistry of fuel cell, Calculation of cell potential: activities or concentrations, electrochemical potential; The movement of ions in solution: diffusion and migration, Conductivity and mobility, Liquid junction potentials, ion-selective electrodes.</p>	<b>(06 Hours)</b>
<b>UNIT - II</b>	<p><b>Classification of Fuel Cells</b></p> <p>Alkaline Fuel Cells, Phosphoric Acid Fuel Cells, Solid Oxide Fuel Cells, Molten Carbonate Fuel Cells, Direct Methanol Fuel Cells, Proton Exchange</p>	<b>(06 Hours)</b>

	Membrane Fuel Cells	
<b>UNIT - III</b>	<p><b>Fuel Cell Components</b> Electrolytes, Catalysts, Current collector/ bipolar plate.</p> <p><b>Fuel cell characterization</b> Possible ways of characterization, In-situ characterization especially I-V characteristics and electrochemical impedance spectroscopy; Cyclic voltammetry; Current interruption technique, Ex-situ characterization especially electrolyte and bipolar plate</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Fuel Cells Thermodynamics</b> Gibb's free energy; reversible and irreversible losses; Fuel cell efficiency, Nernst equation, Effect of temperature, pressure, concentration on Nernst potential, Calculations of electrochemical potential.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Fuel Processing</b> Processing Hydrogen from Alcohols, Producing Hydrogen from Hydrocarbons, Hydrogen from Other Sources, Gas Clean-up, Challenges and Opportunities for Research in Fuel Processing</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Fuel Cell System and system integration</b> Hydrogen Production, Hydrogen Storage, Methods of Hydrogen Storage, Prediction of Hydrogen Uptake in Carbon Materials, Balance of plant and Power electronic and system integration</p>	<b>(06 Hours)</b>

**Tutorials/Assignments:**

The internal assessment shall consist of minimum SIX assignments.

1.	Questions involving classification of Fuel Cells.
2.	Prepare one assignment considering any one type of fuel cell.
3.	Conducting surprise MCQ test for students
4.	Apply a critical-thinking and problem-solving approach towards the principles of fuel cell.
5.	Enhancement in collaborative learning is done through, group assignments that will be given to encourage students to work with classmates to discuss and complete homework assignments
6.	Students have to study any five research papers related to specific topic and prepare/present power point presentation
7.	Brief report on 'Environmental, health and ethical concerns that are associated with Fuel Cell

	Technology.
8.	Group discussions on any/all of the following topics: d) Classification of Fuel Cells. e) Current scientific and technical advances f) Electrochemical Cell Vs Fuel Cell
9.	Preparation of a brief report on applicability of fuel cells in chemical engineering operations
10.	Write a report on innovations in fuel cell technology in current year.
11.	Learning on performance characteristics of fuel cell power plant and its components.
12.	Identify the operational issues and challenges for all major types of fuel cells and give the presentation on it.
13.	Conducting open-book class test.
In addition to these above stated assignments concerned faculty member may design his/her own assignments	
<b>Term Work:</b>	
Term work will consist of the Seminar :	
	Seminar should be based on theory. Students may undertake studies in design and development, analysis, synthesis, construction and fabrication of equipment, treatment plants. Critical review on product and system generation of new concept, idea and improvement in existing process related to subject. Term work should be based on the technical report on these studies carried out by individual or small group of students.
<b>Text Books/ References:</b>	
1.	B. Viswanathan, M. Aulice Scibioh, "Fuel Cells: Principles and Applications", CRC Press, 1 edition, 2008.
2.	James Larminie, Andrew Dicks, "Fuel Cell Systems Explained", 2nd Edition, John Wiley & Sons Ltd, New York, 2003
3.	O'Hayre, R. P., S. Cha, W. Colella, F. B. Prinz, "Fuel Cell Fundamentals", Wiley, NY, 2006
4.	"Fuel cell: a handbook", U S Department of energy.
5.	Bokris John O'm, Srinivasan S., "Fuel cells-their electrochemistry", McGraw Hill 1969.
6.	Appleby A.J. Fralkes F. R., "Fuel cell handbook", Van Nostrand Reinhold, 1989

7.	Basu, S. (Ed) "Fuel Cell Science and Technology", Springer, N.Y. 2007
8.	Liu, H., "Principles of fuel cells", Taylor & Francis, N.Y. 2006
<b>Syllabus for Unit Test:</b>	
Unit Test - I	UNIT- I, II, and III
Unit Test - II	UNIT- IV, V, and VI

### Elective III: Membrane Separation

**Designation:** Elective

**Course Pre-requisites:**

1.

Basic chemistry, Physical chemistry, Mass transfer, Fluid flow operations, Chemical Engineering Thermodynamics

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3Hours/Week

End Semester Examination: 60 marks

Theory : 03

Term work: 2 Hour/Week

Continuous Assessment: 40 marks

Tutorial : 01

Term Work: 50 marks

Total Marks: 150 marks

**Course Outcomes:**

1.

Explain basics of membrane and select proper material depending upon application

2.

Explain the methods of membrane preparation and characterization

3.

Determine suitable process for size based separation and explain its transport mechanism

4.

Understand the transport through non-porous membranes and define membranes for desired application

5.

Explain basics and preparation of membrane for other specialized membrane processes

6.

Design suitable module and parameters for the desired application

#### Topics covered

**UNIT-I**

**Introduction and Membrane Materials**

Introduction, historical development of membrane processes, definition of membrane, permeation, retention and selectivity, membrane processes, their categorization, material for membrane preparation, polymeric material, inorganic materials, mechanical, thermal and chemical stability of membrane based on material, choice of polymer for membrane preparation based on application

**(06 Hours)**



<b>UNIT-II</b>	<p><b>Membrane Preparation and Characterizations</b></p> <p>Preparation of synthetic membranes: phase inversion membranes, preparation of composite membranes, preparation of inorganic membranes</p> <p>Characterization: Porous membranes – electron microscopy, atomic force microscopy, mercury intrusion, bubble point method, permeability method, solute rejection characteristic; non-porous membranes – permeability, surface analysis, wide angle X-ray, DCS/DTA, density measurement</p>	<b>(06 Hours)</b>
<b>UNIT-III</b>	<p><b>Processes using porous membranes</b></p> <p>Transport mechanism in porous membranes – Knudsen flow, friction model, sieving mechanism</p> <p>Processes: Microfiltration – membranes details, characteristics, industrial applications; Ultrafiltration - membranes details, characteristics, industrial applications; Nano-filtration - membranes details, characteristics, industrial applications.</p>	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<p><b>Solution-diffusion based membrane processes</b></p> <p>Transport mechanism – Solution-diffusion mechanism, solubility, diffusivity, effect of temperature, interaction polymer crystallinity of solubility and diffusivity; Free volume theory</p> <p>Processes: Reverse osmosis - membranes details, characteristics, industrial applications; Gas separation - membranes details, characteristics, industrial applications; Pervaporation - membranes details, characteristics, industrial applications</p>	<b>(06 Hours)</b>
<b>UNIT-V</b>	<p><b>Other membrane processes</b></p> <p>Dialysis - membranes details, their preparation, characteristics, transport mechanism, industrial applications; Electrodialysis - membranes details, their preparation, characteristics, industrial applications; Membrane distillation - membranes details, their preparation, characteristics, industrial applications; Membrane bioreactor - membranes details, their preparation, characteristics, industrial applications; Liquid membranes - membranes details, ionic liquids, their preparation, characteristics, industrial applications; ion exchange - membranes details, their preparation, characteristics, industrial applications</p>	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Membrane modules and process design</b>	<b>(06 Hours)</b>

	Selection of process depending upon applications, plate and frame module, spiral wound module, tubular module, capillary module, hollow fiber module, comparison between module configuration, system design, cross flow operations, hybrid dead end/cross flow operations, cascade operations, Process parameters, Energy requirements	
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**Term work/Practical:**

1.	Preparation of microfiltration membranes by phase inversion and their transport analysis.
2.	Preparation of UF membranes and their transport analysis
3.	Study of prepared porous membranes for bubble point analysis
4.	Study of porous membranes for rejection analysis
5.	Surface characterization of membrane by instrumental methods
6.	Preparation of asymmetrically skinned membrane and analyze it for pervaporation
7.	Preparation of thin film composite membranes and analyze its transport properties
8.	Preparation of symmetric membrane and analyze its transport and rejection properties
9.	Study variation in fouling characteristics between dead end and cross flow method
10.	Study separation characteristics of reverse osmosis membranes
11.	Preparation of hollow fiber membranes and study its permeation characteristics
12.	Study dialysis /electrodialysis membrane transport characteristics
13.	Study preparation of membrane bio-reactor and its effect of fermentation system

In addition to these above stated term-work concern faculty member may design his/her own term-work or practicals.

**Assignments:**

1.	Detail of membrane material, preparation, characterization, module and process design for anyone application
2.	Technical interview based on knowledge of membrane technology.
3.	Students have to study any five NPTEL/you-tube videos related to membrane technology and prepare/present power point presentation.
4.	Group discussions on membrane science and technology related topics.
5.	Prepare a report on innovations in membrane technology and their practical importance.

6.	Conducting open-book class test.
7.	Conducting surprise Multiple choice questions (MCQs) test for students
8.	Students have to study any five research papers related to specific topic and prepare/present power point presentation
9.	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
10.	Case study on emerging trends in process/product innovation considering membrane technology.
11.	Students have to visit chemical industry and make a detailed report on membrane technologies used in the process.
12.	Write a report on your visit to research and development laboratory of national/international repute.
13.	Write a report on membrane technologies for addressing the problems of Water and Energy.
In addition to these above stated assignments concern faculty member may design his/her own assignments.	
<b>References/Text Books:</b>	
1.	Basic principle of membrane technology Marcel Mulder, Kluwer Academic Press
2.	Membrane technology and applications, Richard W. Baker, John Wiley and Sons, Ltd.
3.	Handbook of industrial membrane technology, Mark C. Porter (Ed.), Noyes Publications.
4.	Membrane separation systems – recent developments and future directions, R. W. Baker, E. L. Cussler, W. Eykamp, W. J. Koros, R. L. Riley, H. Strathman, Noyes Data Corporation
5.	Membrane technology in the chemical industry, S. P. Nunes, K.-V. Peinemann (Eds.), Wiley-VCH Verlag GMBH
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**ELECTIVE III: PETROLEUM REFINERY ENGINEERING**

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Chemical Process Industry

2 | Mass Transfer

**TEACHING SCHEME:**

Lectures: 3 Hours/Week

Practical : 2 Hour /Week

Total : 5Hours/Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Continuous Assessment: 20 Marks

Termwork / Oral :50 Marks

Total :150 Marks

**CREDITS ALLOTTED:**

Theory : 03

Practical: 01

Total credits: 04

**Course Outcomes:**

After completion of the course students would be able to

1. Know the composition of crude oil and its products, along with its properties and characterization methods.
2. Demonstrate knowledge of petroleum products, quality control and understand processing of crude oil.
3. Understand the thermal and catalytic cracking process.
4. Learn the process of catalytic reforming, Hydrotreating and Hydrocracking.
5. Get conversant with the process of purification and fractionation of crude oil.
6. Analyze theoretical and practice skills in environmental issues of petroleum refinery.

**Topics covered**

**UNIT-I**

**Introduction:**

Introduction to petroleum refinery, Classification of Crude oil, Characterization of crude oil, Composition of crude Physical properties L6: Crude oil; analysis and distillation, Introduction to refinery "feedstock/s" and refinery products. ASTM nomenclature (ASTM test numbers and their meaning)Introduction to various codes required for petroleum industry

**(06 Hours)**

<b>UNIT-II</b>	<b>Evaluation of crude oil properties and Design of crude oil distillation column:</b> Dehydration and desalting of crude. Crude Assay ASTM TBP distillations evaluation of crude oil properties.API gravity various average boiling points and mid percent curves Evaluation of properties of crude oil and its fractions. Design concept of crude oil distillation column design.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Thermal and Catalytic cracking:</b> Coking and thermal process, delayed coking, Catalytic cracking, cracking reactions, cracking feedstock, Effect of process, FCC cracking, catalyst ,New designs for fluidized bed catalytic cracking	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Catalytic Reforming :</b> Objective and application of catalytic reforming, process reforming Catalysts, Reformer feed reforming reactor design continuous and semi regenerative process. Hydrotreating and Hydrocracking reactions.	<b>(06Hours)</b>
<b>UNIT-V</b>	<b>Iso merization, Alkylation and Polymerization:</b> Isomerization process, Reactions, Effects of process variables. Alkylation process, Feedstock, reactions, products, catalysts and effect of process variables. Polymerization: Objectives, process, Reactions, catalysts and effect of process variables. Visbreaking	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Environmental issues and New Trends in petroleum refinery operations:</b> Ecological consideration in petroleum refinery, Waste water treatment, control of air pollution, New trends in refinery, Alternative energy sources. Safety aspects in petroleum industry	<b>(06 Hours)</b>

### Assignments

1.	Write a report on petroleum refining and energy demand in current year.
2.	Discover the methods used to create clean and reformulated fuels
3.	Evaluate the use of catalysts in petroleum refining..
4.	Estimate refinery CAPEX and OPEX
5.	Give power point presentation on vertical integration in petroleum industry
6.	Learning on different areas of study in upstream, midstream and downstream industry.
7.	Analyze worldwide distribution of oil and gas reserves in current year.

8.	Understand basic procedures and role of all fundamental systems used in petroleum drilling..
9.	Apply a critical-thinking and problem-solving approach towards the principles of petroleum engineering.
10.	Specify materials for construction and estimate the cost of investments for crude oil distillation column.
11.	Write a technical report on your visit to a petroleum refinery.
12.	Give power point presentation on knowledge of safety and pollution control in the refining industries.
13.	Group discussion on the recent advances in petroleum refinery processes.
14.	Make a complete chart of operations involved in petroleum industry.
15.	Assess the economic environment of the petroleum industry.

In addition to these above stated assignments concerned faculty member may design his/her own assignments

**Term Work:**

Term work will consist of the Seminar :

Seminar should be based on theory. Students may undertake studies in design and development, analysis, synthesis, construction and fabrication of equipment, treatment plants. Critical review on product and system generation of new concept, idea and improvement in existing process related to subject. Termwork should be based on the technical report on these studies carried out by individual or small group of students.

**Text Books/References:**

1.	B.K.Bhaskar Rao., “Modern Petroleum Refining Processes”, 2ndEd., Oxford and IBH publishing Co. Pvt. Ltd., New Delhi 1990.
2.	W.C. Edmister “Applied Hydrocarbon Thermodynamics”, Gulf Publishing, Houston, Texas, 1961.
3.	Gas Production Engineering” S.Kumar Gulf publishing Co., 1987.
4.	Petroleum Exploration Hand Book by Moody, G.B.
5.	standard Handbook of petroleum and Natural Gas Engineering. 2 <sup>nd</sup> Edition. William C Lyons, Gary C Plisga. Gulf Profession.
6.	W.L. Nelson, “Petroleum Refinery Engineering”, McGraw Hill, 1964.

<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### Elective IV: BIO-SEPARATION

Designation: Elective

Course Pre-requisites:

Students should have basic knowledge of

1 | Basic biology

2 | Analytical chemistry and techniques.

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test: 20 Marks

Practical: 01

Total : 5Hours/Week

Continuous Assessment: 20 Marks

Total credits: 04

Term work / Oral :50 Marks

Total :150 Marks

**Course Outcomes:**

After completion of the course students would be able to

1 | Define concept of bio-separation, physico-chemical basis of bio-separation.

2 | Explain low resolution bio-separation techniques.

3 | Describe high resolution bio-separation techniques.

4 | Discuss separation techniques like precipitation, crystallization, etc.

5 | Recognize the emerging bio-separation techniques like expanded-bed chromatography, hybrid bio-separations, etc.

6 | Apply bio-separation knowledge for purification of  $\beta$  amylase, aspartic acid, etc.

#### Topics covered

<b>UNIT-I</b>	<p><b>INTRODUCTION TO BIOSEPARATION:</b></p> <p>An overview of bio-separation, Separation of cells and other insolubles from fermented broth. bioproduct purification, characteristics of biological mixtures, physico-chemical basis of bio-separation.</p>	<b>(06 Hours)</b>
<b>UNIT-II</b>	<p><b>LOW RESOLUTION BIO-SEPARATION TECHNIQUES:</b></p> <p>Cell disruption, Centrifugation, Liquid-liquid extraction, Leaching, Filtration, Supercritical fluid extraction, Micro-filtration, Ultra-filtration, Adsorption,</p>	<b>(06 Hours)</b>



	Sedimentation	
<b>UNIT-III</b>	<b>HIGH RESOLUTION BIO-SEPARATION TECHNIQUES:</b> Ultra-centrifugation, Different electrophoresis techniques viz. Isoelectric focusing, Affinity separation, Chromatographic techniques viz. Paper, Gel; Ion exchange, Affinity, GLC, HPLC. Dialysis.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>OTHER SEPARATION TECHNIQUES:</b> Zone refining, Molecular sieves, Adductive crystallization, Reactive extraction, Precipitation method using ammonium sulfate, organic solvents, high molecular weight polymers, Reverse osmosis, Foam separation., Aqueous two phase systems,	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>EMERGING BIO-SEPARATION TECHNIQUES:</b> Membrane and monolith chromatography, Expanded-bed chromatography, High-resolution ultrafiltration, Hybrid bio-separations, Introduction to SEP box and Hyphenated techniques.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>APPLICATIONS OF BIO-SEPARATIONS -CASE STUDIES:</b> Purification of $\beta$ amylase, aspartic acid, insulin; Food and Beverages: Beer, Citric acid; Bio-chemicals: Butanol.	<b>(06 Hours)</b>

**Assignments:**

1.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
2.	Prepare a mini report of any topic given above.
3.	Write a report on the recent advances in chromatographic processes with reference to the current year.
4.	Prepare a model for any of the topic given above.
5.	Evaluate efficiencies of different chromatographic techniques.
6.	With the help of this subject knowledge, write a guideline report on how you would apply your concepts in industry.
7.	Search out some industries related to bio-separation.
8.	Write a technical report on your visit to a process industry.

9.	Technical interview based on the knowledge of analytical techniques.
10.	List out all the principles of the analytical techniques.
11.	Perform any one chromatographic technique.
12.	Find out different types of proteins with structure.
13.	Prepare a report on downstream processing.

In addition to these above stated assignments concerned faculty member may design his/her own assignments.

**Term Work:**

Term work will consist of the experiments listed below, out of which any eight experiments are to be performed in laboratory by the students.

1.	Gas chromatography.
2.	Study of membrane separation and its application in industry.
3.	Study of sedimentation and its application in industry.
4	Study of reactive extraction.
5.	Material analysis using paper chromatography
6.	Study of high-resolution ultrafiltration.
7.	Study of gel electrophoresis.
8.	To study molecular sieves.
9.	To estimate efficiency of Centrifugation.
10.	Study of adductive crystallization.

In addition to these above stated experiments concerned faculty member may design his/her own experiments related to course.

**Text Books/References:**

1	Belter P A, Cussler E L, and Wei Shou Hu, “Bio-separation–Downstream Processing for Biotechnology”, Wiley India Pvt. Ltd., 2011.
2	Prasad N K, “Downstream Process Technology-A New Horizon in Biotechnology”, Prentice Hall of India, New Delhi, 2012.
3	Pauline M Doran “Bioprocess Engineering Principles”, Academic Press, London, USA, 2012.
4	B Sivasankar, “Bio-separations: Principles and Techniques”, Phi Learning Pvt. Ltd., 2009.

5	Ajay Kumar, Abishek Awasthi “Bio-separation Engineering: Comprehensive DSP Volumen” I.K International Publishing House Pvt. Ltd., New Delhi, 2009.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## ELECTIVE IV: ENERGY ENGINEERING

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of

1 | Unit operations, Heat Transfer, Mass Transfer

2 | Basic Mathematics and Numerical Techniques.

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures: 3 Hours/Week

End Semester Examination: 60 Marks

Theory : 03

Unit Test: 20 Marks

Total : 3Hours/Week

Continuous Assessment: 20 Marks

Total credits: 03

Total :100 Marks

**Course Outcomes:**

After completion of the course students would be able to

1. Know the basic energy sources *viz* conventional and non conventional.
2. Evaluate Energy balance and efficiency of any thermal system.
3. Understand the basic need for pinch analysis and HEN.
4. Formulate the problem for given energy system.
5. Model the given energy system and optimize it.
6. Understand different applications of non conventional energy systems.

### Topics covered

<b>UNIT-I</b>	<p><b>Basic Energy Sources :</b> Fossil fuels, Nuclear fuels. Conventional &amp; Renewable Energy Energy Sources: prospecting, extraction and resource assessment and their peculiar characteristics. Direct use of primary energy sources, Conversion of primary into secondary energy sources such as Electricity, Hydrogen, And Nuclear energy etc. Energy Conversion through fission and fusion, Nuclear power generation etc.</p>	<b>(06Hours)</b>
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<b>UNIT-II</b>	<b>Energy Management part I:</b> Importance of energy management. Energy auditing: methodology, analysis of past trends (plant data), closing the energy balance, laws of thermodynamics, measurements, portable and on line instruments. Steam Systems: Boiler -efficiency testing, excess air control, Steam distribution & use- steam traps, condensate recovery, flash steam utilization. Thermal Insulation.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Energy Management part II</b> Energy conservation in Pumps, Fans (flow control), Compressed Air Systems, Refrigeration& air conditioning systems. Heatexchanger networking- concept of pinch, target setting, problem table approach, composite curves.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Energy Systems Analysis:</b> Case studies of optimization in Energy systems problems. Dealing with uncertainty- probabilistic techniques. Trade-offs between capital & energy using Pinch Analysis. Case studies	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Application of Non-conventional energy systems in Industry:</b> Solar energy Applications, Wave Energy and Ocean Thermal Energy, Wind Energy, Biomass Energy, Energy from Waste.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Economic Analysis:</b> Initial and annual cost, basic definitions, present worth calculations, economic analysis of add on solar system, Energy audit	<b>(06 Hours)</b>

### Assignments

1.	Write a report on the recent advances in Energy Efficiency.
2.	Give fifteen minutes presentation (seminar) on particular topic and prepare a report.
3.	Compare the industrial data for energy utilization used in 5 different industries.
4.	Write a report on your heat transfer equipments to minimize energy loss.
5.	Present a seminar on Pinch Technology and HEN.
6.	Present a seminar on thermal equipments involved in industry.
7.	Prepare a model on non conventional energy sources and applications.
8.	Write a energy audit for any single industry.

### Text Books/References:

1.	J. Twidell and T. Weir, Renewable Energy Resources, E & F N Spon Ltd, London, 1986.
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2.	D. Y. Goswami, F. Kreith and J. F. Kreider, Principles of Solar Engineering, Taylor and Francis, Philadelphia, 2000
3.	L.C.Witte, P.S.Schmidt, D.R.Brown , Industrial Energy Management and Utilisation, Hemisphere Publ, Washington,1988.
4.	I.G.C.Dryden, Butterworths, The Efficient Use of Energy, London, 1982
5.	Freris L.L., Wind Energy Conversion Systems, Prentice Hall 1990.
6.	S.S.RaoOptimisation theory and applications, Wiley Eastern, 1990
7.	Beveridge and Schechter,Optimisation Theory and Practice,Mcgraw Hill, 1970
8.	Shenoy U. V., Heat Exchanger Network Synthesis: Processes Optimization by Energy
9.	Fowler, J.M., Energy and the environment, 2nd Edn., McGraw Hill, New York, 1984

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## ELECTIVE - IV: GREEN TECHNOLOGY

**Designation:** Elective

**Course Pre-requisites:**

Students should have basic knowledge of chemistry and pollution control.

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

Lectures : 3 Hours/Week

End Semester Examination : 60 Marks

Theory : 03

Practical : 2 Hour /Week

Unit Test : 20 Marks

Practical : 01

Total : 5 Hours/Week

Continuous Assessment : 20 Marks

Total credits : 04

Term Work/Oral : 50 Marks

Total : 150Marks

**Course Outcomes:**

After completion of the course students will be able to:

1. Identify the major environmental issues and describe the need for green technology.
2. Explain green technology principles and protocols.
3. Identify and explain the green synthetic methods.
4. Explain biochemical conversion and bio-photolysis.
5. Explain criteria for choosing appropriate green energy technologies, Green innovation & sustainability.
6. Explain the green house effects, global warming, carbon footprint and ways to overcome them using green technology.

### Topics covered

**UNIT - I**

**Introduction and need for green technology:**

Overview of Major Environmental Issues, Global Environmental Issues. Air Quality Issues. Water Quality Issues, Ecology, Natural Resources, Waste: Production, Prevention, Problems and Source of waste, cost of Waste, Waste minimization technique, waste treatment and recycling. Description of Risk. Value of Risk Assessment in the Engineering Profession. Risk-Based Environmental Law. Risk Assessment Concepts. Hazard Assessment, Risk Characterization. Role of Industry, Government and Institutions in green

**(06 Hours)**

	technology.	
<b>UNIT - II</b>	<p><b>Green technology principals and protocols:</b></p> <p>Importance, advantages and disadvantages of green technologies, factors affecting green technologies, the twelve basic principles of green chemistry. Sustainable development, atom economy, reduction of toxicity. Use of Renewable Feedstock, Reduction of Derivatives, Catalysis, Design for Degradation, Real-time Analysis for Pollution Prevention, Inherently Safer Chemistry for Accident Prevention.</p>	<b>(06 Hours)</b>
<b>UNIT - III</b>	<p><b>Green synthetic methods:</b></p> <p>Microwave synthesis, electro-organic synthesis, Design and development of environmentally friendly chemical pathways: challenges and opportunities. Materials for green chemistry and technology: Catalysis, environmental friendly catalysts, Bio-catalysis, biodegradable polymers, alternative solvents,</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Biochemical conversion:</b></p> <p>Anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Biophotolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Green innovation &amp; sustainability:</b></p> <p>Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends – process/product innovation, Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies).</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Green house effect and Global warming:</b></p> <p>Greenhouse gas emissions, impacts, mitigation and adaptation, carbon credit, carbon footprint ; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCCC), Kyoto protocol; sustainable development, Environmental reporting and ISO 14001; climate change business and ISO 14064; green financing; financial initiative by UNEP</p>	<b>(06 Hours)</b>



<b>Term Work:</b>	
Term work will consist of the seminars on the following topics.	
1	Major Environmental Issues and need for green technology
2	Green technology principals and protocols
3	Green synthetic methods
4	Biochemical conversion and Biophotolysis
5	Green innovation & sustainability
6	Green house effect and Global warming
<b>Assignments:</b>	
1.	Technical interview based on knowledge of green technology.
2.	Students have to study any five NPTEL videos related to green technology and prepare/present power point presentation.
3.	Group discussions on any one of the following topics.
	a) Major Environmental Issues.
	b) Green innovation & sustainability.
	c) Global warming
4	Prepare a report on innovations in green technology and their practical importance.
5	Conducting open-book class test.
6	Conducting surprise Multiple choice questions (MCQs) test for students
7	Students have to study any five research papers related to specific topic and prepare/present power point presentation
8	With the help of this subject knowledge, write a report on how you would apply your concepts in industry.
9	Case study on emerging trends in process/product innovation considering green technology.
10	Students have to visit chemical industry and make a detailed report on green technologies used in the process.
11	Write a report on your visit to research and development laboratory of national/international repute.
12	Write a report on eco/green technologies for addressing the problems of Water and Energy.
13	Write a report on eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity (WEHAB).

In addition to these above stated assignments concern faculty member may design his/her own assignments.

**Text Books/ References:**

1	Paul Anastas, John C. Warner, John Warner Joint; Green Chemistry: Theory & Practice New Edition; Oxford University press, USA, 2000.
2	Mukesh Doble and Anil Kumar Kruthiventi, Green Chemistry and Engineering, Elsevier, Burlington, USA, 2007.
3	Allen, D.T., Shonnard, D.R, Green Engineering: Environmentally Conscious Design of Chemical Processes. Prentice Hall PTR 2002.
4	Baird, C. and Cann, M., <a href="#">Environmental Chemistry</a> , 4 <sup>th</sup> Edition, W.H. Freeman and Company, New York, 2008.
5	Paul T. Anastas, Walter Leitner, Phillip G. Jessop, Chao-Jan Li, Peter Wasserscheid, Annegret Stark; Handbook of Green Chemistry, 3 Volume set, Green solvents; Wiley-VCH.
6	Paul T. Anastas, Istvan T. Horvath ; Green Chemistry for a sustainable future; Wiley-Blackwell publishers, 2010.
7	V.K. Ahluwalia, M. Kidwai; New Trends in Green Chemistry; Kluwer Academic Publishers.

**Syllabus for Unit Test:**

Unit Test - I	UNIT– I, II, III
Unit Test - II	UNIT– IV, V, VI

**BHARATI VIDYAPEETH**  
**DEEMED UNIVERSITY, PUNE**  
**B.Tech. (Civil) (Sem - I) -2014 Course**

Sr. No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Sem. Exam	Continuous Assessment			T W	Total	Theory	T W
						Unit Test	Attendance	Assignments				
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1
6.	Professional Skill Development-I	2	--	--	30	--	--	20	--	50	2	-
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

\*End Semester Exam of increased duration by 1 hour.

**Choice Based Credit System Structure for Undergraduate Course**

**BHARATI VIDYAPEETH**  
**DEEMED UNIVERSITY, PUNE**  
**B. Tech. (Civil) (Sem - II) - 2014 Course**

Sr.No.	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-
9.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1
10.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1
11.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
12.	Building Construction	3	2	-	60	20	10	10	25	125	3	1
13.	Professional Skill Development-II	2	--	-	30	--	--	20	--	50	2	-
14.	Workshop Technology	--	2	-	--	---	--	--	50	50	-	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

**Total Marks of Sem-I and Sem-II = 1400**

**Total Credits of Sem-I and Sem-II = 50**

**BHARATI VIDYAPEETH  
DEEMED UNIVERSITY, PUNE  
ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment:40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

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**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank, System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

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**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :-Unit IV,V,VI**

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<b>02: Fundamentals of Civil Engineering</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Concepts of units and conversions of units.	
<b>2.</b>	Basic knowledge of Chemistry	
<b>3.</b>	Basic knowledge of geography, concept of latitude and longitude.	
<b>Course Objectives:</b>		
	To make student understand the scope and application of Civil Engineering	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	Different building components and material	
<b>2.</b>	Classification of surveying	
<b>3.</b>	Levelling of the ground	
<b>4.</b>	Planning of building	
<b>5.</b>	Methods of irrigation and water supply	
<b>6.</b>	Different methods of transportation	
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>	<b>(06 Hours)</b>



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	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
<b>UNIT - II</b>	<b>Surveying</b>	<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>	<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.	
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>	<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation.  Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>	<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>

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	<p>Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
<b><u>Term Work:</u></b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers	

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	,New Delhi
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication
<b>Reference Books:</b>	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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**ENGINEERING GRAPHICS**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: - 40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b></p> <p>Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b></p> <p>Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b></p> <p>Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b></p> <p>Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b></p> <p>Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b></p>	(6)

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	Projection of prism, pyramid, cone and cylinder by rotation method.	
Unit VI	<b>Section of Solids</b>  Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.	(6)

**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.  
Assignment 05 Problems on each unit in A3 size Drawing Book

**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second

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law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08 hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

**UNIT-VI**

**ARCHITECTURAL ACOUSTICS**

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption

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coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

**QUANTUM MECHANICS**

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

**TERM WORK**

**Experiments**

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

**Assignments**

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).



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**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

***Reference Books:***

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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<b>02: Fundamentals of Electrical Engineering</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Mathematics	
<b>2.</b>	Physics	
<b>Course Objectives:</b>		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
<b>Course Outcomes:</b>		
<b>1.</b>	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
<b>2.</b>	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
<b>3.</b>	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
<b>4.</b>	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
<b>5.</b>	Define basic terms of single phase and three phase ac circuits and supply systems	
<b>6.</b>	Know and use electrical safety rules	

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<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling,</p> <p>Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency &amp; Regulation by direct load test.</p>	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>

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	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	
<b><u>Term Work:</u></b>		
The term work shall consist of record of minimum eight exercises / experiments.		
<ol style="list-style-type: none"> <li>1. Determination of resistance temperature coefficient</li> <li>2. Verification of Superposition Theorem</li> <li>3. Verification of Thevenin's Theorem</li> <li>4. Verification of Kirchoff's Laws</li> <li>5. Verification of Maximum power transfer Theorem</li> <li>6. Time response of RC circuit</li> <li>7. Study of R-L-C series circuits for <math>X_L &gt; X_C</math> , <math>X_L &lt; X_C</math> &amp; <math>X_L = X_C</math></li> <li>8. Verification of current relations in three phase balanced star and delta connected loads.</li> <li>9. Direct loading test on Single phase transformer <ol style="list-style-type: none"> <li>a) Voltage and current ratios.</li> <li>b) Efficiency and regulations .</li> </ol> </li> <li>10. Study of a Residential (L.T.) Bill</li> </ol>		
<b>Text Books:</b>		
1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi		
2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi		
3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd		
<b>Reference Books:</b>		

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1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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**07: Computer Applications in Civil Engineering-I**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: --	End Semester Examination: ---	-----
Practical: 02 Hours / Week	Continuous Assessment:	
	Term Work: 50 Marks	01 Credit

**Course Pre-requisites:**

The students should have

1. Basic knowledge of computer components, systems and operating of computer
2. Basic mathematical ability

**Course Objectives:**

To develop an ability to use MS- Excel and MS- Power Point

**Course Outcomes:**

1. To solve different problems using M S- Excel
2. To generate various graphs and charts by analyzing the given data in Excel
3. To present different problems in various slides using M S – Power Point

Use of computers in Civil Engineering is increasing day by day. Various analysis and design problems can be solved by preparing the programs in Microsoft Office Excel. Also to present any problem properly, knowledge Microsoft PowerPoint is required. Use of Microsoft Office Excel and PowerPoint will make the candidate to analyze and present different problems, the details of which are as listed below:

**Learning Microsoft Excel:**

- Introduction
- Getting Started
- Data analysis and Calculations using relevant formulae.
- Generate graphs and charts.

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**Learning Microsoft PowerPoint:**

- Introduction
- Getting Started
- Preparation of various slides
- Preparing presentation by giving different effects to the data entered.

**Term Work:**

Term work shall consist of **8 assignments** as follows:

- 1) Introduction to Microsoft Excel
- 2) Preparation of Excel Sheets with various solved equations.
- 3) Graphical representation of different data.
- 4) A mini project with Microsoft Excel
- 5) Introduction to Microsoft PowerPoint.
- 6) Preparation of slides.
- 7) Insertion of clipart, word-art, histograms, different shapes and various charts.
- 8) A mini project with Microsoft PowerPoint.

**Reference Books:**

1) "Excel 2013 Bible" by John Walkenbach

2) "Excel 2010 All-in-one For Dummies" by Greg Harvey

3) "Microsoft PowerPoint 2013 Introduction Quick Reference Guide" by Beezix Inc.

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ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**

**Lectures: 3Hrs/Week**

**Tutorials: 1Hr/Week**

**Examination scheme:**

**End Semester Examination: 60 marks**

**Continuous Assessment: 40 marks**

**Credits Allotted:**

**Theory : 03**

**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**



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**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I, II, III**

**Unit Test II :- Unit IV, V, VI**

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**FUNDAMENTALS OF MECHANICAL ENGINEERING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b></p> <p>Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b></p> <p>Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines,</p> <p>Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b></p> <p>Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)

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UNIT-III	<p><b>Energy Sources -</b></p> <p>Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b></p> <p>Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p><b>Properties of fluids-</b></p> <p>Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b></p> <p>Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b></p> <p>Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<p><b>Mechanisms-</b></p> <p>Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	
UNIT-VI	<p><b>Machine Tools-</b></p> <p>Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b></p> <p>Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

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**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

**References-**

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.

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8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.

9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,  
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House,  
Ludhiana. 8th edition

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**10: Engineering Mechanics**

<u>TEACHING SCHEME:</u>		<u>EXAMINATION SCHEME:</u>		<u>CREDITS ALLOTTED:</u>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have knowledge of					
1.	Scalar and Vector				
2.	Newton's law of motion				
3.	Law of friction				
4.	Concept of physical quantities, their units and conversion of units				
5.	Concept of differentiation and integration				
<b>Course Objectives:</b>					
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.				
<b>Course Outcomes:</b>					
<b>The student should be able to</b>					
1.	calculate resultant and apply conditions of equilibrium.				
2.	analyze the truss and calculate friction force.				
3.	calculate centroid and moment of inertia.				
4.	solve problem on rectilinear motion.				
5.	solve problems on curvilinear motion.				
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.				

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<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach..  Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.  Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	



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	Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>		
<b>A)</b> The term-work shall consist of minimum <b>Five</b> experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
<b>B)</b> The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.		
<b>Text Books:</b>		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
<b>Reference Books:</b>		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

**BHARATI VIDYAPEETH  
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ENGINEERING CHEMISTRY**

**Teaching Scheme:**  
**Lectures: 4Hrs/Week**  
**Practical: 2Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory: 04**  
**Practical: 01**

**Term Work:**

**25marks**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming

Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning

Numerical based on the zeolite process

**(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography :** Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement :** Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

**(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

**(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

**(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

**(08 Hours)**

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**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

**References / Text Books :**

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

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**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**12: Building Construction**

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have basic knowledge of					
1.	Fundamentals of civil Engineering				
2.	Concept of Engineering Graphics				
<b>Course Objectives:</b>					
	To develop the knowledge of building components, materials and construction practices				
<b>Course Outcomes:</b>					
<b>The student should able to</b>					
1.	understand different types of foundation and masonry.				
2.	design staircase .				
3.	understand types of Arches and flooring.				
4.	understand different methods of building finishes.				
5.	know different types of formworks.				
6.	understand different properties of construction materials.				
<b>UNIT - I      Building Foundations And Masonry      (06 Hours)</b>					
	Building foundations: Necessity,Types, Building and its components,				

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	Masonry : Stone, Brick ,Types of bonds in brick masonry, Composite masonry, Hollow and Solid block masonry, Mortars used in construction.	
<b>UNIT - II</b>	<b>Doors , Windows And Stairs</b>	<b>(06 Hours)</b>
	Doors: Classification, Terminology used, Frames, Sizes . Windows :Types , Sizes. Stairs : Classification , Terminology used ,Design of stairs. Lifts,, Escalators, Ramps.	
<b>UNIT - III</b>	<b>Arches, Lintels And Floors</b>	<b>(06 Hours)</b>
	Arches: Classification, Terminology used,, Stability Lintels :Types, Details of R.C.C. lintels and chhajja. Flooring: I.S. Specifications, Types , Factors for selection of flooring.	
<b>UNIT - IV</b>	<b>Roof Construction</b>	<b>(06 Hours)</b>
	Roofs :Types, Suitability, Roof structures, Selection of roof covering material, Methods of water proofing of roofs, Types of trusses, Fixtures & fastenings	
<b>UNIT - V</b>	<b>Building Finishes</b>	<b>(06 Hours)</b>
	Plastering : Methods, tools used, Mortars, Defects ,Plaster of Paris. Pointing: Types, Methods of pointing Paints : Types , Textures, Apex, Plastic emulsion , Wall cladding and its Materials	
<b>UNIT - VI</b>	<b>Formwork , Scaffolding And Smart Materials</b>	<b>(06 Hours)</b>
	Formwork : Necessity , Materials , Factors for selection , Types. Scaffolding : Necessity , Materials ,Factors for selection . Precast concrete , Ferrocete , Nanoconcrete , Green construction materials, Tremix	

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<b>Term Work:</b>	
<b>Plates-(1/4 imperial size)</b>	
a. Symbols of Material & structures	
b. Section of wall	
c. Brick bonds - English bond, Flemish bond	
d. Types of stone masonry	
e. Arches - any three	
f. Types of steel trusses - any three	
g. Paneled Door & Flush doors.	
h. M.S. Window, Aluminum Window, Louvers Windows	
Collection of information brochures related to Construction Material.	
<b>Assignment</b> :One from each Unit.	
<b>Text Books:</b>	
1) "Building Construction"-Rangwala,Charotar Publication	
2) "The Text Book of Building Construction"-S.P.Arora& S.P.Bindra-DhanpatRai Publication	
3) " Building Technology and Valuation"- TTTI Madras,-- Tata McGraw Hill Publication	
<b>Reference Books:</b>	
1) " My Construction Practices "R.B.Chaphalkar	
2)"A to Z" Building Construction" Mantri Publications	
3) "Materials of Construction" – Ghose- Tata McGraw Hill Publications	
4) " Civil engineering Material'- TTTI Chandigarh- Tata McGraw Hill Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VII

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Workshop Technology**

**TEACHING SCHEME:**

Theory: -

Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -

Continuous Assessment: -

Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances

Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.

Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.



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**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.

Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme: B. Tech. (Civil) – Sem III - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
1.	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
2.	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
3.	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
4.	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
5.	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
6.	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
7.	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
8.	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	<b>Total</b>	<b>20</b>	<b>08</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

\*End Semester Exam of duration 4 hours.

**Programme: B. Tech. (Civil) – Sem IV - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
9.	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
10.	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
11.	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
12.	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
13.	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
14.	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
15.	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
16.	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>20</b>	<b>5</b>	<b>25</b>

**Total Credits**

**Semester III = 25**

**semester IV = 25**

**Grand Total = 50**

## 01: BUILDING PLANNING , DESIGN AND BYELAWS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory : 3 Hours/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 1 Hour/ Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Student Should have		
1	Fundamentals of Civil Engineering	
2	Building Construction Practices	
<b>Course Objective:</b>		
	To make the student understand the process of building planning and building byelaws	
<b>Course Outcomes:</b>		
Student will be able to		
1	describe various types of buildings, their planning and building byelaws.	
2	apply design considerations for climate, ventilation and lighting in building planning.	
3	apply design considerations for Noise & acoustics, fire protection, Electrical & telecommunication and circulation in building planning.	
4	apply design considerations for plumbing services in building planning.	
5	explain the legal aspects of plan sanctioning.	
6	explain the role of town planning authority and various presentation drawings.	
<b>Unit -I</b>	<b>Buildings, Types, Planning and Regulations :</b>	<b>(06 Hours)</b>
	Types of Residential Building units – Bungalows, Twin bungalows, Row houses, Apartments; Requirements of Public buildings - Educational buildings, buildings for health care, industrial buildings and commercial buildings; Principles of planning for building, Integrated approach necessity. Building Rules Regulations and Byelaws necessity, plot size, open space around the building. FSI, Building line, control line. Height, room size, Built up area, floor area, carpet area. Rules of lighting ventilation, Drainage and Sanitation; Types of drawings - Submission drawings, working drawings and Architectural drawing.	

<b>Unit II</b>	<b>Building Services I</b>	<b>(06 Hours)</b>
	(a)Climate - elements of climate, global climate, thermal design Principles, comfort sectors, Heat exchange of building. Thermal insulation of roof and wall. (b)Ventilation and lighting - comfort factors, function of ventilation, stack effect wind effect. Mechanical ventilation, ventilation rate, Air conditioning-design data, cooling load, Air conditioning systems. (c) Noise and acoustics –Effect of noise, comfort standards, Noise control sound insulation, Acoustics reverberation Sabines formula acoustical defects conditions of good acoustics.	
<b>Unit III</b>	<b>Building Services II</b>	<b>(06 Hours)</b>
	(a) Plumbing services, fixtures and fastenings, Layout of water supply & drainage system, Rate of water supply, storage and distribution arrangement, Plumbing systems, (b)Fire Protection – Fire safety, fire load, grading of occupancies by fire load, fire escape elements. (c)Constructional requirements for different building services like Electrical, Telecommunication services, Circulation-Lift escalators, Entertainment services.	
<b>Unit IV</b>	<b>New Planning Concepts of Buildings</b>	<b>(06 Hours)</b>
	Layout plans of different types of buildings, Design and planning of ECO Friendly building, Intelligent building, Low Cost Housing, Planning considerations in High rise buildings.	
<b>Unit V</b>	<b>Legal Aspects of Plan Sanctioning</b>	<b>(06 Hours)</b>
	Role of Plan Sanctioning Authority for layout, co-op Housing societies and apartments. Ownership of land, plot, 7/12 abstract, meanings of different terms of 7/12 abstract, 6-D form, list of documents to be submitted along with building Plan for sanction from the authority. TDR, certificate of commencement and completion, various no objection certificates to be produced, format of permissions from pollution control board, MSEB, Water Supply and Drainage Department, State or National Highway Department.	
<b>Unit VI</b>	<b>Town Planning and Presentation drawings</b>	<b>(06 Hours)</b>
	(a) Necessity of town planning in India. Importance of safety, amenities and services, Development plan, Land use- zoning: Introduction to different zones of land in town planning, Requirements of residential zone, commercial industrial and agricultural zone, open areas, green belts and parks. (b) Axonometric, Perceptive-One point and Two point.	

**Term work** : It shall consist of :

1.	Preparation of working drawings of any one of the buildings listed below: a) Residential Building b) Commercial Building c) Educational Building d) Industrial Building e) Recreational Building f) Health Club
2.	Sheets to be drawn a) Plan/Typical floor plan to a suitable scale. b) Elevation and section to a suitable scale. c) Site plan showing water supply and Drainage d) Foundation Plan to a suitable scale.
3.	Line plan of remaining five buildings.
4.	Perspective Drawing of different objects.

<b>Assignments:</b>	
1	Study of building bye laws and D.C. rules of local authority
2	Study of different types of drawings.
3	Data collection with respect to climate , ventilation and lighting in building planning.
4	Study of various components of water supply and drainage system of buildings.
5	Case studies with respect to fire fighting of high rise building.
6	Case studies with respect to lift and escalators.
7	Study of constructional requirements with respect to electrical services in buildings.
8	Case studies of Ecofriendly and intelligent buildings.
9	Collecting information about legal aspects of building planning.
10	Writing report on development plan.
<b>Text Books :</b>	
1.	Bindra Arora, “Building Construction”, Laxmi Publication
2.	M. L. Shah, C. M. Kale, S. Y. Patki, “Building Drawing with integrated approach to Built Environment”, Tata McGraw Hill Publishers
3.	Rangwala, “Town Planning” , Charaotar Publications
<b>References :</b>	
3.	IS provisions “National Building Code”
4.	“Development Control Rules” of local plan sanctioning authority
5.	Calendar, “Time Saver Standards for Architectural Design”, Tata McGraw Hill Publishers
6.	Merit, “Building Design and Construction”, Tata McGraw Hill Publishers
<b>Syllabus for Unit Test:</b>	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

## 02: APPLIED GEOLOGY

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Unit Test: 20Marks	
	Assignment : 10 Marks	
	Attendance: 10 Marks	
	TW & Practical : 50 Marks	01 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of engineering science	
<b>Course Objectives:</b>		
	To make students understand physical geology, mineralogy, petrology, structural & Indian geology, surface & sub surface water, geological investigation for tunnel, dam, reservoir & bridge	
<b>Course Outcomes:</b>		
1.	Students should be able to identify different rocks & minerals.	
2.	Students should be able to explain Geology of River, Mountain earthquakes & volcanism to decide the location ,type of foundation and type of civil engineering structure	
3.	Students should be able to identify different Geological structures to decide location and type of civil engineering structure.	
4	Students should be able to determine influence of texture & structures of rocks on occurrence of Ground water.	
5	Students should be able to prepare Geological maps and Geological sections for subsurface investigations.	
6	Student should be able to explain different methods of core drilling and core preservation	
<b>UNIT - I</b>	<b>Physical Geology &amp; Introduction to Engineering Geology:</b>	<b>(06 Hours)</b>
	Origin of Earth, Surface Relief of the earth, Earth Movement, Earthquake, Interior of the Earth, Volcanicity: Product of Volcanoes, types of mountains, Different Branches of Geology, Engineering Geology as a Subject.	
<b>UNIT - II</b>	<b>Mineralogy and Petrology:</b>	<b>(06 Hours)</b>
	Mineralogy: Formation Process of Minerals, Types of Minerals, Classification of Minerals.  Petrology- Rocks & minerals, Igneous rocks- mineral composition, texture, classification of igneous rock, study of common rock types, secondary rocks- weathering, texture & structure of sedimentary rocks & its classification, metamorphic rocks, agents & types of metamorphism,	

	metamorphic textures Building stones.	
<b>UNIT - III</b>	<b>Structural Geology &amp; Indian Geology:</b>	<b>(06 Hours)</b>
	Structural Geology- Outcrop, dip & strike, conformable series, unconformity & overlap, faults & folds in rocks, mode of occurrence of igneous rocks, joints & fractures.  Indian Geology- General Principles of stratigraphy, age of the earth & divisions of geological time, physiographic divisions of India & their characteristics, geological history of peninsula, study of formation in peninsula.	
<b>UNIT - IV</b>	<b>Water: Surface &amp; Sub Surface</b>	<b>(06 Hours)</b>
	Surface Water: Geological action of running water, river valley development, normal & regional cycle of river erosion, waterfalls, ox-bow lakes, flood plane deposits, deltas, rejuvenation & resulting features.,  Sub - Surface Water: Types of Groundwater, depth zones of groundwater, perched water table, pervious & impervious rocks, geological work done by groundwater, natural springs & seepages, effect of pumping, cone of depression, circle of influence, conservation of groundwater, artesian wells, water bearing capacity of common rocks.	
<b>UNIT - V</b>	<b>Geological Investigations</b>	<b>(06 Hours)</b>
	Preliminary geological investigations- use of geological maps & sections, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts etc., limitation of drilling, engineering significance of geological structures,  Tunneling- Influence of geological condition on design & construction method, preliminary geological investigations for tunnels, important geological considerations while choosing alignment, difficulties during tunneling, as related with lithology, nature & structure of materials to be excavated, role of groundwater, geological conditions likely to be troublesome, suitability of common rock types for tunneling, case studies.	
<b>UNIT - VI</b>	<b>Geological Aspects at Dams, Reservoirs &amp; Bridges</b>	<b>(06 Hours)</b>
	Geology of dam site- preliminary geological work at dam site, influence of geological condition on the choice of types & design of dam, favorable & unsuitable geological conditions for locating a dam i.e. landslide, treatment of leaky rocks & geological structures, case studies.  Geology of reservoir sites- Dependence of water tightness on physical properties & structures of rocks, geological conditions suitable & unsuitable	



	<p>for reservoir sites, conditions likely to cause leakage through reservoir rim, importance of groundwater studies &amp; effect of rising of water table, case studies.</p> <p>Geology of Bridge Sites- Preliminary geological exploration for bridge piers &amp; bridge abutments, scouring &amp; erosion around bridge piers, influence of nature &amp; structure of rocks on bridge foundation, case studies.</p>	
<p><b><u>List of Practicals / Term work:</u></b></p> <ol style="list-style-type: none"> <li>1) Identification of the Minerals (Two Practical)</li> <li>2) Identification of Igneous rocks (Two Practical)</li> <li>3) Identification of Secondary rocks (Two Practical)</li> <li>4) Identification of Metamorphic rocks (Two Practical)</li> <li>5) Study of Contoured Geological Maps &amp; drawing the sections (Six Practical)</li> <li>6) Visit to site of Dam / Tunnel for understanding the geological features.</li> </ol>		
<p><b><u>Assignments</u></b></p> <ol style="list-style-type: none"> <li>1) Collect and describe rock forming minerals &amp; ore forming minerals</li> <li>2) Collect and describe igneous rocks</li> <li>3) Collect and describe secondary rocks</li> <li>4) Collect and describe metamorphic rocks</li> <li>5) Collect information and photographs of volcanoes</li> <li>6) Collection of information about waterfalls &amp; ox-bow lakes in India</li> <li>7) Collection of data about different geological structures like folds, faults &amp; unconformities</li> <li>8) Conduct survey of ground water in India\</li> <li>9) Conduct survey of geological conditions suitable for tunneling.</li> <li>10) Conduct survey of geological conditions suitable for dam .</li> </ol>		
<p><b><u>References.</u></b></p> <ol style="list-style-type: none"> <li>1) Gupte R. B., “A Text Book of Engineering Geology”, P. V. G. Publications, Pune</li> <li>2) Legget R., “Geology and Engineering”, McGraw Hill Book Co., London</li> <li>3) Trefethen J. M., “Geology for Engineers”, D Van Nostrand Co. Inc.</li> <li>4) Schultz J. R. and A. B. Cleaves, “Geology in Engineering”, John Wiley Inc.</li> <li>5) Engineering Geology &amp; General Geology by Parbin Singh.</li> <li>6) General Geology &amp; Engineering Geology by Dr. P. T. Sawant, New Delhi Publication.</li> </ol>		
<p><b>Syllabus for Unit Test:</b></p>		
<p>Unit Test -1</p>	<p>UNIT – I, UNIT – II, UNIT - III</p>	
<p>Unit Test -2</p>	<p>UNIT – IV, UNIT – V, UNIT - VI</p>	

### 03.ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS ALLOTTED</u>
Theory: 03 Hours / Week	Continuous Assessment 40 Marks	03 Credits
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Civil Engineering	
2.	Mathematics	
<b>Course Objectives:</b>		
	To make students understand engineering economics and financial management	
<b>Course Outcomes:</b> The Student will be able to		
1.	The Student will be able to draw organization chart.	
2.	The Student will be able find out time value of money.	
3.	The Student will be able select best project.	
4.	The Student will be able find out depreciation cost.	
5.	The Student will be able prepare balance sheet.	
6.	The Student will be able generate finance for his organization.	
<b>UNIT - I</b>	<b>Elementary Economics</b>	<b>(06 Hours)</b>
	Definition of Economics, nature, scope and importance of Engineering economics, basic economics concept-Human wants. Utility, value, cost, price, profit, capital, wealth, equilibrium etc. law of demand, elasticity of demand. The law of supply. Factors influencing production: land, labor, capital and organization.	
<b>UNIT - II</b>	<b>Engineering Economics</b>	<b>(06 Hours)</b>
	Basic principles, time value of money, cash flow diagram. Equivalence-single payment in the future, present payment compare to uniform series payment. Future payment compare to uniform series payment.	
<b>UNIT - III</b>	<b>Project Economics Analysis</b>	<b>(06 Hours)</b>
	Comparison of alternatives, net present value present, future and annual worth method of comparing alternatives, internal rate of return. Break even analysis. Benefit cost ratio	

<b>UNIT - IV</b>	<b>Depreciation and Value Engineering</b>	<b>(06 Hours)</b>
	Depreciation and methods of depreciations. Inflation, value engineering and value analysis.	
<b>UNIT - V</b>	<b>Financial Management</b>	<b>(06 Hours)</b>
	Financial management, construction accountancy charts of accounts, financial statement, profit and loss account, balance sheet, insurance audits and financial risk aspects	
<b>UNIT - VI</b>	<b>Project Budgeting</b>	<b>(06 Hours)</b>
	Types of capitals, fix and working capital, debentures, shares, public deposits. Forms of foreign capital, money and capital market in India. New economical policy. Role of financial institutions in economical development, RBI government of India guidelines for foreign funding in construction projects.	

#### **Assignments**

- 1) Preparation of organization chart for small construction project
- 2) Preparation of organization chart for large construction project
- 3) Preparation of cash flow diagrams and finding out time value of money
- 4) Comparison of different projects by different methods
- 5) Benefit cost analysis of project
- 6) Determination depreciation value of equipments
- 7) Preparation of balance sheet for project
- 8) Assignment on value analysis
- 9) Collection of data regarding RBI government of India guide lines for foreign funding in construction project.
- 10) Numericals on engineering economics

#### **References Books**

- 1 Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
- 2 Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
- 3 Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
- 4 Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
- 5 Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
- 6 Harris, F. , McCaffer, R. and Edum-Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
- 7 Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.
- 8 Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Indian Edition, Oxford University Press, 2010.

- 9 Ostwald, P. F., “Construction Cost Analysis and Estimating”, Prentice Hall, Upper Saddle River, New Jersey, 2001.
- 10 Peterson, S. J., “Construction Accounting and Financial Management”, Pearson Education, Upper Saddle River, New Jersey, 2005.
- 11 Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., “Construction Planning, Equipment, and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.
- 12 Peurifoy, R. L. and Oberlender, G. D., “Estimating Construction Costs”, 5th ed., McGraw-Hill, New Delhi, 2004.
- 13 Schexnayder, C. J. and Mayo, R. E., “Construction Management Fundamentals”, International Edition, McGraw-Hill, 2003.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

## 04 : MECHANICS OF SOLIDS

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
<b>Course Pre-requisites:</b> The students should have knowledge of-					
<b>1.</b>	Engineering Mechanics				
<b>Course Objectives:</b>					
The student should be able to calculate stresses developed in the material.					
<b>Course Outcomes:</b> The student will be able to					
<b>1.</b>	calculate stresses due to axial force.				
<b>2.</b>	calculate shear force and bending moment in the beam.				
<b>3.</b>	calculate bending stress and deflection in the beam.				
<b>4</b>	calculate shear stress due to shear force and torsion.				
<b>5</b>	calculate critical load for column.				
<b>6</b>	calculate principal stresses.				
<b>UNIT - I Simple Stresses and Strains: (08 Hours)</b>					
	Concept of stress and strain: Normal, lateral, shear and volumetric stresses and strains, Stress-strain curve; Elastic constants and their inter relationship; Generalized Hooke's law; Stresses due to Axial Load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.				
<b>UNIT - II Shear Force and Bending Moment in Beams: (08 Hours)</b>					
	Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments;				
<b>UNIT - III Bending Stresses and Deflection of Beam: (08 Hours)</b>					
	Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexure formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Force resisted by partial cross section. Deflection of Beams: Concept of relation between deflection, slope, bending moment, shear force and intensity of loading; Macaulay's method, Elastic curve.				
<b>UNIT - IV Shear Stresses: (08 Hours)</b>					
	Shear Stresses: Concept of direct and transverse shear; Shear stress formula; concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section. Torsion of Circular Shafts: Theory, assumptions and derivation of torsional				

	formula; Shear stress distribution across cross section; Twisting moment diagram; Shear stresses and strains in determinate and indeterminate shafts of hollow, solid, homogeneous and composite cross sections subjected to twisting moment; Torsional rigidity.	
<b>UNIT - V</b>	<b>Combined Stresses and Axially Loaded Column:</b>	<b>(08 Hours)</b>
	Combined Axial and Bending Stress: Concept; Resultant stress due to the axial load and uni-axial or biaxial bending; Core of section. Axially Loaded Long Columns: Concept of critical load and buckling; Differential equation of elastic curve; Euler's formula for hinged ends; Equivalent length for different end conditions; Limitation of Euler's formula; Rankine's formula, Determination of critical load.	
<b>UNIT - VI</b>	<b>Principal Stresses and Principal Planes:</b>	<b>(08 Hours)</b>
	Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes. Maximum shear stress; Analytical and graphical method (Mohr's circle method); Combined effect of axial force, bending moment, shear force and torsion.	
<b>Assignments:</b>		
<b>1</b>	Explain different types of stresses with practical example.	
<b>2</b>	Write physical properties of different metals.	
<b>3</b>	Draw shape of SFD and BMD for different types of loading.	
<b>4</b>	Draw SFD and BMD for beams.	
<b>5</b>	Draw bending stress distribution diagram across section	
<b>6</b>	Calculate bending stress at particular point.	
<b>7</b>	Draw deflected shape of beam for different support conditions.	
<b>8</b>	Calculate slope and deflection at particular point.	
<b>9</b>	Draw shear stress distribution diagram across section	
<b>10</b>	Calculate shear stress at particular point.	
<b>11</b>	Explain application of shafts in series and in parallel.	
<b>12</b>	Calculate twist/torque/stresses in shaft.	
<b>13</b>	Draw effect of combined axial and flexure stress.	
<b>14</b>	Draw deflected shape of column under different support conditions.	
<b>15</b>	Calculate critical load for column.	
<b>16</b>	Explain principal stresses and strains.	
<b>17</b>	Draw Mohr's circle for different stresses.	
<b>Text Books:</b>		
1) R. C. Hibbeler, "Mechanics of Materials", Pearson Prentice Hall,		
2) Rajput R. K., "Strength of Materials", S. Chand Publication		
3) Punmia B. C., Jain, Ashok Kr. Jain Arun Kr., "Mechanics of Materials", Laxmi Publication.		
4) Ramamrutham S. & Narayan R., "Strength of Materials", Dhanpat Rai Publishing Co.		
<b>Reference Books:</b>		
1) Beer F..P. and Johnston E.R., "Mechanics of Materials", McGraw Hill Publication		
2) Gere J.M. & Timoshenko S.P., "Mechanics of Materials", CBS Publishers & Distributors		
3) Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication		

4) Popov E. P., “Engineering Mechanics of Solids”, Prentice Hall of India (P) Ltd.	
5) Singer F. L. & Pytel A., “Strength of Materials”, Harper and Row Publication	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 05: CONCRETE TECHNOLOGY

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
		Continuous Assessment: 40 Marks			
<b>Course Pre-requisites:</b>					
The Students should have knowledge of					
1.	Fundamentals of Civil Engineering				
2.	Engineering Chemistry				
<b>Course Objectives:</b>					
	The student should know qualities & properties of concrete.				
<b>Course Outcomes:</b>					
The student will be able to					
1.	test Ingredients of concrete.				
2.	measure Workability of concrete.				
3.	measure strength of Hardened concrete.				
4.	design of Concrete Mix.				
5.	describe Durability of concrete.				
6.	explain the use of Admixtures.				
<b>UNIT - I</b>	<b>Ingredients of Concrete:</b>				<b>(06 Hours)</b>
	Cement: Manufacture of Portland cement, Chemical Composition, Bogues compounds, Hydration of cement, Structure of Hydrated cement, ASTM classification and types of cement, Tests of cement and I.S. requirements for ordinary Portland cement. Aggregates: Classification, Properties of aggregates, Deleterious materials, Soundness, Alkali-Aggregate Reaction, Grading of aggregates, Standard Grading curves, Testing of aggregates, Artificial & recycled aggregates. Water: Quality of water IS requirements, Use of sea water.				
<b>UNIT - II</b>	<b>Fresh Concrete:</b>				<b>(06 Hours)</b>
	Workability: Factors affecting workability, Measurements of workability, Suitability of concrete based on degree of workability, Segregation, bleeding. Concreting Process: batching, mixing, transporting, placing and compaction. Curing of Concrete: Methods of curing (study of machinery not expected), Effect of temperature on curing, Steam curing, curing compounds, period for curing, stripping time.				
<b>UNIT - III</b>	<b>Hardened Concrete:</b>				<b>(06 Hours)</b>
	Properties of Hardened concrete Strength of Concrete: General, Compressive strength, Factors affecting strength, Maturity Concept, Tensile strength, Relation between compressive and tensile				



	strength, Flexural strength, Testing under central and third point loading, Shear strength, Bond strength, Elasticity, Creep and Shrinkage: Stress-Strain relation, Modulus of Elasticity, Creep-time curve. Non Destructive Testing: Schmidt's Rebound hammer, Ultrasonic Pulse velocity method.	
<b>UNIT - IV</b>	<b>Concrete Mix Design:</b>	<b>(06 Hours)</b>
	Concept of mix design, Variables in mix design, Statistical Quality Control, Various methods of mix design, Design of mix by Indian Standard recommended method (IS: 10262 & IS: 456), Acceptance criteria.	
<b>UNIT - V</b>	<b>Admixtures in Concrete:</b>	<b>(06 Hours)</b>
	Purpose and functions, Classification Chemical Admixtures: Plasticizers, Super-Plasticizer, Retarders, Air entraining agents, Compatibility of admixtures and cement, Marsh Cone Test. Mineral Pozzolanic/Admixtures:- Fly ash, Silica fume. Self Compacting Concrete, Roller Compacted Concrete, Ready mix concrete; High Performance Concrete.	
<b>UNIT - VI</b>	<b>Special Concrete and Durability of Concrete:</b>	<b>(06 Hours)</b>
	Special Concrete: Light weight concrete, Polymer Concrete, Fiber reinforced concrete, Ferro-cement. Special Concreting: Under water concreting, Cold weather concreting. Durability of Concrete: Definition, Significance, Strength and durability relationship; Permeability, Chemical attack; Sulphate attack; Chloride attack, attack by sea water, Carbonation and measurement of depth of carbonation, Requirement for durability as per IS 456.	

**ASSIGNMENTS:**

- 1) To find the types of cement from market.
- 2) To find the different types, sizes, shapes of aggregate from market.
- 3) Measurement of workability of fresh concrete by different methods.
- 4) Describe the concreting process from any nearby site.
- 5) Describe the curing of concrete.
- 6) Design the concrete mix by different method.
- 7) Measurement of strength of hardened concrete.
- 8) Measurement of strength of hardened concrete by nondestructive testing.
- 9) Describe the concept of durability of concrete.
- 10) Explain the use of Admixtures in concrete.

**Text Books:**

- 1) Gambhir M. L., "Concrete Technology", Tata McGraw Hill Publication
- 2) Shetty M. S., "Concrete Technology", S. Chand & Company Ltd.

**Reference Books:**

- 1) Neville A. M. & Brooks J. J., "Concrete Technology", Pearson Education Publication

2) Neville A. M., "Properties of Concrete", ELBS & Longman Publication

<b>Syllabus for Unit Test:</b>	
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Unit Test -1	UNIT – I, UNIT – II, UNIT - III
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Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI
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## 07: COMPUTER APPLICATIONS IN CIVIL ENGINEERING - II

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: --	End Semester Examination: --	--
Practical: 02 Hours / Week	Continuous Assessment: --	
	Term Work: 50 Marks	01 Credit

### **Course Pre-requisites:**

The Students should have

1. Knowledge of basic building aspects.
2. Knowledge of various building components.
3. Knowledge of various building symbols.

### **Course Objectives:**

To make student capable of drawing any kind of Engineering drawing using AutoCAD.

### **Course Outcomes:**

The students will be able to

1. draw various Engineering drawing using AutoCAD.
2. draw various elements of a building.
3. draw various elevation and sections of the building.

### **CIVIL ENGINEERING SCOPE AND APPLICATIONS II**

- Introduction.
- Getting Started.
- Learning commands: Draw and Modify Menu.
- Learning commands through drawings.
- Centerline drawings
- Layers / Filters
- Blocks
- Area Command
- Drawing Presentation :Sheet size and Text Format

### **Term Work:**

- 1) Introduction to the software: Tool bars, Symbols and Various Commands.
- 2) Drawing Plates (minimum 10 in number)
- 3) Drawing Plan, Elevation and Section of G+1 Building.

### **Text Books:**

**AutoCAD users Guide**



## 08: TESTING OF MATERIALS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 02 Hours / Week	TW&Oral:50Marks	01 Credit

### Course Pre-requisites:

The Students should have

1. knowledge of Engineering Mechanics, Solid Mechanics & Concrete Technology.

### Course Objectives:

the student should be able to test qualities & strength of the material.

### Course Outcomes:

The student will be able to test

1. Metals

2. Cement

3. Aggregates

4. Concrete

### Course Contents:

The term work shall consist of minimum **TWELVE** experiments from list below.

	<b>Metal: (min Four)</b>
1	Tension Test – Mild steel, Tor steel
2	Torsion test- Mild Steel
3	Direct Shear test- Mild Steel
4	Izod & Charpy Impact tests- Mild Steel, Aluminum, Brass, Copper
5	Rockwell Hardness test- Mild Steel, Aluminum, Brass, Copper
	<b>Cement: (min Two)</b>
6	Standard consistency and Setting time test on cement
7	Fineness test on Cement
8	Compressive strength of Cement
9	Soundness test on Cement
	<b>Aggregate: (min Two)</b>
10	Specific gravity of Aggregates
11	Fineness Modulus of Aggregate
12	Aggregate Impact Value
13	Aggregate Crushing Value
	<b>Concrete (min Four)</b>
14	Workability of Concrete & effect of admixture.
15	Compressive strength of Concrete
16	Flexural Test of Concrete
17	Split Tensile strength of Concrete
18	Non Destructive Test on concrete –Schmidth's Rebound hammer test
19	Bending test – Timber
20	Compressive Strength test- Bricks

**Reference Books:**

**01)** Neville A. M. & Brooks J. J., “Concrete Technology”, Pearson Education Publication

**02)** Neville A. M., “Properties of Concrete”, ELBS & Longman Publication

**03)** IS Codes

- IS-4926
- IS-516
- IS-2386
- IS-1199
- IS-383
- IS-13360
- IS-5242

**Programme: B. Tech. (Civil) – Sem IV - 2014 Course**

<b>09: ENGINEERING MATHEMATICS-III</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Tutorial: 01 Hours / Week	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	basic knowledge of differentiation, integration and differential equation	
2.	basic knowledge of vector algebra	
<b>Course Objectives:</b>		
	To form mathematical model and solve mathematical problem in Civil Engineering	
<b>Course Outcomes:</b>		
The student should be able to		
1.	form mathematical modeling of systems using differential equations and solve the differential equations	
2.	apply Vector differentiation and integration that finds applications in solid mechanics, fluid flow, heat problems and potential theory etc	
3.	analyze the numerical data by applying statistical methods	
4.	solve system of linear equation and ordinary differential equation by numerical methods	
5.	apply mathematical modeling of systems using partial differential equations and solve the partial differential equations.	
6.	apply vector integral calculus to solve various problems in Civil Engineering.	
<b>Unit - I</b>	<b>Unit I: Linear Differential Equations (LDE)</b>	<b>(06 Hours)</b>
	Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE.	
<b>Unit - II</b>	<b>Unit II: Applications of DE</b>	<b>(06 Hours)</b>
	Modeling of problems on bending of beams, whirling of shafts and mass spring systems. Solution of Partial Differential Equations (PDE): 1) $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ , 2) $\frac{\partial^2 u}{\partial t^2} = a^2 \frac{\partial^2 u}{\partial x^2}$ , 3) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ by using Separation of variables Applications of PDE to problems of Civil and allied engineering.	

**Programme: B. Tech. (Civil) – Sem IV - 2014 Course**

<b>Unit - III</b>	<b>Unit III: Numerical Methods</b>	<b>(06 Hours)</b>
	Numerical solutions of (i) System of Linear Equations by Gauss Elimination, Cholesky and Gauss-Seidel methods (ii) Ordinary Differential Equations by Euler's, Modified Euler's, Runge-Kutta 4 <sup>th</sup> order and Predictor-Corrector methods.	
<b>Unit - IV</b>	<b>Unit IV: Statistics and Probability</b>	<b>(06 Hours)</b>
	Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test	
<b>Unit - V</b>	<b>Unit V: Vector Differential Calculus</b>	<b>(06 Hours)</b>
	Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities	
<b>Unit - VI</b>	<b>Unit VI: Vector Integral Calculus</b>	<b>(06 Hours)</b>
	Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Stream lines, Equations of motion, Bernoulli's equations.	
<b>ASSIGNMENTS:</b>		
1. Problems on Linear differential equation with constants coefficients.		
2. Problems on Application of LDE and partial differential equations.		
3. Problems on Numerical methods to solve system of algebraic equation and ordinary differential equation.		
4. Problems on Statistical methods and probability distribution.		
5. Problems on Vector identities and application of vector differential in mechanics.		
6. Problems on Line integral, surface integral and volume integral .		
<b>Text Books:</b>		
1) Peter V. O'Neil Advanced Engineering Mathematics by (Cengage Learning).		
2) Erwin Kreyszig Advanced Engineering Mathematics by (Wiley Eastern Ltd.).		
<b>Reference Books:</b>		
1) B. V. Raman Engineering Mathematics by Tata McGraw-Hill.		
2) M. D. Greenberg Advanced Engineering Mathematics, 2E, by Pearson Education.		
3) Wylie C.R. & Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill, Inc.		
4) B. S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.		
5) P. N. Wartikar & J. N. Wartikar Applied Mathematics Volumes I and II Pune Vidyanthi Griha Prakashan, Pune.		
<b>Syllabus for Unit Test:</b>		
Unit Test I	Unit - I, II, III	
Unit Test II	Unit - IV, V, VI	



<b>10: SURVEYING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory : 3 Hrs/ Week	End Semester Exam: 60Marks	03 Credits
Practical : 4 Hrs/ Week	Continuous Assessment : 40Marks	
	Term Work & Practical Exam: 50 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Student Should have		
1.	Basic concept of civil engineering.	
2.	Basics of mathematics and Geometry.	
<b>Course Objective</b>		
1.	To make students understand use of various instruments and process of surveying and levelling.	
<b>Course Outcomes</b>		
<b>The student should be able to</b>		
1.	Explain the use of linear measurements and prismatic compass in surveying.	
2.	Describe the process of vertical measurements and contouring and calculate reduced levels.	
3.	Describe the use of vernier theodolite for angular measurements and calculate coordinates of traverse stations.	
4.	Calculate omitted measurements in traverse survey and describe permanent adjustments of theodolite.	
5.	Explain various methods of setting out curves and describe field procedure of curve setting.	
6.	Explain use of plane table and minor instruments in surveying.	
<b>UNIT - I</b>	<b>Linear measurement and Compass survey</b>	<b>(06 Hours)</b>
	Introduction to land surveying, linear measurements, Tapes and EDM- Construction, working and principle, Direct and Indirect methods of linear measurement and ranging, types of tapes, , locating details with offsets by swinging tape, open cross staff and laser square method, concept of scale, R.F. maps and plan. Study and use of topo sheets. Compass survey: Types of bearing and meridian other than magnetic meridian, local attraction and correction of local attraction, dip, declination, reduction of true bearings, adjustment of closing error.	
<b>UNIT - II</b>	<b>Vertical measurements and contouring.</b>	<b>(06 Hours)</b>
	Instruments for vertical measurement-dumpy level, auto level, laser level and digital level. Principle axes of dumpy level, temporary and permanent adjustment, simple, compound and reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring: Direct and indirect methods of contouring, uses of contour maps, profile levelling and cross sectioning and their applications, reduction of volume from contour map and tracing grade contour.	
<b>UNIT - III</b>	<b>Measurement of direction by Vernier Theodolite.</b>	<b>(06</b>

		<b>Hours)</b>
	Study of Vernier transit 20" Theodolite, introduction to digital Theodolite use of Theodolite for measurement of horizontal angles by repetition and reiteration, vertical angles and magnetic bearing, prolonging a line, lining in and setting out and angle with a Theodolite, plane trigonometrical levelling. Theodolite traversing: computation of consecutive and independent co-ordinates, adjustment of closed traverse by transit rule and Bowditch's rule, Gales traverse table.	
<b>UNIT - IV</b>	<b>Omitted measurements, permanent adjustments of transit Theodolite and Tachometry.</b>	<b>(06 Hours)</b>
	Omitted measurements, area calculation by independent co-ordinates, open traverse and its uses, measurement of deflection angles using transit Theodolite, open traverse survey and checks in open traverse. Fundamental axes of Theodolite: testing and permanent adjustment of Theodolite Tachometry: applications and limitations, principle of stadia tachometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points.	
<b>UNIT - V</b>	<b>Curves</b>	<b>(06 Hours)</b>
	Introduction to horizontal and vertical curves, different types and their applications, simple circular curves, elements and setting out by linear methods, offsets from long chord and offsets from chord produced, angular method, Rankin's method of deflection angle. Transition curves: necessity, types and requirements.	
<b>UNIT - VI</b>	<b>Plane table survey and construction survey.</b>	<b>(06 Hours)</b>
	Equipments required for plane table survey and their uses, methods of plane table survey: radiation, intersection, traversing, and simple resection, errors and precisions in plane table surveying, construction survey- survey for tunnels, drainage line buildings, and roads. Use of laser based electronic range finder.	
	<b>Term work:</b>	
	The term work shall consist of	
	Field book containing record of all exercises and project listed below.	
<b>a)</b>	Road project showing L-section plan Of road with contours and typical cross section	<b>2-sheets</b>
<b>b)</b>	Theodolite traverse survey project.	<b>1-sheets</b>
	<b>List of Practicals:</b>	
	Details of practicals to be performed, Exercise projects and assignments	
1.	Linear measurements with tape and accessories.	
2.	Study and use of auto level and double check leveling	
3.	Compound leveling and fly leveling, calculation by rise and fall method.	
4.	Two peg test for level.	
5.	Study and use of 20" Vernier Theodolite.	

6.	Measurement of horizontal angle of triangle by repetition method and applying check.	
7.	Measurement of vertical angle by transit Theodolite	
8.	Trigonometrical levelling by transit Theodolite.	
<b>Project I</b>	Road project of minimum length of 250 M including fixing of alignment, profile leveling and cross sectioning.	
<b>Project II</b>	Theodolite traverse survey of closed traverse for minimum 0.5 hectares area including building roads etc.	
9.	Computation of horizontal distance and elevation of points by tachometry for horizontal and inclined sights.	
10.	Introduction and study of outfit of plane table and method of radiation.	
11.	Intersection method of plane table survey.	
12.	Closed plane table traverse survey around a small four sided building.	
13.	Setting out simple circular curve by Rankin's method of deflection angle	
14.	Use of laser based electronic range finder.	
	<b>ASSIGNMENTS:</b>	
1	Computation of corrected bearings of the traverse by different methods.	
2	Solving problems on calculation of reduced levels by different methods.	
3	Preparing contour map of the area from the given spot levels.	
4	Study of topographical sheets to record various details shown.	
5	Solving problems on trigonometrical leveling.	
6	Computations of independent coordinates of a closed traverse.	
7	Solving problems on omitted measurements.	
8	Calculation of reduced level and distance of a point by tacheometry.	
9	Computation of data required to set out the simple circular curve by Rankine's method .	
10	Write details of survey for drainage line with proper sketches.	
	<b>Text Book:</b>	
1	Surveying and Levelling by Vol.II-T.P. Kanetkar and S.V. Kulkarni.	
2	Surveying Vol. I & II by Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain.	
3	Surveying for Engineers- John Uren & Bill Price- Palgrave Macmillan	
4	Plane Surveying-----A.M. Chandra----- New age International Publishers	
5	Surveying and Levelling----N. N. Basak, Tata Mc-Graw hill	
6	Surveying Vol. I & II-----Dr. K. R. Arora.	
	<b>Reference Books:</b>	
1	Surveying: Theory and practice---James M. Anderson, Edward M. Mikhail	
2	Surveying theory and practices---Devise R. E., Foot F.S.	
3	Plane and Geodetic Surveying for Engineers. Vol. I—David clark.	
4	Principles of Surveying. Vol. I by J.G. Olliver, J.Clenning	

5	Surveying Vol. I & II by S.K.Duggal, Tata Mc-Graw Hill.	
6	Surveying and Levelling by Subramanian, oxford University Press.	

**Syllabus for Unit Test.**

<b>Unit Test I</b>	<b>Units I, II, III</b>
<b>Unit Test II</b>	<b>Units IV, V, VI</b>

## 11. MECHANICS OF FLUID

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory : 3 Hours / Week	End Semester Exam: 60Marks	03 Credits
Practical : 2 Hours / Week	Continuous Assessment : 40Marks	
	Term Work & Oral Exam: 50 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Student Should have		
1	Basic Knowledge of units and conversion of units	
2	Basic Knowledge of Engineering Mathematics	
3	Basic Knowledge of Engineering Physics	
<b>Course Objective:</b>		
	To make the student understand the scope and application of Fluid Mechanics	
<b>Course Outcomes:</b>		
Student should be able to		
1.	describe basic properties of fluids and measure its properties in static conditions.	
2.	apply knowledge of fluid kinematics and dynamics conditions.	
3.	analyse physical phenomenon dimensionally.	
4.	explain laminar flow and flow through pipes	
5.	explain of boundary layer theory.	
6.	describe turbulent flow.	
<b>Unit -I</b>	<b>Properties of Fluids &amp; Statics:</b>	<b>(06 Hours)</b>
	Scope and application of fluid mechanics, Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. <b>Statics:</b> Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	
<b>Unit II</b>	<b>Kinematics</b>	<b>(06 Hours)</b>
	Types of flow, path lines and streak lines, stream lines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	

<b>Unit III</b>	<b>Kinetics</b>	<b>(06 Hours)</b>
	Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, , Impulse momentum equation.	
<b>Unit IV</b>	<b>Dimensional Analysis and Model Studies</b>	<b>(06 Hours)</b>
	Dimensional homogeneity, Important dimensionless parameters, Dimensional analysis using Buckingham's $\pi$ theorem, Model studies, Similitude, Model laws, Types of models.	
<b>Unit V</b>	<b>Fundamental of Pipe Flow &amp; Boundary layer theory</b>	<b>(06 Hours)</b>
	Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe ,Hagen Poisullies Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, Laminar and transitional boundary layer, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer	
<b>Unit VI</b>	<b>Turbulent flow &amp; Pipe Flow Problems</b>	<b>(06 Hours)</b>
	Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Pipe network Analysis, Siphons, Hydraulic transmission through pipes, three reservoir problems.	
<b>Term work shall consist of any Eight Exercises</b>		
1.	Determination of Viscosity	
2.	Study of Pressure Measuring Devices	
3.	Study of Stability of Floating Bodies	
4.	Verification of Bernoulli's Theorem	
5.	Determination of $C_d$ of Venturimeter	
6.	Determination of $C_d$ of Orifice	
7.	Determination of $C_d$ of Notch	
8.	Study of Laminar flow Using Heleshaw's /	
9.	Study of Laminar flow Using Reynold's Apparatus	
T.W and Oral Examination shall be based on above termwork		
<b>ASSIGNMENTS :</b> Assignments will consist of		
1. Solution of numerical problems asked in recent three years of BVU question papers.		
2. Solution of questions asked in recent three years BVU question papers.		
3. Report of new topic being discussed in reputed research journals related to fluid mechanics.		

4. Mini projects such as collection of information, Brochure, Data, on a topic related to fluid mechanics.
5. Writing of industrial applications of various topics of syllabus.
6. Design of new experiments related to fluid mechanics.
7. Collection of two fluid mechanics NPTEL videos and demonstration of it.
8. Collection of information about fluid mechanics equipment's /machinery/materials related to fluid mechanics.
9. Collection of information about fluid mechanics phenomenon and its explanation.
10. Collection of data of different fluids with reference to their properties.

<b>Text Books:</b>	
1.	Garde R. J. and Mirajgaonkar "Engineering Fluid Mechanics" Scitech Pulication C.P.Konthadraman "Fluid Mechanics And Machinery" New Age Publications
2.	S. Ramamurtham "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company
3.	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications
4.	R.K. Rajput "Fluid Mechanics" S Chand Publications
5.	Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems" , New Age International New Delhi
6.	Modi P.N. and Seth S.M. " Fluid Mechanics" Standard Book House
<b>Reference Books:</b>	
1.	Streeter- Wylie,"Fluid Mechanics", TataMcGrow Hill Publication
2.	Dr. R. J. Garde "Turbulent Flow" New Age Publications
3.	N. Narayana Pillai "Principles of Fluid Mechanics and Fluid Machines" University Press
4.	Edward J. Shaughnessy "Introduction to Fluid Mechanics" Oxford University Press
5.	Baljeet S. Kapoor "Fluid Mechanics" New Age International Publishers
6.	Vijay Gupta "Fluid Mechanics And Its Applications" New Age International Publishers
7.	Robert W. Fox "Introduction to Fluid Mechanics" Willey Student Edition
8.	John F. Douglas "Fluid Mechanics" Perason Publication
9.	James A. Fay "Introduction to Fluid Mechanics" PHI Learning Private Limited
<b>Syllabus for Unit Test</b>	
Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI





## 12: CONSTRUCTION TECHNIQUES & MACHINERIES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination : 60 Marks	03 Credits
	Unit Test : 20 Marks	
	Assignment : 10 Marks	
	Attendance : 10 Marks	

### Course Pre-requisites:

The Students should have

1. knowledge of Building Construction Practices, Building Planning & Design.
2. knowledge of Engineering Economics.
3. knowledge of Concrete Technology.

### Course Objectives:

Students should get knowledge of Construction Operation Equipments & different methods of advanced construction techniques, tunneling, concreting & dewatering.

### Course Outcomes:

1. Student will be able to explain erection techniques for high rise structures.
2. Student will be able to Apply different construction techniques in underwater construction.
3. Student will be able to apply grouting techniques.
4. Student will be able to find output of earth moving equipment.
5. Student will be able to explain soil stabilization techniques.
6. Student will be able to describe safety of equipment

<b>UNIT - I</b>	<b>CONSTRUCTION MECHANISATION &amp; HIGH RISE CONSTRUCTIONS</b>	<b>(06 Hours)</b>
	Role of Construction activity in the National (including Urban & Rural) & Global development. Necessity of mechanization in construction industry. Types of construction such as Light, Medium & Heavy duty. Erection techniques for high rise structures, advantages & disadvantages of high rise structures. Scope of infrastructure in India and provisions made.	
<b>UNIT - II</b>	<b>UNDER WATER CONSTRUCTION</b>	<b>(06 Hours)</b>
	Cofferdams Dams & Caissons – Definition, Classification & its use. Dredging Techniques. Construction under deep water (Tremie Method). Classification & different types of Piles, Sheet Piles, Pile driving techniques, Negative skin friction. Use of special types of Formwork. Jetties.	
<b>UNIT - III</b>	<b>ADVANCED CONSTRUCTION TECHNIQUES</b>	<b>(06 Hours)</b>

	Launching of Girders, Precast Techniques, Tunnel Driving techniques, Tunnel boring machines (Open & Shield), Road Headers & Boomers, Placing of concrete in Hot & Cold weather conditions. Shotcreting & Guniting. Trenchless Technology, Micro Tunneling. Pneumatic Drilling equipments. Drill & Blast method.	
<b>UNIT - IV</b>	<b>EARTH WORK MACHINERIES</b>	<b>(06 Hours)</b>
	Classification of Earth Moving machines (rippers, dragline, scrappers, pavers, backhoe) & factors affecting in selection. Group behavior of equipments. Manpower requirement for the equipments. Rollers, Tractors, Bull Dozers, Rippers, Draglines & Clamp Shells, Scrappers, Dumpers, Pavers, Power Shovels, Backhoe -: detailed study of these equipment with classification, uses, output, & economics. Excavating, Transporting & compaction equipments. Importance of record keeping of machineries & mode of payment for them.	
<b>UNIT - V</b>	<b>HOISTING &amp; CONVEYING EQUIPMENTS</b>	<b>(06 Hours)</b>
	Hoisting & Transporting equipment; types (Derrick, Tower & Mobile), factors affecting for selection. Conveying equipments-: belt, apron, vibrating, pneumatic, flight & spiral or screw conveyors. Hauling equipments. Crushers & its types.	
<b>UNIT - VI</b>	<b>DEWATERING, PAVING EQUIPMENTS &amp; CONCRETE PUMPS</b>	<b>(06 Hours)</b>
	Dewatering Techniques; Electro-osmosis method, Well Point System. Paving Equipments; Types, Uses. Asphalt Pavers, Slip Form Pavers, Concrete Pavers. Pumps; Types & Uses. Pumps for concreting.	
<b>ASSIGNMENTS :</b>		
1) Enlist & explain role of construction activity in National & Global development. Explain scope of infrastructure in India & provisions made.		
2) Define with examples; Light, Medium & Heavy construction.		
3) Define & differentiate between Cofferdams & Caissons & briefly explain piles & its classification.		
4) In context of tunneling, enlist different tunnel driving techniques & tunnel boring machines.		
5) Write short notes on -: <ul style="list-style-type: none"> <li>i. Shotcreting</li> <li>ii. Guniting</li> <li>iii. Trenchless technology</li> <li>iv. Drill &amp; Blast method</li> <li>v. Pneumatic drilling equipments</li> </ul>		
6) Classify, discuss briefly various earth work machineries (any five) & factors affecting in		

selection including their economics.	
7) Classify & explain various hoisting & conveying equipment. Discuss in detail about factors affecting in selection of them & its economics.	
8) Explain crushers & its types in detail.	
9) Enlist & explain with neat diagrams, different dewatering techniques (electro-osmosis method, well point system).	
10) Write a brief note on Pumps & its types. Discuss in detail about various pumps used for concreting.	
11) Prepare a Power Point presentation (P.P.T.) on any of the topic of your choice from the entire syllabus after getting approval of topic from your subject teacher.	
<b>Textbooks / Reference Books:</b>	
1) Mahesh Verma, "Construction Equipment & Planning & Application", Metropolitan Book Company Private Ltd., New Delhi.	
2) Peurifoy Robert L., William B. Ledbetter, "Construction Planning Equipment Methods", Mc Graw Hill Book Company.	
3) Russel James E., "Construction Equipment", Reston Publishing Company.	
4) Shetty M.S., "Concrete Technology – Theory & Practice", S. Chand & Company Private Limited.	
5) S.C. Sharma & Khanna, "Construction Equipments & its Management",	
6) V.R. Phadke "Construction Machinery & Works Management".	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 13: STRUCTURAL ANALYSIS - I

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		04 Credits		
Tutorial: 01 Hours / Week		Continuous Assessment: 40 Marks				
<b>Course Pre-requisites:</b> The students should have knowledge of						
1. Solid Mechanics						
<b>Course Objectives:</b>						
The student should be able to analyse the structure.						
<b>Course Outcomes:</b> The student will be able to						
1. calculate degree of indeterminacy of the structure.						
2. calculate deflection of truss.						
3. analyse Indeterminate truss using strain energy method.						
4. calculate fixed end moments.						
5. analyse plane structure using slope deflection method.						
6. analyse plane structure using moment distribution method.						
<b>UNIT - I</b>	<b>Basic Concepts:</b>				<b>(06 Hours)</b>	
	Types and classification of skeletal structures, members, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beam and frame. Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axially force, shear force, bending moment and torsional moment.					
<b>UNIT- II</b>	<b>Deflection of Beam and Truss:</b>				<b>(06 Hours)</b>	
	Deflection of determinate beam using conjugate beam method, Deflection of joints of determinate truss using Castigliano's first theorem					
<b>UNIT- III</b>	<b>Analysis of Indeterminate Plane Trusses using Castigliano's theorem:</b>				<b>(06 Hours)</b>	
	Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Lack of fit, temperature changes and Sinking of support.					
<b>UNIT - IV</b>	<b>Fixed Beam and Clapeyron's Three Moment Theorem:</b>				<b>(06 Hours)</b>	
	Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support.					
<b>UNIT - V</b>	<b>Slope Deflection Method:</b>				<b>(08 Hours)</b>	

	Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);	
<b>UNIT - VI</b>	<b>Moment Distribution Method:</b>	<b>(08 Hours)</b>
	Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).	
<b>Assignments:</b>		
<b>1</b>	Draw different types of structures- space, plane, trusses, beams and frames.	
<b>2</b>	Draw deflected shapes of different types of structures	
<b>3</b>	Calculate degree of static indeterminacy.	
<b>4</b>	Calculate degree of kinematic indeterminacy.	
<b>5</b>	Calculate deflection of beam using conjugate beam method.	
<b>6</b>	Calculate deflection of truss using Castigliano's first theorem.	
<b>7</b>	Analysis of indeterminate trusses using Castigliano's second theorem	
<b>8</b>	Write fixed end moments for different loading cases.	
<b>9</b>	Explain three moment theorem	
<b>10</b>	Analysis beam/frame using slope deflection method	
<b>11</b>	Calculate distribution factor at joint.	
<b>12</b>	Analysis non-sway beam/frame using moment distribution method	
<b>13</b>	Analysis sway frame using moment distribution method	
<b>Text Books:</b>		
1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication		
2) Pandit G. S. & Gupta S. P., "Theory of Structures Vol-I", Tata McGraw Hill Publication		
3) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company		
<b>Reference Books:</b>		
1) Prakash Rao D. S., "Structural Analysis", Universities Press Publication		
2) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication		
3) Aslam Kassimali, "Structural Analysis", Cengage Learning.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

## 15: COMPUTER APPLICATION IN CIVIL ENGINEERING - III

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Practical: 02 Hours / Week	Term work and Practical: 50 Marks	01 Credits
<b>Course Pre-requisites:</b> The students should have knowledge of		
1.	Engineering Mechanics	
2.	Solid Mechanics	
3.	Structural Analysis-I	
<b>Course Objectives:</b>		
	The student should be able to analyse the structure using STAAD.Pro	
<b>Course Outcomes:</b> The student will be able to		
1.	analyse the beams	
2.	analyse the plane frames.	
3.	analyse the plane truss.	
4.	Analyse the structure space.	
	<b>Introduction to STAAD.Pro:</b> Application of software, Getting started, Introduction to Tool bars, Menu bar, working window, setting units, , Local and Global Co-ordinate system etc.	
	<b>Generation of Model:</b> Generation of skeletal model, Defining cross section and section properties, Generate and assign different types of supports, assign different types of nodal and member loads, Define load combination, analysis, static check, load list, post analysis, run analysis, read input file etc	
	<b>Results and Interpretation:</b> Post analysis, extract output/result of axial force, shear force, bending moment, torsional moment, deflection and stresses-their values and graphs. Results from output file, read output file and Interpret the results.	
<b>Term work:</b> Term work consist of assignments on		
	1) Analysis of beams	
	2) Analysis of plane frames	
	3) Analysis of plane trusses	
<b>Practical:</b> The practical examination is based on above syllabus and term work.		
<b>Reference Books:</b>		
	1) T.S. Sharma, “Staad.Pro v8i for beginners” , Notion Press	
	2) Sivakumar Naganathan, “Learn Yourself STAAD.Pro V8i”,Lap Lambert	
	3) Bentley Structures, “Staad.Pro Technical reference manual”, Bentley Community e-book	

## 16: CIVIL ENGINEERING CONSTRUCTION PRACTICE

<b><u>TEACHING SCHEME</u></b>		<b><u>EXAMINATION SCHEME</u></b>		<b><u>CREDITS ALLOTTED</u></b>	
Practical: 02Hrs/Week		TW & Oral Exam: 50 marks		01Credits	
<b>Course Pre-requisites:</b>					
The Student Should have knowledge of					
1.	Fundamental of Civil engineering.				
2.	Building Construction				
3.	Engineering mathematics.				
4.	Concrete Technology				
5.	Building Planning, Designing and Bylaws				
<b>Course Objective</b>					
1.	To make students understand Civil Engineering Practices.				
<b>Course Outcomes</b>					
The students will be able to					
1.	setout of foundation for buildings.				
2.	carry out testing of construction materials				
3.	manage inventory on site.				
4.	maintain quality control on site.				
5.	work as a site engineer				
<b>List of Practicals (Any 10)</b>					
1.	Setting out and layout of building foundation.				
2.	Study of various types of drawings required on construction sites				
3.	Study of reinforcement and its bending for different structural members.				
4.	Slump test on concrete and effect of plasticizers.				
5.	Study of formwork& scaffolding.				
6.	Construction of different types of brick masonry bonds, study of recent types of bricks and blocks				
7.	Study of plastering & pointing.				
8.	Study of different types of tiles.				
9.	Introduction to water supply & sanitary fittings and appliances.				
10.	Consealed construction practices.				
11.	Types of paints.				
12.	Methods of Waterproofing of toilets & roofs.				
13.	Testing of concrete cubes of of different grades.				
14.	Study of stock register format and daily report.				
15.	Study of construction of concrete walls				
16.	Study of precast techniques				
17.	Study of Deck Slab				
18.	Study of Advance Water proofing Techniques				
<b>Reference Books:</b>					
1.	A to Z Building Construction by Mantri publication.				
2.	My Construction Practices by R.B. Chaphalkar.				





**Programme: B. Tech. (Civil) – Sem V - 2014 Course**

Sr · No.	Subject	Teaching Scheme (Hrs/Week )			Examination Scheme-Marks							Credits		
		L	P/ D	T	End Sem · Exa m	Un it Te st	Attenda nce	Assignme nts	T W & Or al	TW & Practic al	Tot al	Theo ry	T W	Tot al
31	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32	Advanced Surveying	3	2	-	60	20	10	10	50	--	150	3	1	4
33	Engineering Project Management	3	2	-	60	20	10	10	50	---	150	3	1	4
34	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35	Advanced Mechanics of Fluid	3	2	-	60	20	10	10	50	----	150	3	1	4
36	Professional Skill Development-V	4	--	-	100	--	--	--	--	---	100	4	--	4
	<b>Total</b>	<b>20</b>	<b>08</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>--</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

\*End Sem Exam of duration 4 hours.

### Optional Subject

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	-	60	20	10	10	--	--	100	4	--	4

**Programme: B. Tech. (Civil) – Sem VI - 2014 Course**

Sr · No.	Subject	Teaching Scheme (Hrs/Week )			Examination Scheme-Marks							Credits		
		L	P/ D	T	End Sem · Exa m	Un it Te st	Attenda nce	Assignme nts	T W & Or al	TW & Practic al	Tot al	Theo ry	T W	Tot al
37	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38	Environmental Engineering-I	3	2	-	60	20	10	10	--	50	150	3	1	4
39	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40	Geotechnical Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
41	Elective-I	3	--	-	60	20	10	10	--	----	100	3	--	3
42	Professional Skill Development-VI	4	-	-	100	--	--	--	--	---	100	4	-	4
	<b>Total</b>	<b>19</b>	<b>08</b>	<b>2</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

\*End Sem Exam of duration 4 hours.

**Total Credits**

**Semester V = 25**

**Semester VI = 25**

**Grand Total = 50**

### 31 Structural Design-I\*

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 60 Marks	Theory :5
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial : 1 Hours / Week	Term Work & Oral : 50 Marks	Termwork: 1
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Structural Analysis- I	
2.	Mechanics of Solids	
<b>Course Objectives:</b>		
	To make student capable to design different structural elements using steel.	
<b>Course Outcomes:</b>		
The student will be able to		
1.	estimate design load	
2.	design a connection for axial load	
3.	design a members for axial tension	
4.	design a members for axial compression	
5.	design a built up column	
6.	design a beam	
<b>UNIT - I</b>	<b>Design Philosophy</b>	<b>(06 Hours)</b>

	Types of structural elements and their behavior, Introduction to IS:875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load, Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS:800.	
<b>UNIT - II</b>	<b>Design of Connections for Axial Load</b>	<b>(06 Hours)</b>
	Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.	
<b>UNIT - III</b>	<b>Design of Axially Loaded Tension Members</b>	<b>( 06 Hours)</b>
	Behavior of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.	
<b>UNIT - IV</b>	<b>Design of Axially Loaded Compression Members</b>	<b>( 06 Hours)</b>
	Behavior of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members	
<b>UNIT - V</b>	<b>Design of Built up Column and Column Base.</b>	<b>(06 Hours)</b>
	Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.	
<b>UNIT - VI</b>	<b>Design of Beams</b>	<b>(06 Hours)</b>
	Behavior of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.	
<b><u>Term Work:</u></b> The term work shall consist of minimum any ONE projects with 2 numbers of half imperial sheets based on following topics:		

1) Design of roof truss: Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.	
2) Design of Building: Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.	
<b>Assignments:</b>	
1) Calculation of Wind load acting on the roof truss.	
2) Design of bolted or welded connection for axial load.	
3) Design of member for axial tensile load.	
4) Calculate axial capacity of member in compression.	
5) Design of lacing or battening connection for built up column	
6) Calculation of moment and shear capacity of rolled / built up section.	
<b>Reference Books:</b>	
1) N. Subhramanian, “ Design of Steel Structures”, Oxford University Press	
2) S. K Duggal, “Limit State Design of Steel Structures”, Tata McGraw-Hill Education	
3) S.S.Bhavikatti, “Design of Steel Structures: By Limit State Method”, I K International Pub	
4) Dr. Ramchandra, “Limit State Design of Steel Structures”, Scientific Publishers	
5) M. R. Shiyekar, “Limit State Design in Structural Steel”, Prentice-Hall of India	
6) IS:800-2007, General Construction in Steel - Code of Practice”	
7) IS:875-1987, “Code of Practice for Design Loads for Buildings and Structures Part (1 to 5)”	
8) IS:808-1989, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections”	
9) SP-6(6)- 1972, “Handbook for Structural Engineers”	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

### 32: ADVANCED SURVEYING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral: 50 Marks	Termwork: 1
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Fundamentals of Civil Engineering	
2.	Surveying	
<b>Course Objectives:</b>		
	To make student capable to use advanced surveying techniques for mapping	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	explain Geodetic control survey and theory of errors.	
2.	explain various features of modern Total Station for survey .	
3.	describe principles and components of Space Based Positioning System and its applications .	
4.	describe technique of Hydrographic Survey.	
5.	explain basics of Remote sensing and Geographical information System and its applications	
6.	describe the process of Aerial survey and its use in Surveying.	
<b>UNIT - I</b>	<b>Geodetic Control Survey:</b>	<b>( 6 Hours)</b>

	Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	
<b>UNIT - II</b>	<b>Total Station Survey:</b>	<b>( 6 Hours)</b>
	Concept and necessity of an electronic total station instrument. Types of total station as per EDM , range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. ,traverse survey with ETS. Concept of data down loading and post processing software, Errors in ETS survey.	
<b>UNIT - III</b>	<b>Space Based Positioning Techniques:</b>	<b>( 6 Hours)</b>
	Introduction and concept, segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential. Access denial techniques and ephemeris. SBPS coordinates and heights. Surveying with SBPS. Errors in positioning with SBPS. Applications of SBPS	
<b>UNIT - IV</b>	<b>Hydrographic Survey</b>	<b>( 6 Hours)</b>
	Concept, objects, Soundings and instruments and personnel required for sounding, methods of locating soundings. Three point problem and its solution by mechanical, analytical and graphical method. Tides and tidal gauges and establishment of MSL	
<b>UNIT - V</b>	<b>Photogrammetry</b>	<b>( 6 Hours)</b>
	Elements of photogrammetry, types of photogrammetry. Aerial photographs their types and scale. Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax. Ground control. Procedure of aerial survey and flight planning.	
<b>UNIT - VI</b>	<b>Remote Sensing and Geographic Information System :</b>	<b>(6 Hours)</b>
	Remote sensing-concept, types –active and passive, components of remote sensing system, electromagnetic energy and spectrum,	



	<p>atmospheric windows and spectral signature. Remote sensing platforms and sensors. Remote sensing data products, interpretation of remotely sensed images visual and digital. Limitations and applications of remote sensing.</p> <p>Concept and need of GIS, Components- people, procedure, hardware, software and data .Functions- Input, manipulation, management, Query analysis and Visualization. Application and limitations of GIS.</p>	
<b>Assignments:</b>		
1. Solution of problems on Laws of weights and normal equations.		
2. Collection of information for various types of ETS used and available in the market and their salient features		
3. Collection of information of SBPS of various countries and applications of SBPS.		
4. Write a report on Instruments used for measurement of soundings.		
5. Case studies on applications of Remote sensing and GIS.		
6. Case studies on applications of Aerial survey.		
<b>Term Work: Any Ten Experiments</b>		
1. Study and use of one second theodolite and measurement of horizontal angle		
2. Measurement of horizontal angles by reiteration method and Measurement of vertical angle.		
3. Study and use of total station.		
4. Study and use of total station for traverse survey.		
5. Applications of Total Station for REM, RDM.		
6. Study and Use of Nautical Sextant for measurement of horizontal angles.		
7. Study and Use of Mirror stereoscope to find air base distance. parallax bar and determination of difference in elevation by differential parallax		
8. Study and use of parallax bar and determination of difference in elevation by differential parallax.		

9. Adjustment of braced Geodetic quadrilateral	
10. Study and use of Handheld GPS for traverse survey	
11. Solution of three point problem in hydrographic surveying	
12. Study of GIS software.	
<b>Text Books:</b>	
1.Duggal S. K., “Surveying Vol-1, Vol-2”, Tata Mac Graw Hill pub. co., New Delhi	
2.Punmia B. C., “Higher Surveying”, Laxmi Publications, New Delhi	
3. Chandra A.M. ,”Higher Surveying “ ,New Age International Publishers,	
4. Bannister A. and Raymond Baker , “Surveying” , Pearson Education	
5 Anji M. Reddy, “ Text book of Remote Sensing and GIS “ , BSP BS Publications	
<b>Reference Books:</b>	
1.Uren J., W. F. Price, “Surveying for Engineers”, Macmillan Pub	
2.Wolf P. R., “Elements of Photogrammetry”, Mc Graw Hill	
3.Agarwal C. S., Garg P. K., “Remote Sensing in Natural Resources”, Wheeler Publishing	
4. Lo C.P., Albert Yeung , “ Concepts and techniques of GIS “ , Printice Hall of India	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V ,VI

### 33: Engineering Project Management

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & oral: 50 Marks	Termwork -1
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Building construction.	
2.	Building planning and design.	
<b>Course Objectives:</b>		
	To prepare the student to analyze the network and monitor and control the civil engineering projects.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	prepare organization chart.	
2.	prepare a network and analyze by CPM and PERT methods.	
3.	update network and carryout resource allocation	
4.	carry out material management	
5.	solve linear programming problem by graphical and simplex methods	
6.	check quality parameters in construction process.	
<b>UNIT - I</b>	<b>Introduction to Project Management</b>	<b>(06 Hours)</b>
	Importance, Objectives and functions of Management, Categories of Project, Project Life Cycle Concept, Importance of organizational	

	structures, types of organization, Project Manager education, experience, authority & responsibility.	
<b>UNIT - II</b>	<b>Project Planning &amp; Scheduling</b>	<b>( 6 Hours)</b>
	Gantt /Bar Charts and its limitations, Network planning, network analysis, C.P.M., P.E.R.T., Types of floats, Slack. Ladder network ,	
<b>UNIT - III</b>	<b>Project Monitoring &amp; Control</b>	<b>( 6 Hours)</b>
	Resource allocation, resource smoothening and leveling, crashing of network, direct cost and indirect cost, cost slope, updating of network,	
<b>UNIT - IV</b>	<b>Material Management</b>	<b>( 6 Hours)</b>
	Objectives of material management, material requirement, scheduling, monitoring, inventory control, inventory classification, inventory management, economic order quantity, inventory models, ABC analysis	
<b>UNIT - V</b>	<b>Linear Programming</b>	<b>( 6 Hours)</b>
	Identification & formulation of L.P. problem, requirements and assumptions of linear programming model, graphical method and simplex method	
<b>UNIT - VI</b>	<b>Total Quality Management</b>	<b>( 6 Hours)</b>
	Importance of total quality management in construction process and steps involved, concept of quality control, quality assurance, quality management and TQM, study of various quality standards in construction, six sigma concept, designing of quality manual, checklist and inspection reports, necessity of MIS in management	
<b>Assignments -:</b>		
1) Project Manager Education, experience, authority & responsibility.		
2) Draw a bar chart for a building project.		
3) Ladder network analysis.		
4) ABC analysis of small building project.		
5) Problems on linear programming, graphical and simplex method.		
6) Total quality management.		

<b><u>Term Work :</u></b>	
1.	Assignment on different types of organization and their flowcharts.
2.	Assignment on bar chart.
3.	Assignments on C.P.M. and P.E.R.T.`
4.	Assignment on resource leveling.
5.	Assignment on crashing of network.
6.	Assignment on updating of network.
7.	Assignment on ABC and EOQ analysis.
8.	Assignment on linear programming, graphical and simplex method.
9.	Study of quality control system of a construction project.
10.	Prepare a network for any construction project containing minimum 25 activities and find out total float and free float.
<b>Text Books:</b>	
1.	Construction Engineering and Management by S. Seetharaman, Umesh Publications, New Delhi.
2.	PERT & CPM principles & applications by L.S. Srinath, affiliated East West press Pvt. Ltd., New Delhi.
3.	Project Planning & control with PERT & CPM by Dr. B.C. Punmia, K.K. Khandelwal, Laxmi Publications (P) Ltd, New Delhi.
<b>Reference Books:</b>	
1.	Construction Management and Planning by B. Sengupta and H. Guha, Tata McGraw Hill Publishing Company, New Delhi.
2.	Construction Project Management Planning, Scheduling and controlling by K.K. Chitkara TMH Publishing Company, New Delhi
3.	Inventory Control by L.C. Zhamb, Everest Publishing House
4.	Project Management by Khatua, Oxford University Press
5.	Project Planning, Analysis selection, Implementation & Review by Prasanna Chandra, Tata McGraw Hill, New Delhi
6.	Civil Engineering Project Management by Alan C. Twort & J. Gordon Rees, Elsevier
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>UNIT – I, II &amp; III</b>
<b>Unit Test -2</b>	<b>UNIT – IV, V &amp; VI</b>

### 34 Structural Analysis-II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Structural Analysis- I	
2.	Mechanics of Solids	
<b>Course Objectives:</b>		
	The student should able to analyse the structure.	
<b>Course Outcomes:</b>		
The student should be able to		
1.	calculate plastic moment capacity of section.	
2.	draw Influence Line Diagrams (ILD) for reaction, Shear Force and Bending Moment	
3.	draw Influence Line Diagrams (ILD) for force in members of truss	
4.	analyse three hinge arch	
5.	analyse two hinge arch	
6.	analyse frame using approximate method.	
<b>UNIT - I</b>	<b>Plastic Analysis of Structure</b>	<b>( 06 Hours)</b>

	Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Single bay single storied rectangular frames.	
<b>UNIT - II</b>	<b>Influence Line Diagrams and rolling loads for beams:</b>	<b>(06 Hours)</b>
	Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams. Muller-Breslau's principle and its application to above beams. Rolling loads - Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values.	
<b>UNIT - III</b>	<b>Influence Line Diagrams and rolling loads for truss:</b>	<b>(06 Hours)</b>
	Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	
<b>UNIT - IV</b>	<b>Analysis of Three Hinged Arch</b>	<b>(06 Hours)</b>
	Concept and types of arches, Three hinged arches – analysis, Calculation of horizontal Thrust, Radial Shear, Normal Thrust and BM at a cross section.	
<b>UNIT - V</b>	<b>Analysis of Two Hinged Arch</b>	<b>(06 Hours)</b>
	Two hinged arches – Horizontal Thrust at support, Radial Shear, Normal Thrust and BM at a cross section. BM diagram for concentrated load and UDL.	
<b>UNIT - VI</b>	<b>Approximate Methods of the Analysis:</b>	<b>(06 Hours)</b>
	Approximate methods of analysis of multistoried, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method iii) Substitute Frame Method	

**Assignments:**

- 1) Calculate Plastic moment capacity of the cross section
- 2) Draw ILD for beams for reaction, SF and BM
- 3) Draw ILDs for members of the Truss
- 4) Analyse three hinged arch
- 5) Calculate support reactions for two hinged arch.
- 6) Analyse frame using any approximate method

**Reference Books:**

- 1) Hibbeler R. C., "Structural Analysis", Prentice Hall Publication
- 2) Pandit G. S. & Gupta S. P., "Theory of Structures- Vol-II", Tata McGraw Hill Publication
- 3) Timoshenko S. P. & Young, "Theory of Structures", McGraw Hill Publication
- 4) Junnarkar S. B. & Adavi, "Mechanic of Structures", Charotar Publishing House
- 5) Ramamrutham S. & Narayan R., "Theory of Structures", Dhanpat Rai Publishing Company

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI



**35 Advanced Mechanics of Fluids**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory : 3
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Oral : 50 Marks	Termwork : 01

**Course Pre-requisites:**

The Students should have knowledge of

1. Fluid Mechanics basics, Types of flows, friction.
2. Basic knowledge of Water retaining structure like dam, weir etc. irrigation channel.
3. Basic knowledge of Drag & lift, unsteady flow.
4. Basic knowledge of Hydro power plant.
5. Basic knowledge of pumps.

**Course Objectives:**

To impart knowledge of open channel flows and hydraulic machinery to students.

**Course Outcomes:**

**The student will be able to**

1. Design most efficient channel section, find critical depth of a flow.
2. Understand and apply knowledge of various flow profile and their characteristics.
3. Find energy dissipated in a hydraulic jump.

4.	Calculate forces on vanes for different conditions.	
5.	Understand and apply knowledge of turbines.	
6.	Understand and apply knowledge of pumps.	
<b>UNIT - I</b>	<b>Uniform Flow in Open Channels:</b>	<b>( 06 Hours)</b>
	Basic Equations: Continuity Equation, Bernoulli's Equation, & Momentum Equation as applied to open channel one dimensional flow, Velocity distribution in open channel, Chezy's & Manning's formulae, factors affecting Manning's roughness coefficient, Normal depth, Conveyance Section factor, Most efficient channel section, Specific Energy, Specific Energy diagram, Depth-Discharge diagrams, alternate depths, Critical depth, Critical slopes, Froude number, Specific Force, Specific force diagrams, Conjugate depths, Depth-Discharge diagrams with respect to specific force.	
<b>UNIT - II</b>	<b>Gradually Varied Flow in Open Channels:</b>	<b>( 06 Hours)</b>
	Gradually and rapidly varied flows, their examples, Basic assumptions in the derivation of GVF, Differential equations of GVF, Various GVF profiles, and their characteristics.	
<b>UNIT - III</b>	<b>Rapidly Varied Flow:</b>	<b>( 06 Hours)</b>
	Hydraulic Jump in Rectangular and Trapezoidal channels, Classification & Practical uses of Jump, Examples of occurrence of Hydraulic Jump, Conjugate Depths, Energy Dissipation in Hydraulic Jump, Location of Jump, Devices for measurement of velocity and discharge in open Channels, Stream gauging.	
<b>UNIT - IV</b>	<b>Unsteady Flow:</b>	<b>( 06 Hours)</b>
	Types, Flow through openings under varying head, Flow Compressibility, Celerity of Elastic Pressure Waves, Water Hammer Phenomenon, Rigid & Elastic water Columns Theories, Simple cases neglecting Friction, rapid	

	acceleration of flow due to sudden opening of valve, surge tanks and their functions, Location and Classification.	
<b>UNIT - V</b>	<b>Fluid Flow Around Submerged Bodies:</b>	<b>( 06 Hours)</b>
	Fluid Flow Around Submerged Bodies: Practical problems involving fluid flow around submerged bodies, Definition & Expression for Drag, lift, drag coefficient, Types of Drag.	
<b>UNIT - VI</b>	<b>Hydraulic Machines :</b>	<b>( 06 Hours)</b>
	Impact of Jet: Force Exerted due to impact of jet on stationary and moving flat and curved plates using linear momentum Principle, Principle of angular momentum, Euler's Momentum Equation for Turbines.  Element of Hydropower plant, Hydraulic turbines, Heads & efficiencies, Governing of turbines, Cavitation in turbines, Performance of turbines, Prediction of performance in terms of unit quantities and specific quantities, specific speed.  Theory of centrifugal pump, Centrifugal head due to rotation, Heads & efficiencies, Cavitation, Prediction of performance in terms of specific quantities, specific speed, characteristic curves.	
<b>Assignments (Any Six)</b>		
1. Solve Four Numericals to find out Critical Depth.		
2. Solve Numerical on GVF to find out flow profiles		
3. Solve Numericals on Hydraulic Jump to find out dissipation of energy.		
4. Solve Numericals to find out forces on different types of vanes.		
5. Solve Numericals on design of Turbines.		
6. Solve Numericals on design of Pumps.		
7. Collection & Study of Information Brochure about different Hydraulic Machineries.		
8. Collection & Study of Information Brochure about Hydraulic Lab Supply Companies.		

<b><u>Term Work: (Any Eight)</u></b>	
1. Flow around aerofoil.	
2. Flow around a Circular Cylinder.	
3. Impact of jet around flat / curved plate.	
4. Performance Curves of Hydraulic Turbine. Constant Head Characteristic Curve	
5. Characteristics of Centrifugal Pump.	
6. Uniform flow formulae of open channel.	
7. Velocity distribution in open channel flow.	
8. Hydraulic jump as energy dissipater.	
9. Characteristics of various GVF profiles.	
10. Design of Hydraulic Centrifugal Pump.	
11. Design of Hydraulic Turbine.	
12. GVF Computations by Direct Step Method.	
<b>Text Books:</b>	
1. Garde R. J., Mirajgaonkar A. G., “Engineering Fluid Mechanics”, Scitech Publication, Chennai	
2. Rangaraju K. G., “Open Channel Flow”, Tata McGraw Publication	
3. Streeter Wylie, “Fluid Mechanics”, Tata McGraw Publication	
4. Subramanyam K., “Open Channel Flow”, Tata McGraw Publication	
5. Ven Te Chow, “Open Channel Hydraulics”, Tata McGraw Publication	
6. Zueb Husain, Zaniel Alimuddin , “ Basic Fluid Mechanics and Hydraulic Machines” BSP Books Pvt. Ltd. Hyderabad	
<b>Reference Books:</b>	
7. Fox, McDonald, Pritchard, “Fluid Mechanics SI Version” Willey Student Edition	
8. Frank M. White, “Fluid Mechanics”, McGraw Hills Series	
9. C P Konthadraman, R Roodramoorthy, “Fluid Mechanics & Machinery” New Academic Science	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

### 36: Professional Skills Development V

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4
<b>Course Pre-requisites</b>		
The Students should have knowledge of		
1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.	
2.	An overall idea about vocabulary, Public speaking skills taught in the last semester	
3.	Knowledge of writing skills, importance of professionalism in emails and letters.	
4.	Knowledge on handling criticism and the concept of conflicts.	
5.	Awareness of the interpersonal skills like team work and its importance in the corporate sector.	
<b>Course Objectives</b>		
	The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.	
<b>Course Outcomes</b>		
<b>The student should be able to</b>		
1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.	

2.	Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5.	Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
6.	Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.
<b>Unit I</b>	<b>Aptitude (Maths, Logical Reasoning, English)</b> <span style="float: right;"><b>(24Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Maths <ul style="list-style-type: none"> <li>▪ Time, Speed &amp; Distance</li> <li>▪ Time &amp; Work</li> <li>▪ Simple Interest &amp; Compound Interest in continuation</li> <li>▪ Maths Revision</li> </ul> </li> <li>• Logical Reasoning <ul style="list-style-type: none"> <li>▪ Data Interpretation</li> <li>▪ Data Sufficiency</li> <li>▪ Set Theory &amp; Syllogisms</li> <li>▪ Reasoning Revision</li> </ul> </li> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement)</li> <li>▪ Grammar- (Tenses)</li> <li>▪ Vocabulary</li> <li>▪ Verbal Ability- Revision</li> </ul> </li> </ul>
<b>Unit II</b>	<b>Soft Skills &amp; English Communication</b> <span style="float: right;"><b>(24Hours)</b></span>
	<b>(6 Hours)</b>
	<ul style="list-style-type: none"> <li>• Situational Conversation</li> <li>• Situational Writing</li> <li>• GD Orientation</li> <li>• Mock GD-1</li> <li>• Mock GD-2</li> <li>• Mock GD-3</li> </ul>

	<ul style="list-style-type: none"><li>• Conflict Resolution</li><li>• Problem Solving Skills</li><li>• Time- Management Skills</li><li>• Handling Case Studies</li><li>• Management Games</li><li>• Business Meeting Etiquettes</li></ul>	
<b>Text Books</b>		
<b>1. APAART: Verbal Ability</b>		
<b>2. APAART: Logical Reasoning</b>		
<b>3. APAART: Quantitative Aptitude</b>		
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>		
<b>5. APAART: Speak Well 2 (Soft Skills)</b>		

### 37 Structural Design-II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
Tutorial: 1 Hour/Week	Term Work: 25 Marks	Termwork:1
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	conditions of equilibrium, plotting Shear force and bending moment diagram of beams with various support conditions and various load combinations.	
2.	Determination of bending stress and shear stress in beams.	
3.	Concept of short, long columns, direct and bending stress, principal stress and strains.	
4.	Concrete, concreting techniques and properties of concrete.	
5.	Plastic theory, concepts of planning of staircase, planning of a building.	
<b>Course Objectives:</b>		
	The student should be able to complete the design and detailing of a G+2 storied R.C.C. building.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	differentiate between various design philosophies of R.C.C. and know the properties of materials used in R.C.C. and the partial safety factors in Limit State Method .	
2.	differentiate between under-reinforced, over-reinforced and balanced section , analyse and design a singly reinforced, doubly reinforced and flanged beam by Limit State Method.	
3.	design beams for flexure, shear, bond for various supporting conditions	



4.	design different types of slabs and a staircase.	
5.	design short columns for axial load, uniaxial and biaxial bending by using SP-16.	
6.	design isolated column footings.	
<b>UNIT - I</b>	<b>Materials and Design Approach:</b>	<b>( 6 Hours)</b>
	Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, semi-probabilistic approach, partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	
<b>UNIT - II</b>	<b>R.C. Sections in Flexure:</b>	<b>( 6 Hours)</b>
	R.C. Sections in Flexure: Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of under reinforced, balanced, over reinforced section; Design parameters of a singly reinforced rectangular section, Moment of resistance of singly reinforced, doubly reinforced, rectangular, flanged section.	
<b>UNIT – III</b>	<b>Beams:</b>	<b>( 6 Hours)</b>
	Design of Beams for Flexure, Shear, Bond : Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond –Introduction, types of bonds, Code provision.  Design of beams- Simply supported, cantilever, Continuous – Singly reinforced, doubly reinforced and flanged beam.  Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	
<b>UNIT – IV</b>	<b>Slabs:</b>	<b>( 6 Hours)</b>
	Design of Slabs: One Way Slabs: Simply Supported, Cantilever, Continuous	

	Two Way Slabs: Various support conditions Design of Staircase: Dog legged, Open well	
<b>UNIT – V</b>	<b>Columns:</b>	<b>( 6 Hours)</b>
	Design of Columns: Columns- Axially loaded short columns, requirements of minimum eccentricity;  Design of short columns for axial load, uniaxial, biaxial bending (use of SP 16); Checking safety of column for biaxial bending	
<b>UNIT-VI</b>	<b>Footings:</b>	<b>(6Hours)</b>
	Design of Footings: Footings- Design of isolated column footing for axial load, uniaxial Bending.	
<b><u>Term Work:</u></b>		
<ol style="list-style-type: none"> <li>1. Design of G+2 storied building for gravity loads only. The design should include all types of slabs, beams, columns, footings and staircase (two flights) (Maximum three students in a group)</li> <li>2. Report of a site visit related to building structure under construction.</li> <li>3. Four half imperial drawing sheets .</li> </ol>		
<b>Assignments : Any Six</b>		
<ol style="list-style-type: none"> <li>1. Assignment based on various methods of design.</li> <li>2. Assignment based on basic parameters in design-Limit State Method and Working Stress Method.</li> <li>3. Assignment based on moment of resistance of a singly reinforced beam, doubly reinforced beam, flanged beam.</li> <li>4. Assignment based on design of various types of slabs.</li> <li>5. Assignment based on design of various types of beams.</li> <li>6. Assignment based on staircase design.</li> <li>7. Assignment based on design of various types of columns.</li> <li>8. Assignment based on design of isolated footing.</li> </ol>		

9. Making the models of reinforcement in various types of slabs.
10. Making the models of reinforcement in various types of beams.
11. Making the models of reinforcement in columns.
12. Making the models of reinforcement in staircase.
13. Making the models of reinforcement in footing.

**Text Books:**

1. Dr. V. L. Shah and Dr. S. R. Karve- "Limit State Theory and Design", Pune Vidyarthi Griha Publications

2. Punmia, Jain and Jain, "Comprehensive Design of R. C. Structures", Standard Book House

3. S. S. Bhavikatti, "Design of R.C.C. structural elements", New Age International Ltd.

4. P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi

5. P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi

6. Sinha R.C. "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi

**I.S.Codes :**

1. I.S.456-2000, "Plain and Reinforced Concrete-Code of Practice"

2. I.S.875-1987 (Part I to V), "Code of Practice for Design Loads"

3. SP-16-1980, "Design Aids for Reinforced Concrete"

**Reference Books:**

1. N. Subramanian "Design of Reinforced Concrete Structures" Oxford University Press

2. M. Fergusson "R.C. Fundamentals" - Tata Mcgraw Hill

3. S. Unnikrishnan Pillai, Devidas Menon "Reinforced Concrete Design"-Tata Mcgraw Hill Companies

4. Dr. H. J. Shah "Reinforced Concrete -Vol.1 (Elementary Reinforced Concrete)" -Charotar Publications

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

### 38: Environmental Engineering I

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work & Practical : 50 Marks	Termwork : 1
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Engineering chemistry.	
2.	Engineering mathematics.	
<b>Course Objectives:</b>		
	To make student aware of water treatment, air pollution, solid waste management and environmental management	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	Explain the water quality criteria and drinking water quality standards.	
2.	Explain aeration and sedimentation process of water treatment.	
3.	Describe filtration, disinfection and advanced water treatment processes.	
4.	Enumerate the various aspects of air pollution.	
5.	Describe the solid and hazardous waste management.	
6.	Explain the aspects of environmental management.	

<b>UNIT - I</b>	<b>Water-Quantity, Quality and Standard</b>	<b>( 06 Hours)</b>
	<p><b>Water:</b> Surface water sources, Ground water Sources, Water demand and quantity, various demands, Conveyance of water, Factors affecting demand, Design period, population forecasting,</p> <p><b>Quality of Water:</b> Various Sources, Common impurities and their effects, Physical, Chemical, Biological, radiological characteristics of water, Drinking water quality standards,</p> <p><b>Flow sheets:</b> Water Treatment Plant (WTP) based on sources of Raw water for Rural and Urban</p>	
<b>UNIT - II</b>	<b>Treatment-Aeration and Sedimentation</b>	<b>( 06 Hours)</b>
	<p><b>Aeration:</b> Types of aerators, gravity aerator and fixed spray aerator.</p> <p><b>Sedimentation:</b> Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clari-flocculator;</p> <p>Tube settlers: Introduction, Design of Tube settler</p>	
<b>UNIT - III</b>	<b>Treatment- Filtration, Disinfection and Advance Technology</b>	<b>( 06 Hours)</b>
	<p><b>Filtration:</b> Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter.</p> <p><b>Disinfection:</b> Necessity, Different methods, chlorination, reactions involved, Free And combined residual chlorine, Break point chlorination. UV disinfection, Ozonation</p> <p><b>Advance Treatment Methods:</b> Water Softening- Chemical and ion exchange methods, Fluoridation and defluoridation, desalination, membrane technologies.</p>	
<b>UNIT - IV</b>	<b>Air Pollution and Control</b>	<b>(06 Hours)</b>

	<p><b>Air Pollution:</b> History of Air pollutants, Sources and classification of pollutants and their effects on human health, vegetation and property. Ambient air quality and emission standards,</p> <p><b>Air Pollution Control:</b> Principles, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods, Particulate Matter Control: settling chambers, cyclone separation, Wet collectors, fabric filters, and electrostatic precipitators.</p>	
<b>UNIT - V</b>	<b>Solid and Hazardous Waste Management</b>	<b>( 06 Hours)</b>
	<p><b>Solid and Hazardous Waste Management:</b> Introduction, Sources, Legislations, Waste Generation, Composition, Source reduction of wastes,</p> <p>Handling and segregation of wastes at source, storage and collection, Transport, Labeling and Handling of Hazardous Wastes, Waste processing, Composting,</p> <p>Solid Wastes Disposal in Landfills, secure landfills and landfill bioreactors, landfill remediation,</p> <p><b>Integrated Solid waste management:</b> Principles and Elements of Integrated Solid waste management.</p>	
<b>UNIT - VI</b>	<b>Environmental Management</b>	<b>( 06 Hours)</b>
	<p><b>Environmental Management:</b> Introduction, Principle, Fundamentals</p> <p><b>Environmental Management Systems-</b> Introduction, ISO 14000 series, Environmental Management Plan, Eco – labeling,</p> <p><b>Environmental Management Tools:</b> Life Cycle Assessment (LCA): Environmental Impact Assessment (EIA) and Environmental Audits</p> <p><b>Environmental Legislation:</b> Rules and Regulations of Environmental laws in India (Water and Air),</p>	
<b>Assignments:</b>		
1. Draw and explain flow sheets of water treatment plant for different types of water sources		
2. Numericals on design of flocculator, sedimentation tank and tube settler.		
3. Information about various types of filtration units		
4. National ambient air quality standards and control methods of air pollutants		
5. Experiences of solid waste management.		

6. EIA studies	
<b><u>Term Work: (Any Eight experiments)</u></b>	
11.	Determination of pH and alkalinity of water samples
12.	Determination of Total Hardness and its components of water samples
13.	Determination of Chlorides of water samples
14.	Determination of Turbidity and optimum dose of alum for raw water samples.
15.	Determination of Optimum dose of chlorine and residual chlorine for water samples.
16.	Determination of calorific value and/or energy content of the solid waste.
17.	Determination of concentration of trace metals (Al, Mn, Cu, Ni, Zn, Pb, Cd, Fe, N, P, K) from water, solid waste, air and soil samples.
18.	Determination of PM 2.5 in ambient air samples.
19.	Determination of concentration of Particulate matter and gaseous pollutants in industrial stack.
20.	Determination of concentration of carbon di-oxide from ambient air/industry/automobile
21.	Site visit
22.	Study of EIA report of infrastructure project.
<b>Text Books:</b>	
4.	Wark Kenneth and Warner C.F, Air pollution its origin and control. Harper and Row Publishers, New York, 1981.
5.	Rao C.S., Environmental pollution control Engineering, New age international Ltd, New Delhi, 1995.
6.	Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.
7.	George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, Integrated Solid Waste Management, McGraw- Hill, New York, 1993



8.	CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
9.	Dr. M. N. Rao and Dr. Razia Sultana, ‘ Solid and Hazardous Waste management’ BSP Books Pvt. Ltd. 2012
10.	I. V. Murali Krishna and Valli Manickam, ’Environmental Management’, BSP, Books Pvt. Ltd. 2014
<b>Reference Books:</b>	
1.	S.K. Friedlander: Smoke Dust and Haze: Fundamentals of Aerosol Behavior, Wiley 1977.
2.	Steven C. Chapra, Surface Water Quality Modeling, Tata McGraw-Hill Companies, Inc., New Delhi, 1997.
3.	J.L. Schnoor, Environmental Modeling Fate and Transport of Pollutants in Water, Air and Soil, John Wiley & Sons Inc., New York, 1996.
4.	Arthur C. Stern, Air Pollution, Air Pollutants, their transformation and Transport, (Ed.), (Third Ed.) Volume I , Academic Press, 2006.
5.	Solid Waste Management, Van Nostrand Reinhold Co. 1975
6.	C.L. ell, Solid Waste Management, John Wiley, 1975
7.	P.W. Powers. How to dispose of toxic substances and industrial Waste, Noyes Data Corporation, England, 1976.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

### 39 Estimating, Costing and Valuation

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory -4
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	Termwork -1
Tutorial : 1 Hour/ week	Term Work & Oral : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Building Construction and Building planning and Design.	
2.	Structural Design I and Structural Design II.	
3.	Surveying and leveling	
4.	Environmental Engineering I	
5	Infrastructure Engineering	
<b>Course Objectives:</b>		
	To prepare the students to make estimate of building, road, and other civil engineering structures	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	explain the specifications for different construction works and materials..	
2.	prepare estimate of the buildings, and other civil engineering structures.	
3.	.carryout rate analysis of different items of construction work	
4.	Carry out valuation of civil engineering structures.	

5.	fill the tender documents.
6.	compare different types of contracts

<b>UNIT - I</b>		<b>( 6 Hours)</b>
	<p><b>Estimating:</b> Definition, importance of quantity surveying, types of estimates, data required for estimates, units of measurement &amp; principles deciding the units, mode of measurement of building works. Abstracting, bill of quantities. Provisional &amp; prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.)</p> <p><b>Approximate Estimate:</b> Definition, purpose, methods of approximate estimation of building &amp; other civil engineering projects like roads, irrigation &amp; water supply &amp; sanitary engineering, electrical works.</p>	
<b>UNIT - II</b>		<b>( 6 Hours)</b>
	<p><b>Methods of Taking out quantities:</b> long wall, short wall method and centre line method of taking out quantities for different items of building. Estimate of RCC members. IS Codes used for estimating.</p> <p><b>Specifications:</b> Definition &amp; purpose, types, standard specifications. Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C. work.</p>	
<b>UNIT - III</b>		<b>( 6 Hours)</b>
	<p><b>Analysis of rates:</b> Factors affecting cost of an item of work, materials, sundries, lab our, Tools &amp; plant, overheads &amp; profit. Task work - definition &amp; factors affecting task work. Analysis of rates of any five items.</p> <p><b>Estimate of Road:</b> Methods of estimate of earthwork for road, canal. Estimate of different types of roads.</p>	
<b>UNIT - IV</b>		<b>( 6 Hours)</b>

	<p><b>Valuation of Properties:</b> Purpose, nature of value, price, cost and value, types of value. Factors affecting value of property. Concept of free hold and lease hold property.</p> <p>Depreciation &amp; methods of working out depreciation, sinking fund, Years purchase, out goings. Methods of Valuation of Building: Land &amp; building basis, Rental basis, Reproduction &amp; replacement cost basis. O<sub>1</sub> form.</p>	
<b>UNIT - V</b>		<b>( 6 Hours)</b>
	<p><b>Tenders:</b> Definition. Methods of inviting tenders, tender notice, Pre- qualifications of contractor, tender documents, preparation of tenders. Submission in 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders, E tendering. Comparative statement, pre- bid conference, acceptance of tenders, various forms of BOT tenders, global tendering. (A mockup exercise of preparation, submission, opening of tender documents is suggested). PPP contracts.</p>	
<b>UNIT - VI</b>		<b>( 6 Hours)</b>
	<p><b>Contracts:</b> General idea, types of contracts viz: lump sum, item rate, cost plus, Conditions of contracts. FIDIC document, standard contract conditions published by MOS and PI, Law of contract. Definition, objective &amp; essentials of valid contract.</p> <p><b>Conditions of contract:</b> General and Specific conditions. Condition regarding EM, SD, time as an essence of contract. Important conditions regarding addition, alteration, extra items, testing of materials, defective work, subletting, powers delegated to Engineer incharge regarding the above aspect, defect liability period, retention money, interim payment or running account bills, advance payment, secured advance, final bill.</p> <p>Settlement of disputes viz. dispute resolving board, arbitration, concept of partnering. Indian Contract Act. Liquidated damages, termination of contract.</p>	
<b>Assignments</b>		
1. Approximate estimate of different types of buildings		
2. To determine quantities of different items of building and preparation of specifications for construction materials (Any five)		

3. Rate analysis.
4. To carryout the valuation of existing building.
5. Mock up exercise of submission of tender.
6. Types of contracts.
<b><u>Term Work:</u></b>
1.Estimate of different structures using long wall short wall method and centre line method
2.Detailed estimate of a single storied R. C. C. framed building using D.S.R. rates
3.Working out quantities of steel reinforcement for a slab, a beam, column footing and preparing bar bending schedule.
4. a)Detailed estimate of roadwork . b) Assignment on road earthwork calculations.
5.Estimating quantities for any two of the following a) House drainage & water supply arrangement. b) Pipe culvert or slab culvert c) Septic tank.
6.Drafting detailed specifications of any five items .
7. Assignment on valuation of building. (O <sub>1</sub> form)
8.Preparation of draft tender notice.
9. Rate analysis for any five items.
<b>Text Books:</b>
1. Estimating and Costing By: Rangwala Published By: Charotar Publishing House, Anand
2.Estimating, Costing Specifications & valuation in Civil Engineering By: M.Chakraborty
<b>Reference Books:</b>
1.Estimating and Costing in Civil Engineering: Theory and Practice, By: B.N Dutta. Published By: S. Dutta & Company, Lucknow.
2.Civil Engineering Contracts & Estimates By: B.S.Patil Published, Orient Longman Ltd. Mumbai.
3.I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.
4. D.S.R: District Schedule of Rates

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV, V, VI

### 40: Geotechnical Engineering

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Termwork : 01
	Term Work & Oral : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Engineering Mathematics	
2.	Engineering Mechanics	
3.	Fluid Mechanics	
<b>Course Objectives:</b>		
	To make student capable to determine the properties of soil and use of soil as a construction material.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	determine weight - volume relation in soil as a three phase system	
2.	determine index properties of soil.	
3.	explain the compaction and consolidation process.	
4.	calculate the geostatic stresses and coefficient of permeability.	
5.	measure the shear strength of soil by various methods.	
6.	calculate the active and passive earth pressure by various methods.	

<b>UNIT - I</b>	<b>Introduction to soil mechanics</b>	<b>( 6 Hours)</b>
	Soil, Soil formation, soil types its composition, soil structures, clay mineral, soil mechanics, history and development of soil mechanics, basic definitions, weight volume relations in soil as three phase system, soil classification systems – USCS, IS, HRB, Textural classification, Activity of clay, Sensitivity of clay, Thixotrophy of clay	
<b>UNIT - II</b>	<b>Index Properties of Soil</b>	<b>(6 Hours)</b>
	Index properties of soil – Water content, specific gravity, particle size distribution, Consistency limits, density, relative density	
<b>UNIT - III</b>	<b>Permeability and Seepage Analysis</b>	<b>( 6 Hours)</b>
	Stresses within a soil, effective stress principle, stress point and stress path, Soil - water systems- capillarity, flow, Darcy’s law, permeability, and tests for its determination, head gradient and potential, seepage pressure, Upward flow condition, 2 D flow, Laplace equation, flow net and applications	
<b>UNIT - IV</b>	<b>Compaction and Stress Distribution</b>	<b>( 6 Hours)</b>
	Compaction: - Laboratory compaction tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Field compaction; compaction specifications and field control.  Stresses in soil: Geostatic Stresses, stress distribution, Bossinsque’s Theory for point load, Westergaard’s theory	
<b>UNIT - V</b>	<b>Shear Strength</b>	<b>( 6 Hours)</b>
	a) Introduction- Shear strength an Engineering Property. Mohr’s stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure. Peak and Residual shear strength, factors affecting shear strength. Stress-strain behavior of sands and clays.  b) Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils, advantages and disadvantages. Different drainage conditions for shear tests.	
<b>UNIT - VI</b>	<b>Earth Pressure Theories</b>	<b>( 6 Hours)</b>



	<p>a) Earth Pressure- Introduction, Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory- Earth pressure on Retaining wall due to submerged backfill,</p> <p>b) Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory. Rebhann's graphical method of determination of earth pressure.</p>	
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**Term Work:**

Term work shall consist of the following experiments (Any Ten)

1.	Determination of water content by oven drying method
2.	Determination of specific gravity of coarse and fine grained soil
3.	Classification of soil by sieve analysis
4.	Determination of consistency limits – Liquid, plastic and shrinkage limit
5.	Determination of in situ density test – Core cutter and sand replacement method
6.	Determination of coefficient of permeability by – a) Constant Head Method b) Falling Head Method
7.	Determination of OMC and MDD by Standard Proctor Test and Modified Proctor Test
8.	Determination of shear parameters by Direct Shear Test.
9.	Determination of Unconfined Compression Strength of soil
10.	Determination of shear parameters Triaxial Shear Test
11.	Determination of shear parameters Vane Shear Test

**Assignments:**

1.	Study of various relationships between weight and volume, numerical based on it and classification of soil.
2.	Classification of soil based on the index properties of soil.
3.	Study of permeability and numerical based on it.
4.	Study of Proctor tests, different field compaction equipments.
5.	Determination of shear strength, numerical problems based on it.
6.	Numerical problems based on earth pressure.

**Text Books:**

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1. Murthy, V.N.S., “Text Book of Soil Mechanics and Foundation Engineering”, CBS Publishers.	
2. Ranjan, G. and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers.	
3. K. R. Arora, “ Soil Mechanics & Foundation Engineering,	
4. Punmia B.C., “Soil Mechanics and Foundation Engineering” Laxmi Publications	
5. C. Venkatramaiah, “Geotechnical Engineering”, New Age International Publishers	
6. Gulati, Manoj Dutta, “Geotechnical Engineering”, Tata McGraw Hill Publications	
<b>Reference Books:</b>	
10. Terzaghi Karl, Ralph B. Pech, “Soil Mechanics in Engineering Practice”, A Wiley International Edition.	
11. Holtz, R.D. and Kovacs, W.D., “An Introduction to Geotechnical Engineering”, Prentice Hall.	
12. Lambe, T.W. and Whitman, R.V., “Soil Mechanics”, John Wiley and Sons.	
13. Couduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India.	
14. Das, B.M., “Principles of Geotechnical Engineering”, Thomson Asia.	
15. Korner Robert M. “ Construction and Geotechnical Engineering” Tata McGraw Hill Publications Company, New Delhi	
16. Joseph E. Bowels, “Soil mechanics and Foundation Engineering”, Tata McGraw Hill Publications Company, New Delhi	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

**41 A: Elective-I: Financial Management**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory - 03
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
<b>The Students should have knowledge of</b>		
1.	Project Management	
2.	Economics and Management	
3.	Construction Techniques and machinery.	
<b>Course Objectives:</b>		
	Students are expected to prepare company's financial position for decision making.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	manage financial planning of a construction project.	
2.	forecast financial requirement of a construction firm.	
3.	analyze Time-Value of Money.	
4.	determine working capital for construction Project.	
5.	apply theories of capital structures.	
6.	carry out risk analysis of budget.	
<b>UNIT - I</b>	<b>Introduction to Financial Management</b>	<b>( 6 Hours)</b>

	Scope and Functions of Financial Management, Role of Finance Manager, Organization of the Finance function, Financial Planning, Financial Statement Analysis	
<b>UNIT - II</b>	<b>Financial Planning</b>	<b>( 6 Hours)</b>
	Introduction, Objectives and steps in Financial planning, Factors affecting financial planning, estimation of financial requirement of a construction firm, Capitalization, Sources of Financing	
<b>UNIT - III</b>	<b>Capital Budgeting</b>	<b>( 6 Hours)</b>
	Time Value of money – Future value of a single cash flow, annuity, Present value of Single Cash flow, Present Value of Uneven Cash flow, Discounting and Non-discounting techniques – NPV, IRR, BCR and Payback period.	
<b>UNIT - IV</b>	<b>Working Capital Management</b>	<b>(6 Hours)</b>
	Importance and Objectives, factors affecting working Capital, Determination of Working Capital, Working capital financing policy	
<b>UNIT - V</b>	<b>Capital Structure</b>	<b>( 6 Hours)</b>
	Introduction, Salient features of Capital Structure, Factors influencing capital structure, Theories of Capital structures – EBIT and MM approach, Financial Management in India	
<b>UNIT - VI</b>	<b>Risk Analysis in Capital Budgeting</b>	<b>( 6 Hours)</b>
	Introduction, Types and Sources of Risk in Capital Budgeting, Risk Adjusted Discount Rate, Certainty Equivalent Approach, Probability Distribution Approach, Sensitivity Analysis, Simulation Analysis	
<b><u>Assignments: (Any Six)</u></b>		
12.	Assignment on Financial Management.	
13.	Assignment on Financial Planning.	
14.	Assignment on Balance Sheet & Profit-Loss statement.	
15.	Assignment on Cash flows.	
16.	Assignment on NPV, BCR and IRR	
17.	Assignment on working Capital Management with reference to case study.	

18.	Assignment on EBIT approach.
19.	Assignment on MM approach.
20.	Assignment on sensitivity analysis.
21.	Assignment on simulation.
<b>Text Books:</b>	
11.	Financial Management, I.M. Pande, Vikas Publication
12.	Financial Management, C. Paramasivam & T. Subramaniam, New Age International (P) Limited, Publishers.
<b>Reference Books:</b>	
17.	Financial Management, An Introduction, Jim Mc Menamin, Taylor and Francis
18.	Financial Management, M.Y. Khan, P.K. Jain, Tata McGraw Hill Publication
19.	Financial Management, Prasanna Chandra, Tata McGraw Hill Publication
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	UNIT – I, II & III
<b>Unit Test -2</b>	UNIT – IV, V & VI

**41 B: Elective-I - Advanced Structural Analysis**

<b><u>TEACHING SCHEME:</u></b>			<b><u>EXAMINATION SCHEME:</u></b>			<b><u>CREDITS ALLOTTED:</u></b>		
Theory: 3 Hours / Week			End Semester Examination: 60 Marks			Theory: 3		
			Continuous Assessment: 40 Marks					
<b>Course Pre-requisites:</b>								
The Students should have knowledge of								
1.	Structural Analysis- I							
2.	Structural Analysis- II							
<b>Course Objectives:</b>								
	The student should able to analyse the structure.							
<b>Course Outcomes:</b>								
The student will be able to								
1.	calculate deflection of beams and frames using Castigliano's first theorem.							
2.	analyze deflection of beams and frames using Castigliano's second theorem,							
3.	analyze indeterminate beams using Stiffness matrix method.							
4.	analyze indeterminate frames using Stiffness matrix method.							
5.	analyze indeterminate beams using Flexibility matrix method.							
6.	analyze indeterminate frames using Flexibility matrix method.							
<b>UNIT - I</b>		<b>Deflection of Beams and Plane Frames using Strain Energy Method:</b>					<b>( 06 Hours)</b>	

	Deflection of determinate beams and rectangular portals by application of Castigliano's first theorem;	
<b>UNIT - II</b>	<b>Analysis of Beams and Plane Frames using Strain Energy Method:</b>	<b>( 06 Hours)</b>
	Analysis of indeterminate beams and rectangular portals by application of Castigliano's second theorem with indeterminacy up to two degrees;	
<b>UNIT - III</b>	<b>Analysis of Beams using Stiffness Matrix Method:</b>	<b>(06 Hours)</b>
	Stiffness matrix method of analysis, Formulation of stiffness matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
<b>UNIT - IV</b>	<b>Analysis of Plane Frames using Stiffness Matrix Method:</b>	<b>(06 Hours)</b>
	Formulation of stiffness matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
<b>UNIT - V</b>	<b>Analysis of Beams using Flexibility Matrix Method:</b>	<b>(06 Hours)</b>
	Flexibility matrix method of analysis, Formulation of flexibility matrices, Applications to indeterminate beams. (Involving not more than three unknowns).	
<b>UNIT - VI</b>	<b>Analysis of Plane Frames using Flexibility Matrix Method:</b>	<b>(06 Hours)</b>
	Formulation of flexibility matrices for frames, Applications for rigid jointed indeterminate rectangular plane frames. (Involving not more than three unknowns).	
<b>Assignments:</b>		
1) Calculate deflection of beams using Castigliano's first theorem		
2) Analyse indeterminate beams or rectangular portals by application of Castigliano's second theorem		
3) Calculate stiffness matrix for beams		
4) Calculate stiffness matrix for frames		
5) Calculate flexibility matrix for beams		
6) Calculate flexibility matrix for frames		

<b>Reference Books:</b>	
1) Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2) Pandit G. S. & Gupta S. P., “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication	
3) Asslam Kassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co.	
4) Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall.	
5) Wilbur & Norris, “Basic Structural Analysis” Tata McGraw Hill Publication	
6) Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication	
7) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
8) Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
9) Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	
10) Junnarkar S. B. & Adavi, “Mechanic of Structures”, Charotar Publishing House	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI



**41 C: ELECTIVE I: URBAN WATER MANAGEMENT**

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week		End Semester Examination : 60 Marks	Theory :03
		Continuous Assessment : 40 Marks	
<b>Course Pre-requisites:</b>			
The Students should have knowledge of			
1.	Physics, Chemistry, Mathematics and Statistics		
2.	Ecology, Hydrology, Environment and Climate Change		
3.	Water Engineering and Management		
<b>Course Objectives:</b>			
To learn Urban Water Management (UWM) which promises a better approach than the current system, in which water supply, sanitation, storm water and wastewater are managed by isolated entities, and all four are separated from land-use planning and economic development and adopt UWM and its adaptive, iterative processes will help cities significantly reduce the number of people without access to water and sanitation by providing water services of appropriate quantity and quality, thereby improving the health and productivity of urban residents.			
<b>Course Outcomes:</b>			
<b>The student will be able to</b>			
1.	Understand how cities are growing and changing which is leading to describing the promise of IUWM and how some city case studies that explore the ways in which aspects of IUWM have been put into practice, since every city faces a different challenge and requires context-appropriate solutions.		
2.	Focus on the implications of these changes for urban water resources: in the past, water security efforts focused on water quantity and understand how new concerns about water quality are now emerging.		

3.	Understand and design the new tools and strategies to shift from urban water management to IUWM, and develop flexible and adaptable urban water systems.	
4.	Gain insight that how UWM can contribute to cities' resilience in the face of climate change and analyze changing climate demanding water management be approached in a different way.	
5.	Understand, apply and develop an enabling environment for the change toward a framework for integrated urban water management.	
6.	Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities that are inclusive, productive, well governed, and sustainable which leads to foster a new culture of urban water management.	
<b>UNIT - I</b>	<b>Introduction to Urban Water Management</b>	<b>( 6 Hours)</b>
	Introduction to Urban Water Management (UWM): Concept, Need, The changing urban context, Expanding city limits, Consequences of globalization and Urbanization, Urban-Rural Conflicts, Special challenges for some cities	
<b>UNIT - II</b>	<b>Water resources and urbanization</b>	<b>( 6 Hours)</b>
	Water: Sources, Quantity and Quality, Wastewater: Sources, Quality and Reuse , Effects on Water Demand due to Urbanization, Water Cess Act, Water(Prevention and Control) Act 1974	
<b>UNIT - III</b>	<b>UWM tools and management strategies</b>	<b>(6 Hours)</b>
	Storm water management, Water reclamation and reuse, Water audits and efficient use, Flexible and adaptable urban water systems, Tariffs, payments and other economic tools, Benefit Cost Ratio for Urban Water Management	
<b>UNIT - IV</b>	<b>Climate Change Challenge</b>	<b>(6 Hours)</b>
	Climate Change: Introduction, Cause and Consequences, Climatic Variations in India in recent years, Effect of Climate change on Water Resources and Sanitation, Urban contributions to climate change, Response options , Resilience to climate change	
<b>UNIT - V</b>	<b>Conventional and Integrated Urban Water Management</b>	<b>( 6 Hours)</b>
	Conventional Urban Water Management: Introduction, Present Scenario, Advantages and Disadvantages, Integrated Urban Water Management (IUWM): Introduction, Need, Advantages, Urban water governance, Application of IUWM for SMART CITY	

<b>UNIT - VI</b>	<b>Framework for integrated urban water management</b>	<b>( 6 Hours)</b>
	Role of Central and Local governments, Involvement of Private sector, Business opportunities and Employment Enhancement, Participation of NGO's and Stakeholder, Sustainable Development and Practices	
<b>Assignments:</b>		
1. Collection of data how cities are growing and changing describing the promise of IUWM		
2. Study of urban water resources: in the past and how new concerns about water quality are now emerging.		
3. Design new tools and strategies to shift from Conventional urban water management to IUWM		
4. Study and data collection of climate change and analyze changing climate demanding water management be approached in a different way.		
5. Design framework for integrated urban water management for Existing and Futuristic SMART Cities		
6. Design, analyze and apply practical approaches for constructing and building GREEN and SMART cities to foster a new culture of urban water management.		
7. Field Visit and Report on SMART City and/or Township in India and/or abroad		
<b>Text Books:</b>		
1. Urban Water Engineering and Management by Mohammad Karamouz, Ali Moridi, Sara Nazif, January 20, 2010 by CRC Press Textbook, ISBN 9781439813102 - CAT# K10665		
2. Municipal Stormwater Management, Second Edition by Thomas N. Debo, Andrew Reese, November 25, 2002 by CRC Press, Reference – 1176, ISBN 9781566705844 - CAT# L1584		
3. Urban Storm Water Management by Hormoz Pazwash, April 28, 2011 by CRC Press, Reference – 550, ISBN 9781439810354 - CAT# K10518		
4. Integrated Urban Water Management: Humid Tropics: UNESCO-IHP by Jonathan N. Parkinson, Joel Avruch Goldenfum, Carlos Tucci, March 26, 2010 by CRC Press, Reference – 180, ISBN 9780415453523 - CAT# K10165, Series: <a href="#">Urban Water Series</a>		
5. Water in Central Asia: Past, Present, Future by Victor A. Dukhovny, Joop de Schutter, January 25, 2011 by CRC Press, Reference – 432, ISBN 9780415459624 - CAT# K00021		
6. The Economics of Sustainable Urban Water Management: the Case of Beijing: UNESCO-IHE PhD Thesis by Xiao Liang, September 28, 2011 by CRC Press, Reference – 200, ISBN 9780415691734 - CAT# K13927		
7. Climate Change Effects on Groundwater Resources: A Global Synthesis of Findings and Recommendations by Holger Treidel, Jose Luis Martin-Bordes, Jason J. Gurdak, December 2, 2011 by CRC Press, Reference – 414, ISBN 9780415689366 - CAT# K13833, Series: <a href="#">IAH - International Contributions to Hydrogeology</a>		
8. Metropolitan Sustainability: Understanding and Improving the Urban Environment Edited by F Zeman, Royal Military College of Canada, Canada, September 2012, Woodhead Publishing, ISBN: 978-0-85709-046-1		
9. Designing the Urban Future: Smart Cities Kindle Edition by Scientific American Editors, Kindle Edition, Kindle eBook, 31 Mar 2014		

10. Urban Water Supply and Sanitation in Southeast Asia: A Guide to Good Practice by Arthur C. McIntosh, ASIAN DEVELOPMENT BANK, ISBN 978-92-9254-554-3 (Print), 978-92-9254-555-0 (PDF), Publication Stock No. TIM135915-2
11. Water Resources and Economics In association with International Water Association (IWA), Editor-in-Chief: [Prof. Dr. Roy Brouwer](#), ISSN: 2212-4284, ELSEVEIR
12. Water and Cities: Ensuring Sustainable Futures, Apr 2015, ISBN : 9789264230149 (PDF) ; 9789264230101 (print)
13. Water Management: Performance and Challenges in OECD Countries, Mar 1998, ISBN : 9789264162600 (PDF) ; 9789264160781 (print)
14. Good Practices in Urban Water Management: Decoding Good Practices for a Successful Future Edited by Anand Chiplunkar, Kallidaikurichi Seetharam, Cheon Kheong Tan, 2012, Asian Development Bank, National University of Singapore, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF), Publication Stock No. BKK102333
15. Strategic Planning of Sustainable Urban Water Management, P-A Malmqvist, G Heinicke, E Korrman, TA Stenstrom, G Svensson, 2006, IWA Publishing, ISBN13: 9781843391050, eISBN: 9781780402413, Categories: Utility / network management, Urban water
17. Climate Change and Water: International Perspectives on Mitigation and Adaptation edited by Carol Howe, Joel B. Smith, MS. Jim Henderson, American Water Works Association and IWA Publishing, ISBN: 978-1-58321-730-6
18. Climate Change and Water Resources by Younos, Tamim, Grady, Caitlin A (Eds.) , ISBN 978-3-642-37586-6, Springer, USA
19. Climate Change, Water Supply and Sanitation: Risk Assessment, Management, Mitigation and Reduction by Adriana Hulsmann, Gesche Grützmacher, Gerard van den Berg, Wolfgang Rauch, Anders Lynggaard Jensen, Victor Popovych, Mario Rosario, Lydia S. Vamvakeridou-Lyroudia, Dragan A. Savic, 2015, ISBN13: 9781780404998, eISBN: 9781780405001, Categories: Developing Countries, Water resources / environment, Water supply & treatment

**Reference Books:**

1. Integrated Urban Water Management By Akiça Bahri, Global Water Partnership Technical Committee (TEC), TEC BACKGROUND PAPERS, NO. 16, ISBN: 978-91-85321-87-2
2. Good Practices in urban water management: Decoding good practices for a successful future edited by Chiplunkar, Anand, Kallidaikurichi Seetharam, and Cheon Kheong Tan, Mandaluyong City, Philippines: Asian Development Bank, 2012, ISBN 978-92-9092-740-2 (Print), 978-92-9092-741-9 (PDF)
3. Integrated Urban Water Management for Planners By John Y. Whitler and Jennifer Warner, Water Research Foundation, PAS Memo — September/October 2014, American Planning Association, 205 N. Michigan Ave., Ste. 1200, Chicago, IL 6060

Syllabus for Unit Test:

Unit Test -1

UNIT – I, II, III

Unit Test -2	UNIT – IV, V, VI
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**41 D: Elective-I: Docks, Ports and Harbours**

<b><u>TEACHING SCHEME:</u></b>			<b><u>EXAMINATION SCHEME:</u></b>			<b><u>CREDITS ALLOTTED:</u></b>		
Theory: 03 Hours / Week			End Semester Examination: 60 Marks			Theory: 03		
			Continuous Assessment: 40 Marks					
<b>Course Pre-requisites:</b>								
The Students should have knowledge of								
1.	Fluid Mechanics							
2.	Advanced Surveying (Hydrographic Survey)							
<b>Course Objectives:</b>								
	To study different marine structures and their design considerations.							
<b>Course Outcomes:</b>								
<b>The student will be able to</b>								
1.	describe development of port.							
2.	describe the wave, tide and the phenomenon related to the same.							
3.	explain different harbour and port facilities.							
4.	design the breakwaters.							
5.	explain the port planning.							
6.	explain marine pollution.							
<b>UNIT - I</b>	<b>Introduction to Ports and Harbours</b>						<b>( 6 Hours)</b>	

	History, development of port and ship construction technology along with International trade, Port Development – Indian Scenario	
<b>UNIT - II</b>	<b>Waves and Tides</b>	<b>(6 Hours)</b>
	Concept of generation, propagation and form of wave in coastal zone, global tide phenomenon, types of tides concept of wave tranquility, resonance, coastal sediment transport	
<b>UNIT - III</b>	<b>Ports and Harbours</b>	<b>( 6 Hours)</b>
	Harbour : classification, facilities and structures, Approach channel, Marker Buoys, Breakwater layout, Berth and Jetties, Bulk oil container  Ports: Loading unloading, storage, Customs and relevant facilities, security, hospital colony, Associated Services, Maintenance facilities, Dry docks, Slipway, locks.	
<b>UNIT - IV</b>	<b>Marine Structures</b>	<b>( 6 Hours)</b>
	General design aspects, breakwaters - function, types general design principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories- function, types, suitability, design and construction features.	
<b>UNIT - V</b>	<b>Port Planning</b>	<b>( 6 Hours)</b>
	Modernization of port, Lifting and loading unloading (RORO) facilities, Computerization, Automation, berth occupancy, Port Cost Analysis, Dredging and disposal technology	
<b>UNIT - VI</b>	<b>Port Development</b>	<b>( 6 Hours)</b>
	Role of port development and national policy, Public and private sector, Marine pollution and environmental aspects.	
<b><u>Assignments:</u></b>		
1. Explain history and development of port in India.		
2. Write the concept of wave generation and propagation in coastal zone		
3. Explain the facilities provided at ports and harbours.		

4. Design a breakwater with the data given.	
5. Write different aspect of port planning.	
6. National policy for port development and environmental aspect of it.	
7. Site visit to CW & PRS	
<b>Text Books:</b>	
1. Basic Coastal Engineering, R.M.Sorenson, J.Wiley & Sons, 1978	
2. Docks and Harbour Engineering,H.P.Oza and G.H.Oza, Charotar Publishing 2013	
3. A Course in Docks and Horbour Engineering, S.P.Bindra, Dhanpatrai Publications	
4. Harbour, Dock and Tunnel Engineering,R.Shrinivasan, Charotar Publishing House Pvt.Ltd (2013)	
<b>Reference Books:</b>	
1.Oceanographical Engineering, R.L.Wiegel, Prentice –Hall 1964	
2.Coastal Engineering, Vols. 1 and 2 , R. Silvester Elsevier Scientific Publishing Co., 1974	
3.N I O Design Manual	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI



**41 E: Elective-I: HUMAN RESOURCE MANAGEMENT**

<b><u>TEACHING SCHEME:</u></b>			<b><u>EXAMINATION SCHEME:</u></b>			<b><u>CREDITS ALLOTTED:</u></b>		
Theory: 3 Hours / Week			End Semester Examination: 60 Marks			Theory: 03		
			Continuous Assessment: 40 Marks					
<b>Course Pre-requisites:</b>								
The Students should have knowledge of								
1.	Engineering Economics Management							
2.	Project Management							
<b>Course Objectives:</b>								
	To develop the skill of human resource management in construction industry.							
<b>Course Outcomes:</b>								
<b>The student will be able to</b>								
1.	discuss the significance of human resources in construction industry.							
2.	plan human resources.							
3.	describe the recruitment and selection process.							
4.	discuss the significance of training and development of employees.							
5.	analyze the employee benefits and incentives.							
6.	describe employee management relations.							
<b>UNIT - I</b>		<b>Introduction</b>					<b>( 6 Hours)</b>	
		History of HRD, Objectives, Functions, HRD in Construction industry, status of construction labour.						
<b>UNIT - II</b>		<b>Human Resource Planning</b>					<b>( 6 Hours)</b>	

	Formulating human resource plans, various methods, job analysis, job specifications and job design in construction projects, forecasting personal needs and supply in construction sector.	
<b>UNIT - III</b>	<b>Recruitment &amp; selection</b>	<b>( 6 Hours)</b>
	Selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.	
<b>UNIT - IV</b>	<b>Training &amp; Development</b>	<b>( 6 Hours)</b>
	The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system, Performance Management / Encouragement, Rewarding Employees	
<b>UNIT - V</b>	<b>Employee Benefits</b>	<b>( 6 Hours)</b>
	Employee health and safety, wage and salary administration, incentive system, wages of construction industry, retirement and pensions.	
<b>UNIT - VI</b>	<b>Employee Management Relations</b>	<b>( 6 Hours)</b>
	Collective Bargaining, Effective ways of working, trade unions act, labour welfare act, payment of wages act ,workers compensation act ,contract labour act, management of conflicts.	
<b><u>Assignments:</u></b>		
1. Case study of HRD in construction industry		
2. Formulating human resource plan		
3. Case study of external and internal recruitment		
4. Report on establishing evaluation system for performance appraisal		
5. Importance on Employee benefits		
6. Report on conversation with HR of any construction industry		
<b>Text Books:</b>		
13.	“Human Resource Development and Management” by “Biswanath Ghosh”, Vikas Publishing House Pvt. Ltd.	
14.	“Human Resource Management” by “S.C. Agarwal”, Dhanpat Rai Publications	
15.	Personnel & Human resource Management – C.B. Mamoria, Himalaya Publishing House	
<b>Reference Books:</b>		

20.	Human resource management – Subbarao, Himalaya Publishing House
21.	Human Resource Management— K. Aswathappa, TMH Pvt. Ltd
22.	“Human Resource Management” by “John Stredwick”
23.	International Human Resource Management--- Gary Diesler
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

**41 F: Elective-I - Green Construction Practices.**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
	basic knowledge of conventional construction practices, green materials and immerging trends in the green building industry.	
<b>Course Objectives:</b>		
1.	To understand the concept of sustainability and sustainable development	
2.	To familiarize students with various environmental issues	
3.	To familiarize students with various Green Building Rating Systems	
4.	To understand selection criteria and implementation options for various green material	
5.	To inform the various alternatives materials and construction practices.	
6.	To inform the various recycled and innovative materials and construction techniques through case studies.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	evaluate the immerging trends in the fields of sustainable development and environment.	
2.	evaluate the effects of construction industry on environment.	
3.	understand the various evaluation systems for green buildings.	

4.	implement various green material selection and construction techniques.	
5.	determine immerging trends in alternative materials and construction techniques.	
6.	determine immerging trends in the field of recycled and innovative materials	
<b>UNIT - I</b>	<b>Introduction to Sustainable Development</b>	<b>(06 Hours)</b>
	Basic Concepts of Sustainable Development - History of sustainable development in India and around the world – Sustainable Development an overview Bruntland Commission, UNFCCC – Goals of sustainable development – Energy, Environment and Financial sustainability	
<b>UNIT - II</b>	<b>Environment Management and Impact Assessment</b>	<b>(06 Hours)</b>
	Environment Management Basic: Introduction to biodiversity, Ecosystem and impacts of climate change on environment  Environment Laws and Policies: EP Act (Environment Protection Act)  Acts related to pollution and climate change	
<b>UNIT - III</b>	<b>Sustainable Architecture and Green Buildings</b>	<b>(06 Hours)</b>
	Green Ratings System: in India and around the world- an introduction  Green Rating Systems in India : LEED (IGBC), Griha – Ecohousing,	
<b>UNIT - IV</b>	<b>Green Building Materials and Construction Techniques</b>	<b>(06 Hours)</b>
	Introduction to Green materials – Life Cycle Analysis – Life Cycle Cost Analysis – Selection criteria of Materials and Construction Techniques <u>Green Buildings.</u>	
<b>UNIT - V</b>	<b>Alternative Material and Construction Techniques:</b>	<b>(06 Hours)</b>
	Bamboo, ferrocete, cob-adobe, etc and their construction techniques.	
<b>UNIT - VI</b>	<b>Recycled and Innovative Materials and Construction Techniques</b>	<b>(06 Hours)</b>
	Recycled glass, plastic, recycled debris block. Process of manufacture and construction.	
<b>Assignments:</b>		

22.	Assignment on various building practices carried out conventionally and the consequences.
23.	Assignment on Eco system and food chain,
24.	Assignment on Environmental Impact.
25.	Report writing on Green Material.
26.	Report writing on Indoor Environmental Quality Enhancement facilities.
27.	Case Studies
<b>Text Books:</b>	
16.	Dominique Gauzin – Muller “Sustainable Architecture and Urbanism: Concepts,
17.	Slessor, Eco-Tech : “Sustainable Architecture and High Technology”, Thames and Hudson
18.	Ken Yeang, “Ecodesign : A manual for Ecological Design”, Wiley Academy, 2006.
<b>Reference Books:</b>	
1.	Francis D.K. Ching, Ian M. Shapiro : “Green building Illustrated”
2.	<b>Kumar</b> , Surender, <b>Managi</b> , Shunsuke: “The Economics of Sustainable Development The Case of India “
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

**41 G: Elective-I: Numerical Methods in Civil Engineering**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 3
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Engineering Mathematics	
2.	Concept of differentiation and integration	
3.	Partial differential equations.	
<b>Course Objectives:</b>		
	To give a broad background to numerical methods common to various branches of civil engineering to the student.	
<b>Course Outcomes:</b>		
<b>The student will be able to</b>		
1.	find out core concepts of error estimate and accuracy of numerical solutions.	
2.	use direct solutions of linear systems.	
3.	use iterative solutions of linear systems.	
4.	use direct solutions of non-linear systems.	
5.	use numerical solutions to solve partial differential equations.	
6.	use numerical integration methods to solve partial differential equations.	
<b>UNIT - I</b>	<b>Introduction to Numerical Methods.</b>	<b>( 6 Hours)</b>

	Introduction, need of studying numerical methods, Sources of error in numerical solutions: truncation error, round off error. Order of accuracy - Taylor series expansion.	
<b>UNIT - II</b>	<b>Direct Solutions of Linear Systems</b>	<b>( 6 Hours)</b>
	Gauss elimination, Gauss Jordan elimination. Pivoting, inaccuracies due to pivoting. Factorization, Cholesky decomposition.	
<b>UNIT - III</b>	<b>Iterative Solutions of Linear Systems</b>	<b>( 6 Hours)</b>
	Jacobi iteration. Gauss Seidel iteration. Convergence criteria.	
<b>UNIT - IV</b>	<b>Direct Solutions of Nonlinear Systems</b>	<b>(6 Hours)</b>
	Newton Raphson iterations to find roots of a 1D nonlinear equation. Generalization to multiple dimensions. Newton Iterations, Quasi Newton iterations. Local and global minimum, rates of convergence, convergence criteria.	
<b>UNIT - V</b>	<b>Numerical Methods to solve partial differential equations.</b>	<b>( 6 Hours)</b>
	Difference operators (forward, backward and central difference), Stability and accuracy of solutions, Application of finite difference operators to solve initial and boundary value problems. Numerical quadrature: Trapezoidal rule, simpsons rule, Gauss quadrature.	
<b>UNIT-VI</b>	<b>Numerical integration of time dependent partial differential equations</b>	<b>(6Hours)</b>
	Parabolic equations: algorithms - stability, consistency and convergence, Lax equivalence theorem. Hyperbolic equations: algorithms - Newmark's method, stability and accuracy, convergence, multi-step methods.	
<p><b>Assignments: Any Six</b></p> <ol style="list-style-type: none"> <li>1. Assignment problem based on ‘Gauss -Jordan Method’.</li> <li>2. Assignment problem based on ‘Gauss -Elimination Method’.</li> <li>3. Assignment problem based on ‘Gauss –Seidel Iteration Method’.</li> <li>4. Assignment problem based on ‘Newton-Raphson Method’-1D solution.</li> <li>5. Assignment problem based on ‘Newton –Raphson Method’-multidimensional solution.</li> <li>6. Solution of Partial Differential Equation using ‘Trapezoidal Rule’.</li> </ol>		



7. Solution of Partial Differential Equation using ‘Simposon’s Rule’.	
8. Solution of Partial Differential Equation using ‘Gauss Quadrature Rule’.	
9. Solution of Time Dependent Partial Differential Equation .	
<b>Text Books:</b>	
1. Balaguruswamy “ Numerical Methods” Tata Mcgraw Hill Publications	
2. Dr.V.M.Domkundwar “Numerical Methods”	
3. S. S. Sastry “Introductory Methods of Numerical Analysis”, Prentice Hall India	
<b>Reference Books:</b>	
1.T.J.R.Hughes"The Finite Element Method", Prentice Hall, Englewood Cliffs, NJ, 1987.	
2. I.Stakgold , “Green's functions and Boundary Value Problems", Wiley, 1998.	
3.D.Dahlquist and A. Bork "Numerical Methods", Dan Prentice-Hall, Englewood Cliffs, NJ,. 1974.	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

**ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Determinants	
2.	Matrices	
3.	Differentiation	
4.	Integration of functions	
5.	Differential equation	
<b>Course Objectives:</b>		
	The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.	
<b>Course Outcomes:</b>		
<b>The student should be able to</b>		
1.	derive appropriate numerical methods to solve algebraic and transcendental equations	
2.	evaluate the accuracy of common numerical methods.	

3.	develop appropriate numerical methods to solve a difference equation	
4.	be familiar with numerical interpolation and approximation of functions , numerical integration and differentiation.	
5.	be familiar with numerical solution of ordinary differential equations.	
6.	To compute Numerical Solution of Partial Differential Equations.	
<b>UNIT - I</b>	<b>Numerical solutions of algebraic and transcendental equations</b>	<b>(08 Hours)</b>
	Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.	
<b>UNIT - II</b>	<b>Solution of system of linear algebraic equation</b>	<b>(08 Hours)</b>
	Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.	
<b>UNIT - III</b>	<b>Difference equation and Solution of difference equations</b>	<b>(08 Hours)</b>
	Definition of difference equations, formation of difference equation.  Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.	
<b>UNIT - IV</b>	<b>Interpolation and Numerical differentiation and integration</b>	<b>(08 Hours)</b>
	Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.	

	Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.	
<b>UNIT - V</b>	<b>Numerical solution of I order ordinary differential equation</b>	<b>(08 Hours)</b>
	solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.	
<b>UNIT - VI</b>	<b>Numerical Solution of Partial Differential Equations</b>	<b>(08 Hours)</b>
	Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.	
<b>Text Books:</b>		
1. Gupta P.P.& Malik G.S., <i>Calculus of Finite Differences and Numerical Analysis</i> , Krishna Prakashan Mandir, Meerut, 21/e, 2006.		
2. B.S.Grewal, <i>Engineering Mathematics</i> , Khanna Publishers, 12/e, 2006.		
<b>Reference Books:</b>		
24. Francis J. Scheid, Schaum's <i>Outline of Numerical Analysis</i> , McGraw-Hill, New York, 1989.		
25. S. S. Sastry, <i>Engineering Mathematics</i> , Vol I, II Prentice Hall Publication, 3/e, 2004.		
26. C.Ray Wylie & Louis C. Barretle, <i>Advanced Engineering Mathematics</i> , Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I,II,III	
Unit Test -2	UNIT – IV,V,VI	



## 42 Professional Skills Development VI

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 4 Hours / Week	End Semester Examination: 100 Marks	4
<b>Course Pre-requisites</b>		
The Students should have knowledge of		
1.	Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.	
2.	A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.	
3.	Basic knowledge of writing skills, importance of professionalism in emails and letters.	
4.	Knowledge on the concepts of criticism, feedback and conflicts.	
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.	
6.	Brief idea about professional and business meeting etiquettes.	
<b>Course Objectives</b>		
	The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs	
<b>Course Outcomes</b>		
<b>The student should be able to</b>		

1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.
2.	Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams
3.	Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc to be demonstrated in an interview process.
4.	They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.
5.	Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.
<b>Unit I</b>	<b>Aptitude (Maths, Logical Reasoning, English)</b>
	<b>(24Hours)</b>
	<ul style="list-style-type: none"> <li>• Maths <ul style="list-style-type: none"> <li>▪ Permutation &amp; Combinatiom</li> <li>▪ Probability</li> <li>▪ Maths Revision -1</li> <li>▪ Maths Revision - 2</li> </ul> </li> <li>• Logical Reasoning <ul style="list-style-type: none"> <li>▪ Matching, Selection &amp; Arrangement</li> <li>▪ Clocks &amp; Calendars, Visual Reasoning</li> <li>▪ Input , Output &amp; Flow Chart.</li> <li>▪ Reasoning Revision- 1</li> <li>▪ Reasoning Revision-2</li> </ul> </li> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar – III– (Prepositions&amp; Conjunctions)</li> <li>▪ Grammar- (Articles &amp; Parallelism)</li> <li>▪ Verbal Ability Revision- I</li> </ul> </li> </ul>
<b>Unit II</b>	<b>Soft Skills &amp; English Communication</b>
	<b>(24Hours)</b>

	<ul style="list-style-type: none"> <li>• Resume-I</li> <li>• Resume- II</li> <li>• Mock GD</li> <li>• Mock GD</li> <li>• Personal Interviews-I</li> <li>• Personal Interviews-II</li> <li>• Mock PI</li> <li>• Mock PI</li> <li>• Extempore Speeches, Group Interviews</li> <li>• Written Skills- Revision</li> <li>• Stress Management</li> <li>• Business Writing Tones.</li> </ul>	
<b>Text Books</b>		
<b>1. APAART: Verbal Ability</b>		
<b>2. APAART: Logical Reasoning</b>		
<b>3. APAART: Quantitative Aptitude</b>		
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>		
<b>5. APAART: Speak Well 2 (Soft Skills)</b>		



**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil) – Sem I - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment			TW	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments					
1.	Engineering Mathematics- I	3	--	1	60	20	10	10	--	100	4	-	4
2.	Fundamentals of Civil Engineering	3	2	--	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics*	4	2	--	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
6.	Professional Skill Development-I	2	--	--	50	--	--	--	--	50	2	-	2
7.	Computer Applications in Civil Engineering-I	-	2	--	--	---	--	--	50	50	-	1	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>	<b>25</b>

\*End Semester Exam of duration 4 hours.

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**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil) – Sem II - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)						Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW	Total	Theory	TW	Total
8.	Engineering Mathematics- II	3	--	1	60	20	10	10	--	100	4	-	4
9.	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1	4
10.	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1	5
11.	Engineering Chemistry	4	2	--	60	20	10	10	25	125	4	1	5
12.	Building Construction	3	2	--	60	20	10	10	25	125	3	1	4
13.	Professional Skill Development-II	2	--	--	50	--	--	--	--	50	2	-	2
14.	Workshop Technology	--	2	--	--	---	--	--	50	50	-	1	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>	<b>25</b>

**Total Credits**

**Semester I = 25**

**Semester II = 25**

**Grand Total = 50**

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**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil) – Sem III - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
15	Building Planning, Design and Byelaws*	3	2	--	60	20	10	10	50	--	150	3	1	4
16	Applied Geology	3	2	--	60	20	10	10	--	50	150	3	1	4
17	Engineering Economics & Financial Accounting	3	-	-	60	20	10	10	--	---	100	3	--	3
18	Mechanics of Solids	4	--	1	60	20	10	10	---	---	100	5	-	5
19	Concrete Technology	3	--	--	60	20	10	10	--	----	100	3	-	3
20	Professional Skill Development-III	4	--	--	100	---	----	--	--	----	100	4	-	4
21	Computer Applications in Civil Engineering-II	---	2	--	---	--	---	---	---	50	50	---	1	1
22	Testing of Materials	--	2	--	--	--	--	--	50	---	50	--	1	1
	<b>Total</b>	<b>20</b>	<b>08</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

\*End Semester Exam of duration 4 hours.

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**Programme: B. Tech. (Civil) – Sem IV - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
23	Engineering Mathematics-III	3	--	1	60	20	10	10	--	---	100	4	-	4
24	Surveying	3	4	--	60	20	10	10	--	50	150	3	2	5
25	Mechanics of Fluids	3	2	--	60	20	10	10	50	----	150	3	1	4
26	Construction Techniques and Machinery	3	--	--	60	20	10	10	---	----	100	3	-	3
27	Structural Analysis- I	3	--	--	60	20	10	10	---		100	3	-	3
28	Professional Skill Development-IV	4	--	--	100	--	--	--	--	---	100	4	--	4
29	Computer Applications in Civil Engineering-III	---	2	--	---	--	---	---	---	50	50	---	1	1
30	Civil Engineering Construction Practice	--	2	--	--	--	--	--	50	----	50	--	1	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>20</b>	<b>5</b>	<b>25</b>

**Total Credits**

**Semester III = 25**

**Semester IV = 25**

**Grand Total = 50**

**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil) – Sem V - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
31.	Structural Design-I*	4	2	1	60	20	10	10	50	--	150	5	1	6
32.	Advanced Surveying	3	2	--	60	20	10	10	50	--	150	3	1	4
33.	Engineering Project Management	3	2	--	60	20	10	10	50	---	150	3	1	4
34.	Structural Analysis-II	3	--	-	60	20	10	10	---	---	100	3	--	3
35.	Advanced Mechanics of Fluid	3	2	--	60	20	10	10	50	----	150	3	1	4
36.	Professional Skill Development-V	4	--	--	100	--	--	--	--	---	100	4	--	4
	<b>Total</b>	<b>20</b>	<b>08</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>--</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

\*End Sem Exam of duration 4 hours.

**Optional Subject**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
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**Programme: B. Tech. (Civil) – Sem VI - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
37.	Structural Design-II*	3	2	1	60	20	10	10	50	--	150	4	1	5
38.	Environmental Engineering-I	3	2	--	60	20	10	10	--	50	150	3	1	4
39.	Estimation, Costing and Valuation*	3	2	1	60	20	10	10	50	---	150	4	1	5
40.	Geotechnical Engineering	3	2	--	60	20	10	10	50	---	150	3	1	4
41.	Elective-I	3	--	--	60	20	10	10	--	----	100	3	--	3
42.	Professional Skill Development-VI	4	-	--	100	--	--	--	--	---	100	4	-	4
	<b>Total</b>	<b>19</b>	<b>08</b>	<b>2</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>
<b>MD</b>	Environmental Studies	<b>3</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>25</b>	<b>-</b>	<b>-</b>	<b>125</b>	<b>-</b>	<b>-</b>	<b>--</b>

\*End Sem Exam of duration 4 hours.

**Total Credits**

**Semester V = 25**

**Semester VI = 25      Grand Total = 50**

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**Programme: B. Tech. (Civil) – Sem VII - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW & Practical	Total	Theory	TW	Total
43	Structural Design-III*	3	2	-	60	20	10	10	50	--	150	3	1	4
44	Environmental Engineering-II	3	2	--	60	20	10	10	50	--	150	3	1	4
45	Foundation Engineering	3	-	--	60	20	10	10	--	---	100	3	-	3
46	Urban Planning	3	-	--	60	20	10	10	--	---	100	3	-	3
47	Elective-II	3	--	--	60	20	10	10	---	---	100	3	--	3
48	Computer Applications in Civil Engineering-IV	--	2	-	--	--	-	---	50	--	50	--	1	1
49	Project Stage- I	--	2	--	-	-	-	-	50	---	50	--	4	4
50	In plant Training for 45 days	--	--	--	--	--	--	--	50	---	50	--	3	3
	<b>Total</b>	<b>15</b>	<b>12</b>	<b>-</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>250</b>	<b>00</b>	<b>750</b>	<b>15</b>	<b>10</b>	<b>25</b>

\*End Sem Exam of duration 4 hours.

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**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil) – Sem VIII - 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme-Marks							Credits		
		L	P/D	T	End Sem. Exam	Unit Test	Attendance	Assignments	TW & Oral	TW& Practical	Total	Theory	TW	Total
51	Earthquake Resistant Design of Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
52	Water Resources Engineering	3	2	1	60	20	10	10	--	50	150	4	1	5
53	Infrastructure Engineering	3	2	-	60	20	10	10	50	---	150	3	1	4
54	Elective-III	3	2	--	60	20	10	10	50	---	150	3	1	4
55	Project Stage- II	--	6	--	--	-	--	--	150	----	150	--	8	8
	<b>Total</b>	<b>12</b>	<b>14</b>	<b>1</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>300</b>	<b>50</b>	<b>750</b>	<b>13</b>	<b>12</b>	<b>25</b>

**Total Credits**

**Semester -VII = 25**

**Semester -VIII = 25**

**Grand Total = 50**

**Total Credits from Sem - I to Sem-VIII= 200**



**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. (Civil)**

<b>Sr. No.</b>	<b>41 Elective –I (Sem VI)</b>		<b>Sr. No.</b>	<b>47 Elective II ( Sem VII)</b>
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**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING and TECHNOLOGY**

41 A	Financial Management		47A	Construction Management
41 B	Advanced Structural Analysis		47B	Maintenance & Rehabilitation of the Structures
41 C	Urban Water Management		47C	Environmental Impact Assessment
41 D	Docks, Ports and Harbours		47D	Bridge and Tunnel Engineering
41 E	Human Resource Management		47E	Ground Water Hydrology
41 F	Green Construction Practices		47F	Geo informatics
41 G	Numerical Methods in Civil Engineering		47G	Advances in Concrete technology & Composites
<b>Sr. No.</b>	<b>54 Elective-III (Sem VIII)</b>			
54A	Disaster Management			
54B	Advanced Steel Design			
54C	Solid Waste Management			
54D	Entrepreneurship Development			
54E	Hydraulic Structures			
54F	Social and Legal Aspects in Civil Engineering			
54G	Advanced Engineering Geology with Rock Mechanics			
54 H	Development Engineering			

**Revised Structure**

**BHARATI VIDYAPEETH UNIVERSITY, PUNE  
FACULTY OF ENGINEERING and TECHNOLOGY**

**Programme: B. Tech. Civil**

**Reasons for Revision:**

- 1. Letter from Secretary, University Grants Commission, New Delhi (D. O. No. F 14-12/2016(CPP II) dated 13<sup>th</sup> June 2016)**

**Action:**

- a. Addition of new course Urban Planning at B. Tech. Civil Sem VII
  - b. Subsequent removal of Elective II of B. Tech. Civil Sem VII
  - c. Adjustment of the courses of Elective II in Elective III (Sem VII) and Elective IV (Sem VIII).
  - d. Renaming of Elective III and Elective IV as Elective II (Sem VII) and Elective III (Sem VIII) respectively.
- 
2. Subject Environmental Studies shifted from Sem VIII to Sem VI.

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**B. Tech. (Computer) - 2014 Course  
Semester –I**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Semester Examination	Continuous Assessment			TW	Total	Th	TW
						Unit Test	Attendance	Assignments				
1	Engineering Mathematics - I	3	--	1	60	20	10	10	--	100	4	--
2	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1
3	Engineering Graphics	4	2	-	60	20	10	10	25	125	4	1
4	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
5	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1
6	Professional Skill Development - I	2	--	-	30	--	--	20	--	50	2	--
7	Programming Principles and Paradigms	--	2	-	--	--	--	--	50	50	--	1
<b>Total</b>		<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

Teaching Scheme			Examination Scheme-Marks						Credits	
Lectures	Practical	Tutorials	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

**BHARATI VIDYAPEETH  
DEEMED UNIVERSITY, PUNE**

**B. Tech. (Computer) - 2014 Course  
Semester –II**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
					End Semester Exam.	Continuous Assessment			TW	Total		
		L	P/D	T		Unit Test	Attendance	Assignments			Th	TW
8	Engineering Mathematics-II	3	--	1	60	20	10	10	--	100	4	--
9	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1
10	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1
11	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1
12	Object Oriented Programming	3	2	--	60	20	10	10	25	125	3	1
13	Professional Skill Development - II	2	--	--	30	--	--	20	--	50	2	--
14	Workshop Technology	--	2	--	--	--	--	--	50	50	--	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

Teaching Scheme			Examination Scheme-Marks						Credits	
Lecture	Practical	Tutorial	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

**Total Marks of Semester –I and Semester-II = 1400**

**Total Credits of Semester –I and Semester-II = 50**

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**ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

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**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**02: Fundamentals of Civil Engineering**

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
<b>Course Objectives:</b>					
	To make student understand the scope and application of Civil Engineering				
<b>Course Outcomes:</b>					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.				
<b>UNIT - II</b>	<b>Surveying</b>				<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.				
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>				<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.				
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>				<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.				
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>				<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.				
<b>UNIT - VI</b>	<b>Infrastructure</b>				<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of				



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	<p>terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
<b>Reference Books:</b>		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

**ENGINEERING GRAPHICS**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views

6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India,  
New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International  
Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria  
and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

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**ENGINEERING CHEMISTRY**

**Teaching Scheme:**  
**Lectures: 4Hrs/Week**  
**Practical: 2Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory: 04**  
**Practical: 01**  
**Term Work: 25marks**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process  
**(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography** : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.  
**Cement** : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.  
**(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.  
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.  
**(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.  
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.  
**(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions  
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.  
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.  
**(08 Hours)**

**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers  
Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,  
Conformations :- conformations of ethane, conformations of n-butane  
**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

**References / Text Books :**

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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<b>02: Fundamentals of Electrical Engineering</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Mathematics	
2.	Physics	
<b>Course Objectives:</b>		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
<b>Course Outcomes:</b>		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>

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	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency &amp; Regulation by direct load test.</p>	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

**Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$  ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

**Text Books:**

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

**Reference Books:**

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications

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<b>4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications</b>	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



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**ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

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**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

**FUNDAMENTALS OF MECHANICAL ENGINEERING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)
UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism	
UNIT-VI	<b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.  <b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.	(08)

**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

**References-**

- 1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.
6. “Mechanics of Materials” Johnston and Beer TMH, 5th edition
- 7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India, 2007.
8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

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9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,  
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th  
edition

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**10: Engineering Mechanics**

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

**Course Pre-requisites:**

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

**Course Objectives:**

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

**Course Outcomes:**

**The student should be able to**

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

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Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>	
A) The term-work shall consist of minimum <b>Five</b> experiments from list below.	
1. Determination of reactions of Simple and Compound beam.	
2. Study of equilibrium of concurrent force system in a plane.	
3. Determination of coefficient of friction for Flat Belt.	
4. Determination of coefficient of friction for Rope.	
5. Study of Curvilinear motion.	
6. Determination of Coefficient of Restitution.	
B) The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.	
<b>Text Books:</b>	
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.	
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.	
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.	
<b>Reference Books:</b>	
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.	
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.	
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.	
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.	
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.	
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI

**ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**



**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

## UNIT-VI

### ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

### QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

### TERM WORK

#### Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

#### Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

***Reference Books:***

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

**Object-Oriented Programming in 'C++'**

**TEACHING SCHEME**

Lectures : 2 Hrs/week

Practicals : 2 Hrs/week

**EXAMINATION SCHEME**

ESE (End Semester Examination) : 60 Marks

Continuous Assessment: 40 Marks

Term Work : 25 Marks

Credits : 3 Credits

**Course Pre-requisite:**

Programming Principles and Paradigms, "C" programming language.

**Course Objectives:**

- To familiarize with the universal concepts of computer programming.
- To present the syntax and semantics of the "C++" language as well as basic data types offered by the language
- To discuss the principles of the object-oriented model and its implementation in the "C++" language
- To demonstrate the means useful in resolving typical implementation problems with the help of standard "C++" language libraries

**Course Outcomes:**

*At the end of this course students will able to :*

- Understand basic concepts of Object Oriented Programming and applications of OOP.
- Use basic, user-defined and derived data types, Operator precedence.
- Apply Decision Structure, Loops and Functions
- Write, Debug and Compile Programs of C++
- Implement OOP concepts like – Inheritance using C++ programming.

**UNIT I**

**(3 Hours)**

**Principles of Object Oriented Programming:**

Object Oriented Programming Paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages, Applications of OOP.

## **UNIT II**

**(5 Hours)**

### **Beginning with C++:**

Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file , compiling and Linking, Tokens, Keywords , Identifiers and Constants, Basic data types, User-defined data types, Derived data types, Declaration of variables, Dynamic initialization of variables, Scope Resolution Operator, Operator Overloading, Operator precedence, Control Structures.

## **UNIT III**

**(5Hours)**

### **Functions in C++:**

The Main Function, Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading , Friend and Virtual Functions .

### **Classes and Objects:**

Class specification , Class Objects , Scope resolution operator, Accessspecifiers- Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members , Static Member Functions, Data hiding.

## **UNIT IV**

**(6 Hours)**

### **Inheritance: Extending Classes:**

Defining Derived Classes, Single Inheritance, Making a Private member inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract class. Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors , Passing parameters to base class constructors, virtual base classes. STL: An overview, containers, vectors, lists, maps.

## **UNIT V**

**(6 Hours)**

### **Constructors and Destructors:**

Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.

### **Polymorphism:**

Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.

## **UNIT VI**

**(3 Hours)**

### **Managing Console I/O operations:**

C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.

### **Text Books/References:**

- *Herbert Schildt, "The Complete Reference C++", 4<sup>th</sup> Edition, Mc Graw Hill, 2003.*
- *Stanley.B.Lippmann, Josee Lajoie, Barbara.E.Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.*
- *Scott Meyers: "Effective C++", Third Edition, Addison-Wesley, 2005.*

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- *E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010.*

**Syllabus for Unit Test**

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

**Workshop Technology**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**  
Types of pipe joints, threading dies, Pipe fittings.

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**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (Computer) – SEM III – 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
1	Fundamentals of Data Communication	3	--	1	60	20	10	10	--	--	100	4	-	4
2	Principles of Data Structures	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Digital Techniques and Logic Design	3	2	--	60	20	10	10	--	50	150	3	1	4
4	Discrete Mathematics and Graph Theory	3	2	--	60	20	10	10	--	50	150	3	1	4
5	Engineering Economics and Management	3	--	--	60	20	10	10	--	--	100	3	--	3
6	Professional Skill Development- III	4	--	--	100	--	--	-	--	--	100	4	--	4
7	Programming Lab-I	--	4	--	--	--	--	--	50	--	50	--	2	2
	<b>TOTAL</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>20</b>	<b>05</b>	<b>25</b>



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**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (Computer) – SEM IV – 2014 Course**

Sr.no	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
8	Engineering Mathematics- III	3	--	1	60	20	10	10	--	--	100	4	--	4
9	Computer Graphics and Visualization	3	2	--	60	20	10	10	50	--	150	3	1	4
10	Systems Programming	3	2	--	60	20	10	10	--	50	150	3	1	4
11	Fundamentals of Software Engineering	3	--	--	60	20	10	10	--	--	100	3	--	3
12	Microprocessors and Micro-controllers	3	2	--	60	20	10	10	50		150	3	1	4
13	Professional Skill Development- IV	4	--	--	100	--	--	-	--	--	100	4	--	4
14	Programming Lab-II	--	4	--	--	--	--	--	50	--	50	--	2	2
	<b>TOTAL</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>05</b>	<b>25</b>

**Total Credits**

**Semester - III = 25**

**Semester - IV = 25**

**Grand Total = 50**

## 01: FUNDAMENTALS OF DATA COMMUNICATION

### TEACHING SCHEME:

Theory: 03 Hours / Week

Tutorial: 01 Hrs/Week

### EXAMINATION SCHEME:

End Semester Exam: 60 Marks

Unit Test: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

### CREDITS ALLOTTED:

04 Credits

### **Course Pre-requisites:**

The Students should have

1. Knowledge of basic Engineering Mathematics

### **Course Objectives:**

1. Create awareness among the students about theoretical aspects of data communication system
2. To make students aware of various modulation techniques, networking concepts, and error detection and analysis methods.

### **Course Outcomes:**

1. Understand basic concepts and principles of data communications.
2. Differentiate between various Modulation Techniques and their applications.
3. Analyze codes used for Error Detection and Correction
4. Compare the switching techniques in data communication.
5. Comprehend various issues pertaining to Satellite Communications.
6. Gain substantial knowledge of evolution of Cellular communication systems.

### **UNIT - I Fundamentals of data communications :**

**(08 Hours)**

Simplified data communications model. Frequency Spectrum and Bandwidth. Analog and Digital data transmission - data and signals, analog and digital transmission, their comparison, Digital data rate and bandwidth. Transmission impairments - Attenuation, Delay distortion, Noise, Channel Capacity.

**Transmission Media:** Guided Transmission Media - Twisted pair wires, Coaxial, Optical fiber. Wireless Transmission - Terrestrial microwave, satellite microwave, broadcast Radio, Infrared.

**UNIT - II Digital and Analog Transmission (08 Hours)**

Digital Data, Digital Signal, Line coding- characteristics, Line coding schemes- Unipolar encoding: NRZ, RZ, Manchester, Differential Manchester. Bipolar encoding:- AMI, Block coding Analog Data, Digital Signal: Sampling, Sampling theorem, Nyquist rate, Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM). PCM Encoder and Decoder, DPCM, ADPCM, Delta modulation. Analog Transmission: Modulation of Analog signals :AM, FM, and Phase Modulation. Digital Modulation Techniques –ASK, FSK, PSK, QAM. Modems. Multiplexing: FDM, TDM, statistical TDM, WDM, OFDM. Multiple Access Techniques: FDMA, TDMA, CDMA.

**UNIT - III Information theory and Coding (08 Hours)**

Information Rate, Shannon's theorem, Optimum Codes, Huffman Code, Code Efficiency, Error Control Coding, Methods of Controlling Errors, Types of Errors, Types of Codes, Error detection and correction capabilities, Hamming Distance, Hamming Bound, Hamming Codes, CRC Block Codes, Error Detection and Correction, Handshaking Techniques, FEC, ARQ - Stop and Wait, Go Back N, Selective Repeat, Channel Throughput and Efficiency.

**UNIT - IV Transmission Modes and Telecommunication (08 Hours)**

Parallel transmission, Serial transmission, Asynchronous transmission, synchronous transmission. Line Configurations, full duplex and half duplex transmission. Packet switching: Datagram, virtual circuit. Circuit switching and packet switching, (ISO-OSI) Seven layer model, Physical layer protocol, RS232, etc. Data link level Protocol HDLC, SDLC, X-25, LAN, WAN, ISDN. **Telephone Network:** Wire telephony, Subscriber loop, Trunk circuits. Four wire terminating set. PSTN, Frame Relay.

**UNIT - V Satellite and Fiber Optic Communication (08 Hours)**

Orbital aspects. Geostationary satellite, Station keeping, Frequency plans and polarization, Transponders, Multiple access methods. Line-of-Sight (LOS) issues in Satellite Communications. Fiber optic communication: Principle of light transmission in Fiber, types and modes of fiber, losses in Fiber. Dispersion, light sources and detectors, fiber optic communication link, Physical Layer of Wireless Media. Case Studies on recent communication technologies.

**UNIT - VI Cellular Communication System (08 Hours)**

Cell structure, Frequency reuse, Roaming, transmitter, Receiver, Special services provided by cellular phone, IEEE 802.11, WIFI, Bluetooth, GSM, GPRS. High-Speed Digital Access:- DSL Technology-ADSL, xDSL, Spread Spectrum-Concept, Frequency Hopping, Direct Sequence Cellular Telephony:- Basic concepts, Frequency-Reuse Principle, Transmitting, Receiving, Handoff, Roaming. First Generation, Second Generation-GSM, 3G Generation, 4G Networks. Case Studies on recent communication technologies.

**Assignments:**

1. Outline a comparison of all the various analog modulation techniques.
2. Solve Problems on Signal to Noise Ratio , Channel Bandwidth
3. Solve Problems on Sampling Theorem
4. Outline a comparison of all the various digital modulation techniques.
5. Solve Problems on Line Coding Techniques
6. Solve Problems on Information Rate
7. Solve Problems on Shannon’s Channel Capacity Theorem
8. Solve Problems on Hamming Code
9. Solve Problems on CRC and FEC
10. Discuss LOS issues in Satellite Communication
11. Case Study on current generations of Cellular Mobile Communication System

**Text Books:**

1. William Stallings -Data and Computer communications - Prentice Hall of India,7<sup>th</sup> Edition.
2. Behrouz. A Forouzan, Data Communications and Networking, McGraw Hill ,4th edition .
3. Understanding Data Communications, John Wiley & Sons, Ltd7<sup>th</sup> Edition

**Reference Books:**

1. Andrews S. Tanenbaum -Computer Networks, Prentice Hall of India, 4th Edition.
2. Dennis Roddy, Satellite Communications Systems, John Wiley & Sons, Ltd 5th Edition
3. Richard Van Nee & Ramjee Prasad., “OFDM for Multimedia Communications”, Artech House Publication, 2001.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 02: PRINCIPLES OF DATA STRUCTURES

### TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Tests: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

Practical + Term Work: 50Marks

### CREDITS ALLOTTED:

04 Credits

### **Course Pre-requisites:**

The Students should have

1. Knowledge of programming language C++

### **Course Objectives:**

1. To develop skills to use appropriate data structures and selection of appropriate algorithm in computer engineering applications.

### **Course Outcomes:**

1. Gain knowledge of basic concepts of data structures & Realization of ADT.
2. Apply the implementation of stack for evaluation of POLISH expressions, and other problems using C ++ compiler.
3. Differentiate between linear and nonlinear data structures and implement tree traversal techniques using recursive and non recursive methods.
4. Develop different algorithms for operations on Graphs. Implement programs using different sorting algorithms and Analyze for best, worst and average case.
5. Describe the characteristics of an algorithm, Gain knowledge of time and space complexity. Analyze for the searching algorithms.
6. Gain knowledge of decision problems.

## UNIT - I

### Introduction to Algorithm and Data Structures:

(06 Hours)

Definition, ADT, Complexity of Algorithms, Asymptotic Notations, Big 'O' Notations, Types of Data Structures, Linear Arrays, Arrays as ADT, Representation of Linear Array, Traversing Linear Array, Searching in Linear Array, Representation of Polynomials using Arrays, Introduction to Stack, Stack as ADT, Array representation of Stacks, Introduction to Queue, Queue as ADT, Array Representation of Queue.

## UNIT- II Linked List:

(06 Hours)

Introduction, Singly Linked List ,Traversing, Searching , Insertion and Deletion from a Singly Linked List, Doubly Linked List, Circular Linked List, Stack using Linked List, Linked Representation of Queue, Circular Queue, Application of Stacks and queues.

## UNIT III Trees:

(06 Hours)

Introduction, Binary Trees, Binary Tree representation ,Recursive and Non recursive tree traversal algorithms, Threaded Binary Tree, Binary Search Tree, Huffman's Algorithm, AVL Trees, m-way Search Trees, general trees,B Trees, B+ Trees, Red Black Tree, Applications of Trees.

## UNIT IV Graphs and Sorting techniques:

(06 Hours)

Introduction, sequential and Linked representation of graph, Dijkstra's Algorithm , ADT for Graph, Traversing a Graph, minimum spanning Trees.

**Sorting:** Introduction, Bubble sort, Insertion sort, Selection Sort, Merge Sort, shell Sort, Radix Sort, Quick Sort, Hashing, Heap sort. Complexity Analysis of Algorithms.

## UNIT V Design and Analysis of Algorithms I :

(06 Hours)

Divide and Conquer The General Method, Greedy Method, Dynamic Programming, Basic Search and Traversal Techniques: Code Optimization, AND/OR Graphs.

## UNIT VI Design and Analysis of Algorithms II :

(06 Hours)

Game Trees, Backtracking: The 8-Queens Problem, Graph Coloring, Knapsack Problem, Branch and Bound Method, Introduction to NP- Hard, NP- Complete Problems, Polynomial Complexity .

### List of Practical Assignments:

1. Analyze the Complexity of given algorithms and build program for it using c++.
2. Build a program for creation of Stack and Queue using arrays and perform all the operations on it.
3. Construct Linked List, Doubly Linked List, and Circular Linked List and perform all the operations on it.

4. Write a program for application of Stack and Queues.
5. Write a program for Recursive and Non-Recursive traversal on trees.
6. Explain a Huffman's algorithm and build a program in C++ for it.
7. Represent a graph in memory and Implement Dijkstra's algorithm.
8. Write an algorithm for illustrating Bubble Sort, and Quick Sort (any other sorting method may be implemented).
9. Discuss about Threaded Binary Tree, design algorithm for its illustration.
10. Write a program to Implement Minimum Spanning Tree.

**Internal Assignment:**

**Implement mini project with suitable data structures studied in syllabus.**

**Reference Books:**

- 1) Ellis Horowitz, Sartaj Sahani, "Fundamentals of Computer Algorithms", Galgotia Publications.
- 2) GA V Pai, "Data Structures and Algorithms, Concepts, Techniques and Applications, The McGraw Hill Publications.
- 3) Data structures using C and C++ by Langsam, Augenstein, Tenenbaum, PHI publication.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

### 03: DIGITAL TECHNIQUES AND LOGIC DESIGN

**TEACHING SCHEME:**

Theory: 03 Hours / Week

Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Oral + Term Work: 50Marks

**CREDITS ALLOTTED:**

04 Credits

**Course Pre-requisites:**

The Students should have

1. Knowledge of number system and codes
2. Basic Mathematics

**Course Objectives:**

1. To develop an ability to design system with combinational and sequential circuits elements
2. To introduce digital logic design software.

**Course Outcomes:**

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply Boolean algebra to simplify and apply design logic.
3. Analyze a given digital system involving combinational circuit elements.
4. Design and Synthesize a system with sequential circuit elements.
5. Understand structure and characteristics of Memory.
6. Validate and implement the PLD based designs using both schematic capture and VHDL

**UNIT - I**    Number Systems and codes:

**(06 Hours)**

Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction.

Boolean algebra and logic gates:- NAND-NOR Realization. De Morgan's theorems. Theorems and Properties of Boolean Algebra, Standard SOP and POS form,



	Reduction of Boolean functions using Algebraic method, Karnaugh maps. Quine McCluskey Method.	
<b>UNIT - II</b>	Combinational logic design:	<b>(06 Hours)</b>
	Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder and Subtractor, BCD Adder, code conversion, Multiplexers and Demultiplexer( IC 74153 & 74154), Decoders (IC 74138), Parity generator and checker.	
<b>UNIT - III</b>	Sequential Logic Design:	<b>(06 Hours)</b>
	Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion. Sequential circuit analysis, construction of state diagrams. Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter. Shift Registers: SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register.	
<b>UNIT - IV</b>	Memory :	<b>(06 Hours)</b>
	Random Access Memory, TTL RAM Cell, Parameters, Read/Write Cycles, ROM Types, EPROM Structure and Programming, MOS Static RAM Cell, Dynamic Cell, Refreshing, Memory Cycles.	
<b>UNIT - V</b>	Algorithmic State Machines:	<b>(06 Hours)</b>
	ASM state blocks, ASM Charts, Notations, ASM modeling styles, Design of Simple Controller, Multiplexed Controller Method, RTL Notations and Implementation.	
<b>UNIT - VI</b>	PLD and PLA, Introduction to CPLD and FPGA Computer Aided Design of digital systems:-	<b>(06 Hours)</b>
	Functional Simulation, Timing Simulation, Logic synthesis and optimization, Introduction to VHDL, Introduction to HDL, Framework of VHDL program VHDL-Library, Entity, Architecture, Modeling Styles, Data Objects & Data Types, and Attributes.	

**Term Work: The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. To Describe and illustrate Boolean Functions Using Logic Gates
2. To describe and investigate Half adder, Full Adder, Half Subtractor and Full Subtractor Using Gates And IC's.
3. Illustrate and Investigate Bit Digital Comparator And ALU Verification
4. To describe and devise Up-Down Counter Using JK Flip-Flop.
5. To design and construct Modulo N Counter Using 7490 & 74190 (N>10).
6. To Examine and formulate how to realize Boolean Expression Using Multiplexer.

7. To describe Shift Registers: Shift Left, Shift Right, Parallel Loading And Pulse train Generator.
8. To Discuss on FPGA Devices.
9. To discuss about Typical RAM IC.
10. To Build Combinational Logic Using PLA

**Text Books:**

- 1) R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill
- 2) Malvino- Brown, "Digital Computer Electronics" Tata McGraw Hill.
- 3) Douglas L. Perry, "VHDL Programming by Example", Tata McGraw Hill

**Reference Books:**

- 1) Donald p Leach, Albert Paul Malvino, "Digital principles and Applications", Tata McGraw Hill.
- 2) Yarbrough John M. , "Digital Logic Applications and Design ", engage Learning
- 3) M. Morris Mano, "Digital Logic and computer Design", PHI.

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

## 04: DISCRETE MATHEMATICS AND GRAPH THEORY

### TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

Oral: 50 Marks

Total : 150 Marks

### CREDITS ALLOTTED:

Theory:03 Credits

TW/Oral:01 Credit

### **Course Pre-requisites:**

1. Knowledge of basic mathematics.

### **Course Objectives:**

1. To create ability among the students to understand the difference between continuous mathematics and discrete mathematics.
2. To develop the skills to mathematically analyze the characteristics of various discrete structures
3. To develop the skills among the students to apply the discrete mathematical concepts in computer engineering applications

### **Course Outcomes:**

1. Apply knowledge of mathematical and logical notation to define and formally reason about mathematical concepts.
2. Interpret and apply the operations and terminologies associated with relations and functions.
3. Gain knowledge of discrete mathematics techniques for constructing mathematical proofs.
4. Demonstrate and implement the basic concepts in graph theory.
5. Understand various concepts of algebraic systems.
6. Develop fundamental understanding of Elementary Combinatory.

**UNIT - I      Mathematical Logic:      (06 Hours)**

Propositional logic; negation ,disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs; resolution principle; Set theory; Paradoxes in set theory; inductive definition of sets and proof by induction

**UNIT - II      Relations:      (06 Hours)**

Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Hasse diagram ,Lattices, Lattice and its Properties, Recurrence Relation: Calculating Coefficient of generating function, solving recurrence relation by substitution. Characteristics roots solution of In homogeneous Recurrence Relation.

**UNIT - III      Functions:      (06 Hours)**

Introduction, types of functions and characteristics of functions ,mappings; composition of functions; inverse functions; special functions; hashing functions, recursive function ,recursion in programming languages.

**UNIT - IV      Graph Theory:      (06 Hours)**

Representation of Graph, DFS, BFS, Spanning Trees, and planar Graphs. Graph Theory and Applications, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers

**UNIT - V      Algebraic structures:      (06 Hours)**

Definition and elementary properties of groups, semi groups, monoids, rings, fields, Homomorphism of Groups and Semigroups, Group Codes,Error recovery in group code,vector spaces

**UNIT - VI      Elementary Combinatorics:      (06 Hours)**

Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Probability Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion –Exclusion. Pigeon hole principles and its application.

**Term Work:**

**The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. To describe various operations on Set and illustrate the same using C program.
2. Formulate the approach for generating a Power Set of a given set and apply it using C language.
3. List various properties of Relation and construct a program to evaluate it.

4. To formulate a program to find the Transitive Closure of a given relation using C.
5. To Build a program in C for Depth First Search And Breadth First Search on a graph.
6. To state various operations on a Graph and illustrate it using C language.
7. To Justify whether an entered Graph is a Simple or Multiple devising c program.
8. To Produce a Minimal Spanning Tree from given graph Using C programming language.
9. To Examine whether the graph contains Hamiltonian path or Eulerian path using C code.
10. To Build a program to find the various cycles present in the graph.

**Assignment:**

1. The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.
2. In case of assignments for internal 10 Marks students will be assigned two assignments containing based on problems of different types or any programming assignment and guided for the solution of the problem.
3. The assignments are to be submitted as a hard copy

**Text books**

- 1) "Discrete Mathematical Structures" : Tremblay and Manohar, Tata McGraw Hill
- 2) "Discrete Mathematics" : 1<sup>st</sup> edition by Maggard, Thomso
- 3) C.L.Liu, Elements of Discrete Mathematics, 2<sup>nd</sup> Edition , McGraw Hill Pub
- 4) V. K. Balakrishn, Graph Theory, TMH (Recommended for Graph)

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

## 05: ENGINEERING ECONOMICS AND MANAGEMENT

### TEACHING SCHEME:

Theory: 03 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test: 20 Marks

Attendance:10 Marks

Assignments: 10Marks

Total Marks: 100 Marks

### CREDITS ALLOTTED:

03 Credits

### **Course Pre-requisites:**

Students should have

1. Basic knowledge about communication skills.
2. General awareness of economics and financial terms.

### **Course Objectives:**

1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization
2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption.
3. To help the students to understand the fundamental concepts and principles of management, functions of management, various organizational structures and basic knowledge of marketing.

### **Course Outcomes:**

1. Understand the fundamentals of economics and theory of demand and supply.
2. Describe concept of production and cost.
3. Explain the fundamentals of national income and Aggregate supply and aggregate demand consumption.
4. Comprehend the concepts of money and banking.
5. Brief the basic concepts of management and its functions.

6. Describe marketing, production and financial management concepts.

**UNIT - I Introduction to Economics (06 Hours)**

Definition of economics, Concept of money, value, goods, wealth, Concept of Engineering economics, Difference between Microeconomics & Macroeconomics, Nature of Economic problem, Relation between Science, Engineering, Technology and Economics. Firm-Meaning, objectives, Theories of firm- concept of profit maximization, Theory of Demand & Supply: determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity: elasticity of demand, price elasticity, income elasticity, cross elasticity, concept of Capital.

**UNIT - II Theory of production (06 Hours)**

Theory of production: production function, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale. Cost: short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost, Laws of costs. Break even analysis: introduction, numerical, Return on investment. Inventory Control, Quality related concepts.

**UNIT - III Markets (06 Hours)**

Markets: introduction, types of markets & their characteristics ( Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly). National Income: meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP,NDP, Personal income, disposal income. Aggregate supply and aggregate demand consumption, Investment and saving functions.

**UNIT - IV Money (06 Hours)**

Concept of money and its functions, types. Meaning, objectives and tools of Monetary policy and fiscal policy. Banking: types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR. Functions of central and commercial banks. Inflation, Deflation, Stagflation, Direct and Indirect taxes. . Monetary and cycles, new economic policy, Liberalisation, Globalisation, privatisation, market friendly state, fiscal policy of the government, Meaning and phases of business.

**UNIT - V    Management and its functions****(06 Hours)**

Introduction to Management, Nature, scope. Management & administration, skill, types and roles of managers. Management Principles: Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory. Functions of Management: Planning, Organizing, Staffing, Directing, Controlling. Organizational Structures: principles of organization, types-formal and informal, line, line & staff, matrix, hybrid, span of control, departmentalization. Decision making- steps in decision making.

**UNIT - VI    Marketing and Finance Management****(06 Hours)**

Team Management, Leadership –Trait theory and charismatic leadership, Qualities of a good leader, Leadership Styles. Introduction to Marketing management: Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation. Introduction to Financial management, Financial Statements, Profit and Loss Statement (Income Statement), Balance Sheet. Financial Analysis- Profit Analysis. Introduction to Production Management; definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definition, objectives of manpower planning, process, sources of recruitment, process of selection. Corporate Social Responsibility and its importance. Business Ethics.

**Assignments:**

Quiz/ Test / Mini Project / Case Study / Presentations based on syllabus.

**Reference Books:**

- 1) R.Paneerselvam, Engineering Economics, PHI publication
- 2) O.P.Khanna, Industrial engineering and management
- 3) Robbins S.P. and Decenzo, Fundamentals of Management
- 4) Tripathy and Reddy, Principles of Management
- 5) N Gregory Mankiw, Economics: Principles of Economics, Cengage Learning
- 6) L.M.Prasad, Principles and Practices of Management
- 7) Dr. K. K. Dewett & M. H. Navalur, Modern Economic Theory, S. Chand Publications
- 8) P.N. Chopra, Principles of Economics, Kalyani Publishers



**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## 07: PROGRAMMING LABORATORY I

### TEACHING SCHEME:

Practical: 04 Hours / Week

### EXAMINATION SCHEME:

Term Work (Practical): 50 Marks

### CREDITS ALLOTTED:

02 Credits

### **Course Pre-requisites:**

The Students should have

1. Basics concepts of Object Oriented Programming
2. Basic mathematical ability

### **Course Objectives:**

1. At the completion of this course, student is able to read, write, and debug java programs using good programming style.

### **Course Outcomes:**

1. Write java programs using JDK & Solve arithmetic expressions using java program.
2. Gain knowledge & apply concepts of class fundamentals in various programming assignments.
3. Differentiate between String & String Buffer Class. And use different functions of these classes in various programming assignments.
4. Understand and implement the concept of interfaces and packages.
5. Learn the concept of Exception handling and Apply it.
6. Apply the functions of AWT classes in various programming assignments.

**UNIT - I Java Evolution:** Difference between Java , C, C++, Features of java, The java runtime environment (JDK, JVM, Command Line Arguments), Sample java program, Java statements and program structure, Fundamental programming constructs in java: (Constants, Variables, keywords, Data Types, Operators, Expressions and control structures) **(06 Hours)**

- UNIT - II**      **Classes and methods:** Specification of a class, Introduction to Methods, Access specifiers, Constructors, Method overloading, this keyword, finalizer method, recursion, Introducing Final keyword , Concept of array, Introducing Nested and Inner Classes, Inheritance , Using Super, Method overriding, Dynamic method Dispatch, Abstract class concept.      **(06 Hours)**
- UNIT - III**      **String Handling:**      **(06 Hours)**  
The String Constructors, String Operations, CharacterExtraction, StringComparison, Modifying a String, String Buffer.  
**The Collections Framework:**  
More Utility Classes, Networking, the Applet Class, Event Handling, Collection Interface, List Interface, Set interface, Map Interface , Enumeration Introduction to Swing.
- UNIT - IV**      **Package and Interfaces:**      **(06 Hours)**  
**Introduction to package:** Types of packages, User define packages, Use of package keyword, Importing packages.  
**Interfaces:** Define and implement interface, use of interfaces to support multiple inheritance, variables in interfaces, interfaces can be extended.
- UNIT - V**      **Exception Handling and Multithreaded programming:**      **(06 Hours)**  
**Exception handling:** Introduction to exception handling, predefined and user defined exceptions.  
Use of try, catch, throw, throws and finally keywords.  
**Introduction to threads,** life cycle of a thread, thread states, thread properties, methods in Threads and Runnable, setting priority of threads, synchronization and inter thread communication
- UNIT - VI**      **Introducing the AWT, Using AWT controls, Images:**      **(06 Hours)**  
Introduction to AWT, events, listeners, event handling methods, a small application to demonstrate use of controls – label, button, check box, text, radio button, Dialog Box, scroll bar, choice controls ,List, Menu bars and Menus layout. Image Fundamentals image Observer, Double Buffering, and ImageProducer.  
AWT classes, Frame windows, Creating a Frame Window in an Applet,

Working with graphics, Working with color, Setting the Paint Mode,  
Working with Fonts, Control Fundamentals,

**Term Work:**

1. Introduction to Java.
2. Write a program to implement Class and Inheritance Concept.
3. Write a program to differentiate between method overloading and method overriding.
4. Write a program to understand the use of String class and string buffer class
5. Write a program to implement Applet.
6. Write a program to implement the concept of Package.
7. Write a program to implement concept of Exception Handling.
8. Write a program to implement the concept of Multithreaded Programming
9. Write a program to implement Frame and different graphics objects.
10. Write a program to use different controls of AWT classes.

**Text Books:**

1. E. Balagurusamy, Programming with Java, 3 e, McGraw-Hill Companies.
2. JAVA 7 Programming, Black Book ,Kogent Learning Solutions Inc.

**Reference Books:**

1. The complete reference Java 2 Third Edition, TMH publication by Patrick Naughton, Herbert Schildt.
2. Ken Arnold, James Gosling, David Holmes, "The Java Programming Language", 3e, Sun Microsystems.

## 08: ENGINEERING MATHEMATICS – III

### TEACHING SCHEME:

Theory: 03 Hours / Week

Tutorials: 1Hr/Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test : 20 Marks

Attendance: 10 Marks

Assignments: 10 Marks

### CREDITS ALLOTTED:

04 Credits

### **Course Pre-requisites:**

The Students should have knowledge of

1. Differential calculus
2. Integral calculus.
3. Complex numbers.

### **Course Objectives:**

1. To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

### **Course Outcomes:**

1. Develop mathematical modeling of systems using differential equations and solve linear differential equations with constant coefficient.
2. Evaluate complicated real integrals using basics of analytic functions and the basics in complex integration.
3. Solve problems on Fourier sine and cosine transform and solve difference equation by Z-transform.
4. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
5. Solve system of linear equation and ordinary differential equation by numerical methods.
6. Apply basics of statistics and probability.

### **UNIT - I Differential Equations:**

**(08 Hours)**

Solution Of Linear Differential Equation Of  $n^{\text{th}}$  Order With Constant Coefficients, Method Of Variation Of Parameters, Cauchy's and Legendre's Linear Equation, Simultaneous Linear Differential Equations, Total Differential Equations, Symmetrical Simultaneous Differential Equations. Applications to Electrical Circuits.

**UNIT - II    Complex Variables    (08 Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem.

**UNIT - III    Transforms    (08Hours)**

Fourier transforms: Fourier Integral Theorem, Fourier Sine And Cosine Integrals. Fourier Transform, Fourier Sine And Cosine Transforms, Inverse Fourier Transforms, Discrete Fourier Transform and its Applications.  
Z – Transform: Definition, Properties, Inverse Z- Transform. Applications to difference equation, Relationship between Z- Transform and Fourier Transform.

**UNIT - IV    Laplace Transform    (08 Hours)**

Definition, Properties and Theorems, Inverse Laplace Transform,  
Methods of Finding Inverse Laplace Transforms, Laplace Transform of Unit-step Function. Dirac-Delta Functions, Periodic Functions, Ramp Functions.

**UNIT - V    Numerical Methods    (08 Hours)**

LU decomposition for systems of linear equations; numerical solutions of non-linear algebraic equations by Secant, Bisection and Newton-Raphson Methods; Numerical integration by trapezoidal and Simpson's rules

**UNIT - VI    Statistics and Probability    (08 Hours)**

Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates.

Theorems and Properties of Probability- Baye's Theorem, Probability Density Function, Discrete, Random and Continuous variables, Probability Distributions: Binomial, Poisson, Normal and Hypergeometric; Test of Hypothesis: Chi-Square test.

**Stochastic Processes:**

Markov Chains, stochastic Matrix.

**Term Work:**

- 1) Differential equations.
- 2) Complex variables.
- 3) Fourier transform and Z- transform.
- 4) Laplace transform.
- 5) Numerical methods.
- 6) Statistics and Probability.

**Text Books:**

1. Applied Mathematics (Volumes I and II,III) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).

**Reference Books:**

1. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008).
2. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition(1999).
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition( 2002).

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 09: COMPUTER GRAPHICS AND VISUALIZATION

### TEACHING SCHEME:

Theory: 03 Hours / Week  
Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Unit Test: 20 Marks  
Attendance:10 Marks  
Assignments:10 Marks  
Term Work (Practical): 50 Marks  
Total : 150 Marks

### CREDITS ALLOTTED:

Theory :03 Credits  
TW :01 Credit

### **Course Pre-requisites:**

The Students should have knowledge of

1. Basics of “C” programming language
2. Basic mathematical ability
3. Basics of GLUT

### **Course Objectives:**

1. To familiarize with the universal concepts of computer Graphics Programming.
2. To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
3. To introduce computer graphics techniques, focusing on 2D and 3D modeling, image synthesis, and rendering.
4. To provide knowledge of how interdisciplinary nature of computer graphics is emphasized in the wide variety of examples and applications.

### **Course Outcomes:**

1. Apply fundamental concepts and practical skills in computer graphics.
2. Implement and use classic and modern algorithms and data structures in computer graphic to 3-D geometry, 3D modeling and 3D object Representation.
3. Acquire practical skills on additional advanced concepts, e.g. hidden surfaces & lines, curves & fractals.
4. Demonstrate graphics programming skills for different animation techniques & virtual reality.
5. Improve different solid modeling skills.
6. Apply basics of rendering & physical based modeling to image.

### **UNIT - I Basics of Computer Graphics:**

**(06 Hours)**

Introduction to computer graphics, Graphics Primitives: Raster scan & random scan displays, display processor, display file structure, Display devices, Interactive devices, Data generating devices. line segments, vector generation, DDA and Bresenham’s line and circle drawing algorithms, thick lines, character generation methods.

### **UNIT - II Polygon:**

**(06 Hours)**

Introduction, representation, entering Polygons, Polygon filling: Seed fill, Edge fill, scan conversion algorithm, filling with patterns. Windowing and Clipping Introduction, viewing transforms, 2D clipping, Cohen-Sutherland algorithm, Polygon Clipping, Sutherland-Hodgman algorithm, Generalized clipping



- UNIT - III 3-D Geometry: (06 Hours)**  
 2-D Transformation: Basic Transformations, Homogenous coordinates, Rotation about an arbitrary point, coordinate transformation, Inverse transformation, Shear and Reflection transformation.  
 3-D Transformations: Displays in three dimensions,, 3D transformations & matrix representation, Rotation about an arbitrary axis, Concept of parallel and perspective projections, Viewing parameters, 3D clipping, 3D viewing transformations. Case Study on 3D modeling and 3D object Representation
- UNIT - IV Hidden Surfaces and Lines: (06 Hours)**  
 Back Face removal algorithm,Z-Buffer,Scan Line algorithm, Painter’s algorithm,Hdden line methods. Light, Colour and shading: Introduction, Diffused illumination, point source illumination, shading algorithm, reflections, shadows, ray tracing, Color models and tables, shading algorithm, transparency
- UNIT - V Segments and Animation: (06 Hours)**  
 Introduction, The Segment Table, Segment creation, closing a segment, deleting a segment, renaming segment, saving and showing segments,  
 Computer animation, Morphing, Methods of controlling animation, animation languages and tools. Virtual Reality,Rendering
- UNIT - VI Curves and Fractals: (06 Hours)**  
 Curve generation, Interpolation,Interpolation alogorithm,B-splines,Curved surface patches,Bezier curve,fractals,factal line, surfaces,

**Term Work:**

1. State and discuss on basics of computer graphics.
2. Design and apply the Bresenham’s circle & line drawing algorithm using C language.
3. Design and build the DDA circle & line drawing algorithm using C language
4. Design and Illustrate 2D & 3D transformation.
- 5 Illustrate and construct 3D clipping algorithms.
6. Build shading algorithm using OpenGL.
7. Design and Construct interpolation algorithm using OpenGL.
8. State and discuss on real-time animation techniques.
9. Design a triangle in 3D format with solid model.(Using C with Open GLUT)
10. Illustrate to Render any 3D object using OpenGL.

**Text Books:**

2. Apurva A Desai,“Computer Graphics”,PHI Learning Pvt. Ltd.,2010
3. Donald Hearn & M. Pauline Baker, “Computer Graphics C version”, 2nd Ed, Pearson Education
3. David F. Rogers, “Procedural Elements for Computer Graphics”, 2nd Ed – Tata McGraw Hill Edition.
- 4 Tomas Moller and Eric Haines Real-Time Rendering A K Peters Ltd, 2nd edition, 2002
- 5 Alan H. Watt and Mark Watt, Advanced Animation and Rendering Techniques : Theory and Practice, Addison-Wesley, 1992
6. Matt Pharr and Greg Humphreys, Physically based rendering, Morgan Kaufmann,

7. James D. Foley, Andries van Dam, Steven K. Feiner and John F. Hughes, Computer Graphics : Principles & Practices, Addison Wesley, 2nd edition in C

**Reference Books:**

1. M.N. Sinha, A.D.Udai, "Computer Graphics", Tata McGraw Hill Edition.
2. Foley, Dam, Feiner, Hughes," Computer Graphics Principles & Practice", 2nd Ed, Pearson Education.
3. Hill, Kelly, "Computer Graphics using OpenGL", 3rd Ed, Eastern Economy Edition.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## 10: SYSTEM PROGRAMMING

### TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Attendance: 10 Marks

Assignments: 10 Marks

Term Work +Oral: 50Marks

### CREDITS ALLOTTED:

Theory: 03 Credits

TW : 01 Credit

### **Course Pre-requisites:**

The Students should have knowledge of

1. Knowledge of Microprocessor concepts and Assembly language

### **Course Objectives:**

1. To help the students understand functioning of various system programs
2. To initiate an understanding of design of language translators and brief about phases of compilers and other
3. To provide a theoretical framework for optimizing the code.
4. To brief the students about operating system concepts

### **Course Outcomes:**

1. Understand theoretical and practical aspects of language translation.
2. Understand and show working and design of assemblers and microprocessors
3. Understand the concept of memory allocation, relocation along with the functions of loaders linkers and use various types of loaders.
4. Gain knowledge about phases of compiler and show it's working.
5. Gain knowledge of various operating system concepts and shell scripting.
6. Understand the concept and use of various device drivers

**UNIT - I System Software and Assemblers:**

**(06 Hours)**

	System software concepts, assembler basics, system software Components, Language translators, Language translation fundamentals Machine structure, Elements of Assembly language programming., Structure of an assembler, Design of single and two pass assembler	
<b>UNIT II</b>	<b>- Macro processor</b>	<b>(06 Hours)</b>
	Macro language and macro processor, macro instructions, features of macro facility, macro instruction arguments, conditional macro expansion, macro call within macros, macros instructions defining macros, Macroprocessor design	
<b>UNIT III</b>	<b>- Linkers and Loaders:</b>	<b>(06 Hours)</b>
	Loader scheme, absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, other loader schemes Binders, linking loaders, Overlays, Dynamic Binders, Design of an absolute Loaders, Design of a Direct –Linking loaders. Dynamic Link Libraries.	
<b>UNIT IV</b>	<b>- Compiler:</b>	<b>(06 Hours)</b>
	Basic Compiler Function Compiler phases - Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, Designing a lexical analyzer generator, Syntax Analysis: Role of Parser, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers. Intermediate code generation three address code intermediate code forms,. Compiler generation tools –LEX and YACC. Interpreters. Case study: Java Compiler,JIT Compiler, Concurrent Compiler, embedded Compiler.	
<b>UNIT V</b>	<b>- Operating system:-</b>	<b>(06 Hours)</b>
	system concept, Operating system structure.O. S. Components, O.S. Services, System calls. Shell scripting Shell scripting (Bourne Shell (SH), Bourne-Again Shell (BASH), C-Shell (CSH), TCSH, Korn Shell (KSH))Shell commands (Basics, Pipelining, Background/Foreground, File Permissions, etc.) AWK Programing, Process control (ps,jobs, kill,bg,fg,fork,spawn,wait,pipe,socket)	
<b>UNIT VI</b>	<b>- Unix Device Drivers:</b>	<b>(06 Hours)</b>
	Definition, Anatomy and types, Device Programming, Installation and Incorporation of driver routines, Basic device driver operation, Implementation with Line printer, Comparative study between device drivers for Unix and Windows.	

**Term Work:**

**The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. Design and Build a single pass assembler.
- 2.Design and Build a two pass assembler.

- 3.Design and Build a two pass Macro processor
- 4.Illustrate use of DLLs.
5. Design and apply lexical analyzer using Lex Compiler.
6. Devise some programs using Shell Programming.
7. Illustrate and discuss use of various device drivers.

**Text Books:**

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.
- 2.System Programming by Leland Beck, Pearson Ed.
- 3.D. M. Dhamdere : “Systems programming and operating system”, Tata McGraw Hill
4. Unix device drives by George Pajani, Pearson Education.
5. Bash Pocket Reference (Pocket Reference (O'Reilly))

**Reference Books:**

Unix programming Environment- Keringham and Pike, Pearson Education

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 11: FUNDAMENTALS OF SOFTWARE ENGINEERING

### TEACHING SCHEME:

Theory: 03 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Unit Test Tests: 20 Marks

Assignment :10 Marks

Attendance: 10 Marks

### CREDITS ALLOTTED:

04 Credits

### **Course Pre-requisites:**

The Students should have

1. programming paradigms
2. Basic mathematical ability

### **Course Objectives:**

1. To introduce software engineering and its grandness.
2. To understand the process of developing new technology and the role of experimentation.
3. To introduce ethical and professional issues and to explain why they are of concern to software engineers.
4. Analyze, classify the requirements and design the software.
5. Demonstrate expertise in problem solving in the design, development, validation, evolution and sustainment of (software) products.

### **Course Outcomes:**

- I. Recognize Distinguish Software engineering process models and describe specifications of the software to be developed or modified.
- II. Analyze, classify the requirements and design the software.
- III. Design and develop software qualitatively.
- IV. Analyze, classify, select software development process to develop, and maintain software systems that behave reliably and efficiently.
- V. Demonstrate expertise in problem solving in the design, development, validation,

evolution and sustainment of (software) products.

VI. Apply the techniques, skills, and modern engineering tools as Rational rose and Star UML etc. necessary for designing and constructing software systems

**UNIT - I Introduction to Software Engineering (06 Hours)**

Defining Software, What & Why Software Engineering? Difference between software and hardware, software engineering – A layered approach, Software Application Domains, Software Myths.

Process Models – Software process Framework, Process activities, Defining Framework Activity? Identifying a Task Set, Process Patterns, Traditional software development process model approach - Linear Framework model, Iterative Framework Model, Parallel Framework model, and Component based Model, Object oriented software development approach.

**UNIT - II Software Specification (06 Hours)**

What is requirement engineering, Requirement Elicitation and Analysis Process, Elicitation Techniques, Requirement Specification, Functional requirements and Non-Functional Requirements, Drafting Software Requirement Specification?

Requirement Analysis - Domain Analysis, Object Oriented Analysis, Requirement Modelling, Data modelling, and Flow oriented modelling, Functional Modelling, Process specification, CASE tools.

**UNIT - III Software Evolution (06 Hours)**

System Engineering Hierarchy, Information Engineering, Product Engineering, Introduction to Business area analysis, CASE Tools in software design.

Software Design Process, Design model – Data Design model, Architecture Design model, Transform and Transaction Flow, Interface design Flow, Component Level and Deployment level design elements.

Design Concepts – Abstraction, Architecture, Patterns, Modularity, Functional Independence, Refinement, Refactoring, Object-

Oriented Design Concepts.

**UNIT - IV Software Evaluation (06 Hours)**

Introduction to Software testing, Bugs, Defects and Errors, Internal and External view of Software testing, Types of Testing – White Box – Basis path testing, Control Structure testing, Black Box, Grey Box testing, Verification and Validation Model, Unit Testing, Integration Testing, System Testing, Strategic issues, Testing Strategy for OOPS .

Debugging – Debugging process, Debugging Strategies, Correcting Errors

**UNIT - V Software Quality Assurance (SQA) (06 Hours)**

Software Quality and Metrics, Quality Standards, Reviews and Inspection, Software Measurement and metrics, Elements of SQA, SQA tasks, Goals and Metrics, Formal approaches to SQA, SQA Plan, and Software Reliability.

Software Configuration Management – Elements of SCM, Baselines, Software Configuration Items, SCM Features, the SCM process.

**UNIT - VI Project Planning and Management (06 Hours)**

The management Spectrum – People, Product, Process, Project. Project Planning process, Process Metrics, Software Scope and Feasibility study, Project Scheduling, Software Project Estimation, Effort estimation model, the make-buy Decision, Outsourcing,

Risk management – Software Risks, Risk identification, Risk projection, Risk Refinement, RMMM plan.

**CLASS ASSIGNMENTS –Guidelines**

1. The Class Assignments with respect to this subject might be conducted using these tools (either one tool or combination):-
  - a. Asking each student to give one presentation on one topic related to this syllabus.
  - b. Conducting six Multiple choice question online test on each unit each test of 10 marks and then average out



- c. Asking students to prepare a report based on their understanding by viewing the NPTEL videos of this subject.
- d. Asking the students to perform these Assignments:-
  - i. Suggest Which SDLC model will be used to develop ATM software. Justify?
  - ii. Develop Requirement Specification for ATM Software.
  - iii. Design the Class Diagram and Use case Diagram for ATM software.
  - iv. Discuss on Automated Software Testing. Create Test cases for Functionality of ATM software using a Test Tool (Test Link).
  - v. Discuss and Prepare IEEE Quality Document for ATM software.
  - vi. Prepare a Gantt chart using MS Project CASE Tool for a small Project.

**Text Books:**

ROGER PRESSMAN - A Practitioner's Approach", 4th Ed., Tata McGraw Hill Publication Company.

Software Engineering.", Sommerville, 9th Edition, Addison Wesley, 2010

**Reference Books:**

- 1.ROGER PRESSMAN - A Practitioner's Approach"
- 2.Martin Fowler
- 3.Grady Booch
- 4.Rambaugh
- 5.Pfleeger S. L., "Software Engineering".

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## 12: MICROPROCESSOR AND MICROCONTROLLER

### TEACHING SCHEME:

Theory: 03 Hours / Week  
Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Unit Test Tests: 20 Marks  
Practical + Term Work: 50Marks marks

### CREDITS ALLOTTED:

04 Credits

### **Course Pre-requisites:**

The Students should have

1. Binary number system, Boolean algebra , Combinational and sequential circuits and memory.

### **Course Objectives:**

1. To develop an understanding of the architecture and functions of microprocessors and microcontrollers.
2. To learn machine language programming & interfacing techniques.

### **Course Outcomes:**

1. Describe microprocessor and micro controller architecture.
2. Understand programmer's model of 80386.
3. Understand concepts of segmentation and paging
- 4.. Comprehend hardware and software interaction and integration.
5. Design microcontroller based systems.
6. Write assembly language program using 32 bit registers.

### **UNIT - I Introduction to 8086**

**(06 Hours)**

Concepts of architecture of 8086 microprocessor and segmentation, 80386 DX architecture, Registers, Salient features of 80386 DX, Signal definition, Addressing modes, Instruction format, Instruction pipelining in 80386.

### **UNIT - II Real and protected mode**

**(06 Hours)**

	Real mode programming model, Memory addressing in real mode, Interrupt handling and exceptions, Switching between real and protected mode, protected mode register model, segment translation, segment descriptors, paging	
<b>UNIT - III</b>	I/O interface	<b>(06 Hours)</b>
	Programmable peripheral devices and interfacing, Interfacing with PPI 8255, PIC 8259, USART 8251, PIT 8254, DMAC 8237, Block diagram, operating modes and control word formats.	
	<b>Case study- I/O hub.</b>	
<b>UNIT - IV</b>	<b>Multicore Architecture</b>	<b>(06 Hours)</b>
	Intel 64 bit architecture, Pentium processor functional block diagram, memory management, Multicore Architecture, Bus Connections, core to duo and dual core processors, characteristics and design guidelines.	
	<b>.Case study:- i5/i7</b>	
<b>UNIT - V</b>	Introduction to 8051 microcontroller	<b>(06 Hours)</b>
	Comparison of microprocessor and micro controller, Features of 8051, pin definition, 8051 architecture, Register set, memory organization, Timers and counters, serial port, Interrupt structure. Addressing modes, instruction set	
<b>UNIT - VI</b>	Programming and interfacing of 8051	<b>(06 Hours)</b>
	Counter and timer programming, interrupt programming, serial communication programming, Interfacing keyboard and Display. External memory interface, stepper motor interface.	
	Contemporary processor and controller survey.	

### **Term Work:**

#### **List of assignments**

- 1) Design and build an Assembly language program for multiplication of two 16 bit numbers using 8086 microprocessor.
- 2) Design and build an ALP to count no. of positive and negative numbers from the array
- 3) Design and build an 8086 ALP to check whether the string is palindrome or not
- 4) Design and build an program to arrange given set of numbers in Ascending/Descending order.
- 5) Design and build an Assembly language program to convert Input hexadecimal to BCD Number.
- 6) Design and build an ALP to program to use GDTR, LDTR and IDTR in Real Mode.
- 7) Design and build an program to switch between real mode and protected mode
- 8) Design and build an Assembly language program to display current time from system.
- 9) Design and build an Assembly language program to interface 8051 Microcontroller with Keyboard and display.

10) Design and build an Assembly language program to interface 8051 Microcontroller with stepper motor.

**Text Books:**

1. Muhammad Ali Mazidi and Janice Gillispie Mazidi, " The 8051 Microcontroller and embedded systems", 2009, Pearson education
2. Krishna Kant "Microprocessors And Microcontrollers Architecture, Programming And System Design 8085, 8086, 8051, 8096" PHI
3. 80386 Microprocessor Handbook, Chris H. Pappas, William H. Murray

**Reference Books:**

1. intel microprocessor and peripheral handbook(32 bit) 80386 DX
2. D.V.Hall, "Micro Processor and Interfacing ", Tata McGraw-Hill.
3. Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2<sup>nd</sup> ed., Liu & Gibson
4. Intel 64 and IA-32 bit architectures Software Developer's Manual, Volume 3A, Intel, (Digital Content PDF: 253668.pdf)

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

## 14: PROGRAMMING LABORATORY II

### TEACHING SCHEME:

Practical: 04 Hours / Week

### EXAMINATION SCHEME:

Term Work (Practical): 50 Marks

### CREDITS ALLOTTED:

02 Credits

### **Course Pre-requisites:**

The Students should have

1. Basics concepts of Object Oriented Programming
2. "Java" programming language ( Core and Advanced Java)

### **Course Objectives:**

1. To provide an insight of Internet programming and how to design and implement complete applications over the web.
2. To provide hands-on experience of the recent platform, technologies and design Methodologies used in developing web Applications.

### **Course Outcomes:**

1. Develop WEB 2.0 Rich Internet Applications using the hierarchy of objects in HTML and XML.
2. Design dynamic and interactive web pages using HTML and Ajax performing client validation using Java Script.
3. Use ontology and inference engines in semantic web development.
4. Develop full-fledged Enterprise Applications
5. Implement enterprise beans and understand its benefits.
6. Develop Web services using SOAP .

### **UNIT - I Introduction to WEB 2.0 Rich Internet Applications:**

**(08 Hours)**

Introduction: From Browsers to Rich Clients – browser drawbacks, A solution – rich clients, Rich clients today. HTML 5: Detecting HTML 5 features – Canvas, video, local storage, web workers, offline Applications , geo location, placeholders, input types, doc type, root, headers, articles, dates and times, navigation and footers. Introduction to PHP, Basic rules of PHP program, JSF, The WEB Model and XML,

	XPATH and XSLT .	
<b>UNIT - II</b>	<b>AJAX-I:</b>	<b>(08 Hours)</b>
	Java Script Fundamentals, Objects in Java Script, Dynamic HTML with Java Script, ASP, Basic communication techniques –AJAX with images, Dynamic script loading, AJAX libraries – JQuery, JSON, JSON versus XML, server-side JSON tools.	
<b>UNIT - III</b>	<b>Semantic Web Technologies:</b>	<b>(08 Hours)</b>
	Introduction to Semantic Web, Web 3.0 and Semantic Web; why Semantic Web; Impact of Semantic Web; Myths about Semantic Web; Ontologies: Introduction to Ontology; Types of Ontologies, Basic OWL; Class, Properties and Constraints; Ontology development methodology; Ontology tools- SPARQL, Search Engine Optimization(SEO).	
	<b>Applications of Semantic Web:</b> Software Agents; Semantic Search; Semantic Web Services; Semantics in Social Networking; SOA, ETL; Web crawling, Page Ranking Algorithm.	
<b>UNIT - IV</b>	<b>Enterprise JAVA (J2EE):</b>	<b>(08 Hours)</b>
	Defining the Enterprise, Introducing Enterprise Applications, Creating dynamic content with servlets, using Java server pages(JSP), NetBeans, interacting with relational databases using JDBC,MVC Architecture, JMS, Managing transactions with JTA/JTS, security aspects in system architecture, J2EE design patterns.	
<b>UNIT - V</b>	<b>Enterprise Beans:</b>	<b>(08 Hours)</b>
	Enterprise Bean, Benefits of Enterprise Beans ,When to Use Enterprise Beans, Types of Enterprise Beans - Session Bean, Message-Driven Bean , Contents of an Enterprise Bean ,Packaging Enterprise Beans in EJB JAR Modules ,Naming Conventions for Enterprise Beans ,The Lifecycles of Enterprise Beans - Stateful Session Bean , Stateless Session Bean, Creating the Enterprise Bean . Coding the Enterprise Bean Class.	
<b>UNIT - VI</b>	<b>Web services:</b>	<b>(08 Hours)</b>
	Introduction to Service Oriented Architecture, Combining protocols to build Web services – REST Services, REST – resources, representations, state, transfer – using HTTP methods. Web services using SOAP and WSDL.	

**Term Work:**

1. Design the static web pages required for a website using HTML 5.
2. Illustrate XML document processing in Java using XPath and XSLT.
3. Illustrate the use of Java Script in performing client side validation.
4. Describe and Build Dynamic web Pages using DHTML with Java Script.
5. Construct small applications using AJAX
6. Design and build small applications using JQuery, JSON and AJAX.
7. Outline and Discuss on Applications of Sematic Web Technologies.
8. Report how to use OWL to develop Ontologies.
9. Construct a Web Crawler
10. Outline and Discuss on implementation of Page Ranking Algorithm
11. Build and Illustrate an Enterprise Applications
12. Build and Apply Web Services using SOAP

**Text Books:**

1. Eric Van Der Danny Ayers et al, "Professional Web 2.0 Programming", Wrox Publications, 2007
2. Web Technologies: Black Book, Kogent Learning Solutions Inc. Wiley India Pvt. Ltd. 2006
3. David Hunter et al , "Beginning XML", 4th Edition, Wrox/John Wiley, 2007
4. Mark Pilgrim "HTML 5 Up and Running", O'REILLY | GOOGLE Press, 2010.
5. Nicholas C Zakas et al , "Professional AJAX", 2nd Edition, Wrox publications, 2007.
6. Thomas Erl , "SOA: Concepts, Technology and Design", Pearson, 2005
7. Karin K. Breitman, Marco Antonio Casanova and Walter Truskowski " Semantic Web: Concepts, Technologies and Applications", Springer International Edition, 2007.
8. Justin Couch and Daniel Steinberg, Hungry Minds Inc, "Java 2 Enterprise Edition Bible" 2002.

**Reference Books:**

1. Lee W. Lacy , OWL: Representing Information Using the Web Ontology Language, Trafford Publishing, 2005.
2. Christopher D. Manning, Prabhakar Raghavan & Hinrich Schütze, Introduction to Information Retrieval, Cambridge university press, 2008

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

Board of Studies  
Computer Engineering and IT.  
Bharati Vidyapeeth University, Pune

**STRUCTURE AND THE SYLLABI**

**B.TECH.**

**[COMPUTER ENGINEERING]**

**SEMESTER V AND VI**

**[2014 Course]**





**Bharati Vidyapeeth University, Pune**  
**Faculty of Engineering & Technology**  
**Programme: B. Tech (Computer Engineering) Sem – V (2014 Course)**

Sr. No	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
1	Formal Language and Automata Theory	3	--	1	60	20	10	10	--	--	100	4	-	4
2	Software Testing	3	2	--	60	20	10	10	--	50	150	3	1	4
3	Computer Network	3	2	--	60	20	10	10	50	--	150	3	1	4
4	Database Management System	3	2	--	60	20	10	10	50	--	150	3	1	4
5	Elective - I	3	--	--	60	20	10	10	--	--	100	3	--	3
6	Professional Skill Development-V	4	--	--	100	--	--	--	--	--	100	4	--	4
7	Programming Lab-III	--	4	--	--	--	--	--	50	--	50	--	2	2
	<b>TOTAL</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>05</b>	<b>25</b>

**Elective - I:** a) Multimedia and Mobile Applications b) Scripting Languages c) Software Project Management d) Computational Genomics  
**Optional Subject**

Sr. No	Name of Course	Teaching Scheme			Examination Scheme							Credits		
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4



## FORMAL LANGUAGE AND AUTOMATA THEORY

### TEACHING SCHEME:

Theory: 3 Hours / Week

Tutorial: 1 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

### CREDITS ALLOTTED:

Theory: 04 Credits

### Course Pre-requisites:

1. Discrete Mathematics
2. Introductions to algorithms

### Course Objectives:

1. Learn types of grammars.
2. Understand various Computing models like Finite State Machine, Pushdown Automata, and
3. Turing Machine.
4. To Learn various applications of Formal Language Processing

### Course Outcomes: After completion of course, students will able to:

1. Illustrate the importance of Automata Theory in designing computer languages.
2. Transform informal problems into formal ones.
3. Infer Grammars, languages modeling and compilers basics.
4. Investigate and prove the equivalence of languages described by pushdown automata
5. Design Language Acceptability by Turing Machine
6. Outline the applicability of the formal language and automata theory concepts.

### UNIT I **Finite State Machine (FSM):** Introduction, difference between natural and formal (06 Hours)

languages, Basic machine - design of basic machines. Transition diagram, Transition graph, Acceptance of String, Acceptance of Language, examples, Finite Automata (FA), Deterministic Finite Automaton (DFA) and Non-Deterministic Finite Automaton (NFA), Conversions of NFA with  $\epsilon$  and without  $\epsilon$ , Minimization of DFA, Equivalence of NFA and DFA, Limitations of FA.

### UNIT II **Regular expressions (RE)** - Introduction, FA and RE, RE to FA, FA to RE, algebraic laws, (06 Hours) applications of REs, FA for regular grammar, Uses of Regular expression, Pumping Lemma.

**Moore and Mealy Machines:** Introduction, Difference between Moore & Mealy, models, inter conversions, Equivalence of Mealy machine and Moore machine, Uses of both the machines.

### UNIT III **Grammar-** Introduction, representation of grammar, Chomsky hierarchy, Context Free (06 Hours)

Grammar- Derivation, sentential form, inference, derivation, parse tree, ambiguity in grammar and language- ambiguous Grammar, removing ambiguity from grammar, Normal Forms- Chomsky normal form, Greibach normal form, Closure properties of CFL, Decision property of CFL, Reduced form grammar removal of unit productions, epsilon production,

useless symbols. left linear and right linear grammars and inter conversions.

- UNIT Push Down Automata (PDA):** Introduction, Pushdown Automata (PDA), Transition Diagrams, Functions and Tables, Deterministic Push- down Automata (DPDA) - definition, Nondeterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages. Introduction to Post Machines (PMs) **(06 Hours)**
- UNIT Turing Machine (TM):** Introduction, Transitions Diagrams, Functions and Tables, Design of TM as generator, decider and acceptor, comparison of Turing machine (TM) with FSM, PDM, and PM. combination TM, iterative TM, recursive TM, universal TM, Language Acceptability by TM, Recursive sets, partial recursive functions, recursively enumerable sets, Church's Turing hypothesis, multi stack Turing machine, TM limitations. **(06 Hours)**
- UNIT Applications** –Application of RE, FA, PDA, CFG, TM. Syntax analysis language definition. Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine. Lexical analyzer, Text editor, and searching using RE. Introduction to Natural Language Processing. **(06 Hours)**

**Assignment:**

**Note:**

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Text books**

1. E.V. Krishnamurthy, “Theory of Computer Science”, EWP Publication
2. Vivek Kulkarni “Theory Computation” Oxford higher education.

**References:**

1. Hopcroft Ullman, “Introduction to Automata Theory, Languages & Computations, Narosa
2. Daniel A. Cohen, “Introduction to Computer Theory”, Wiley Publication
3. John C. Martin, “Introduction to Language & Theory of Computation”, McGraw Hill
4. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

## SOFTWARE TESTING

### TEACHING SCHEME:

Theory: 03 Hours / Week  
Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Exam: 60 Marks  
Continuous Assessment: 40 Marks  
Term Work/Oral: 50 Marks

### CREDITS ALLOTTED:

Theory: 03 Credits  
TW/OR: 01 Credits

### **Course Pre-requisites:**

The Students should have

1. Basic knowledge of Software Engineering.

### **Course Objectives:**

1. Create awareness among the students about the basic fundamentals of Software Testing Process.
2. To make students aware of various techniques and tools used for testing different kinds of software.

**Course Outcomes:** After completion of course, students will able to:

1. Define Software Testing level, techniques, test deliverables/artifacts, V-Model.
2. Comprehend various Testing Levels and Techniques.
3. Compare different testing approaches for various kinds of applications.
4. Analyze business and software Risks involved in managing Software Testing Projects. .
5. Outline substantial knowledge of Agile Testing Process.
6. Recite Agile Testing Techniques and Tools.

<b>UNIT I</b>	<b>Introduction:</b>	<b>(06 Hours)</b>
<b>I</b>	Testing as an Engineering Activity – Basic Definitions – Bug, Defect, Verification validation, Debugging ,Software Testing Principles – The Tester’s Role in software Development Organization , Iterative development – Risk Driven and Client Driven, Test driven Development, Evolutionary and adaptive development , Evolutionary requirements analysis – Early “Top Ten” high-level requirements and skillful analysis, Testing Fundamentals- Quality Assurance, Quality Control, V-Model of software testing, Testing techniques and Levels of Testing, Static Vs Dynamic testing, Test deliverables.	
<b>UNIT II</b>	<b>Testing Techniques and Test Case Fundamentals.</b>	<b>(06 Hours)</b>
<b>II</b>	Testing Levels- Unit Testing, Integration Testing, Functional and System Testing, Types of Testing- Stress Testing, Performance Testing, Usability Testing, Non-Functional Testing, Acceptance Testing, Regression Testing, Beta Testing, Testing techniques- Black Box Vs. White Box Testing, Black Box Techniques, White Box Techniques, and Verification Techniques: Inspection, Walk-Through, Peer Reviews. <b>Test Case Fundamentals-</b> Definition, Test Case Template, Test Case Parameters, Kinds of Test cases, Characteristics of Good Test Case, Writing Functional and Boundary Test Cases, Manual Test Cases Vs Automated Test Scripts.	
<b>UNIT III</b>	<b>Testing approaches for different Types of Applications</b>	<b>(06 Hours)</b>
<b>III</b>	Testing COTS (Commercial-Off-the-shelf Software, Web-based applications/e-commerce applications, Object-Oriented Systems, Wireless applications, Testing for security, Website Testing, Foreign Language Testing. <b>Test Automation Tools:</b> Web browser Automation through Selenium, Test	

Management Tool-Test Director, Defect Tracking Tool – Bugzilla, GUI Testing Tool- WinRunner, and Configuration Management Tools.

**UNIT Managing Software Testing Projects (06 Hours)**

**IV** Test Planning- Test strategy, Creating a test Plan, Test Plan document, Test Pass/Fail criteria, Risk analysis, Test Scoping and Effort Estimation, Test Scheduling and budgeting. Introduction to Testing Maturity Model (TMM).  
**Test Metrics:** Types, Identifying Test Metrics, Methods for gathering Test metrics, Analyzing and Applying Test Metrics, GQM Paradigm. Defect Management: Defect Tracking, Defect Reporting, Defect Metrics.

**UNIT Agile Methodology (06 Hours)**

**V** Introduction to Agile Model, Agile Vs Waterfall Method, Methodologies of Agile Testing - Scrum- Practices, Process flow of Scrum, eXtreme Programming- Phases, Crystal Methodologies, DSDM (Dynamic Software Development Method), Agile Testing Lifecycle. Test-Driven Development, Acceptance Test-Driven Development, and Behavior-Driven Development, Role of the Agile Tester, Assessing Quality Risks in Agile Projects, Techniques in Agile Projects- Acceptance Criteria, Adequate Coverage, Applying Acceptance Test-Driven Development, Exploratory Testing and Agile Testing, Tools in Agile Projects.

**UNIT Agile Testing Techniques and Quality Tools: (06 Hours)**

**VI** Agile testing – Nine principles and six concrete practices for testing on agile teams. Six Sigma - Kaoru Ishikawa's Basic Seven QC (Quality Control) Tools- Cause and Effect diagram, Check Sheet, Control charts, Histogram, Pareto chart, Scatter diagram, Flowchart, PDCA (Plan-Do-Check-Act) cycle, Software Testing- ISO Standards, IEEE Standards- IEEE 829, IEEE 1008, IEEE 1012 etc.

**Term Work:**

1. Introduction to Software Testing Lifecycle Model and the SPRAE Software Testing Framework.
2. Design functional and boundary test cases manually, execute tests, and evaluate test results.
3. Write manual test cases for a C program which demonstrates the working of the following
  - A. Constructs: I) do...while II) switch
  - B. A program written in C language for Matrix Multiplication fails." Introspect the causes for its failure and write down the possible reasons for its failure".
4. Write the test cases for any known application (e.g. Banking application)
5. Create a test plan document for any application (e.g. Library Management System)
6. Consider any system (e.g. ATM system) and study its system specifications and report the various bugs.
7. Running test scripts using automated testing tool (e.g. Win runner)
8. Testing of a web application using the web testing tool (e.g. Selenium)
9. Tracking and reporting bugs using bug tracking tool (e.g. Bugzilla, bugbit)
10. Create a database of manual and automated tests using any open source test management tool.
11. Implement software testing on an Agile Project.

**Assignments:**

1. The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.
2. In case of assignments for internal 10 marks students will be assigned two assignments containing

- problems of different types or any programming assignment and guided for the solutions of the problem.
3. The assignments are to be submitted as hard copy.

**Text Books:**

1. William.E. Perry, “Effective Methods for software Testing”, Wiley 3rd Edition.
2. Ron Patton, “Software Testing”, Techmedia.
3. Elfriede Dustin,” Effective Software Testing”, Addison-Wesley, 1<sup>st</sup> Edition, 2003.
4. Lisa Crispin, Janet Gregory,” Agile Testing”, Addison-Wesley, 11th Edition, 2015.

**Reference Books:**

1. Marnie Hutcheson,” Software Testing Fundamentals: Methods and Metrics”, Wiley.
2. Paul C. Jorgensen, “Software Testing: A Craftsman's Approach”, Auerbach Publications, 2008.
3. Craig Larman, “Agile and Iterative Development – A Manager’s Guide”, Pearson Education – 2004.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI



## **COMPUTER NETWORK**

### **TEACHING SCHEME:**

Theory: 3 Hours / Week

Practical: 2 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

Term work/Practical: 50 Marks

### **CREDITS ALLOTTED:**

Theory:03 Credits

TW/PR:01 Credit

### **Course Pre-requisites:**

1. Students should have basic knowledge of Computers and Internet.
2. C/C++/Java programming, algorithms & probability.

### **Course Objectives:**

1. Developing the students with the knowledge of advanced computer networking.
2. Developing students with practical knowledge of latest networking technologies.

**Course Outcomes:** After completion of course, students will able to:

1. Recite the basics of Computer network.
2. Relate detailed structure of data link layer with other layers.
3. Enumerate the concept of Medium Access Control layer.
4. Recite the details of Network layer.
5. Discuss the details of Transport layer.
6. Infer the functionality of Application layer.

### **UNIT INTRODUCTION:**

**(06 Hours)**

- I** Internet working, Use of the computer network, Physical layer, Networking hardware devices, networking software, types of networks, OSI model working, TCP/IP reference model, Wireless networks, Buffering, Switching, packets, frames, introduction to latest internet technologies.

### **UNIT Data Link Layer:**

**(06 Hours)**

- II** Data layer working, Framing, Error Control, Flow Control, error detection and correction, data link protocols, IEEE standards.

### **UNIT MEDIUM ACCESS CONTROL SUBLAYER:**

**(06 Hours)**

- III** MAC layer working, Ethernet, Static & Dynamic Channel Allocation, multiple access protocols, wireless technologies, RFID.

**UNIT NETWORK LAYER: (06 Hours)**

**- IV** Network layer working, Network layer design issues, routing algorithms, congestion control algorithms, quality of service, IP Addresses, Subnets, Configuring network settings, Firewalls, IP V6, Mobile IP V6.

**UNIT TRANSPORT LAYER: (06 Hours)**

**V** Transport layer working, services of transport layer and elements of transport protocols, congestion control in transport layer, Transport protocols-TCP &UDP, Performance issues, Mobile TCP.

**UNIT APPLICATION LAYER: (06 Hours)**

**VI** Application layer working, DNS, Email, WWW, Audio & video streaming, Content delivery, Caching in Web Browser remote login, Wireless web, browsers, NFS, SNMP, Telnet, FTP, HTTP, WiMAX, WSN.

**Term Work:**

- Introduction and configuration of networking devices  
Practical Study of PC, router, Switches, hubs, servers, repeaters, Wi-Fi modem and its configurations
- Introduction to “CISCO’s Packet tracer”.  
Working and study of CISCO’s Packet tracer
- Implementation of Packet switching using “CISCO’s Packet tracer” software.
- Client-Server setup. Connection establishment between client and server. Study of FTP and HTTP through this setup. Study of packet delivery. Simulation of packet delivery.
- Implementation of static routing using “Packet tracer” software.
- Distance vector routing algorithm. Packet switching using static routing algorithm
- Implementation of dynamic routing using “Packet tracer” software.
- Dijkstra's shortest path algorithm. Packet switching using dynamic routing algorithm.
- WAP in C to implement routing algorithm using Bellman Fords distance vector algorithm.
- Study of network throughput and efficiency using “Wireshark software”
  
- Packet delivery from one system to other. Observe its throughput by using Wireshark software.
- Data encryption using “GnuPG” Software.
- Encryption of the data using GnuPG software. Encrypt data and deliver it to other system and
- Observing the change in file size using Wireshark
- Experiment related to NS2/NS3 tool.
- Case study of “Networking commands in Linux based operating system”

**Assignment:**

**NOTE:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Text Books /Reference books**

1. James f. Kurose, Keith w. Ross. Computer networking: a top-down approach. 6<sup>th</sup> ed.: Pearson.
2. Andrew s. Tanenbaum, David j. Wetherall. Computer networks. 5<sup>th</sup> ed.: Pearson.
3. Forouzan. Data comm.& netw. 5e. 5th ed.: McGraw-Hill.
4. William Stallings. Data and computer communications. 8th ed.: Pearson.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## DATABASE MANAGEMENT SYSTEM

### TEACHING SCHEME:

Theory: 03 Hours / Week  
Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks  
TW/Practical: 50 Marks

### CREDITS ALLOTTED:

Theory: 03 Credits  
TW/PR: 01 Credit

### Course Pre-requisites:

1. Discrete mathematics and Data structures.
2. Programming languages.

### Course Objectives:

1. To provide a strong formal foundation in database concepts, technology and practice.
2. To design and develop a database schema.
3. To understand Structured query language (SQL), indexing and query processing.

### Course Outcomes: After completion of course, students will able to:

1. Differentiate significance of Database Management System over the file processing system.
2. Illustrate the fundamentals of data models and to conceptualize and depict a database system using data models.
3. Analyze and practice Relational Data Model.
4. Apply SQL queries for database definition and database manipulation.
5. Illustrate transaction management concepts like serializability, concurrency control and recovery system.
6. Investigate the knowledge about emerging trends in the area of database for unstructured data and applications for it

### UNIT Overview of Database Management System

#### I Overview of DBMS: Data and Information, Database, characteristics of databases, (06 Hours)

Data Governance and Importance of database, Database Management System (DBMS), structure of DBMS, Objectives of DBMS: Data Availability, Data Integrity, Data Security, and Data Independence. Three level DBMS architecture and Data Abstraction. Classification of DBMS, File based System; Drawbacks of File based System, Advantages of DBMS.

**Database Architecture:** Two Tier, Three Tier, Multi-Tier. The DBMS Life Cycle, Information Life Cycle, Roles in Database Environment, Database users and Administrator, Introduction to Data models, Need for abstraction, Situation where DBMS is not necessary, DBMS vendors and their products.

### UNIT Data modeling and Design

#### II Data modeling: Benefits of Data Modeling, Types of Data Modeling, Phases of (06 Hours)

Data Modeling, Building Blocks of Entity Relationship(E-R) model, Mapping Constraints, Keys, Weak and strong Entity Sets, Extended-R features, Reduction to relational schemas, a case study on building an ER Model.

**Database design: Objectives** of Database design, Database Design Tool, Features of Design Tool, merits and De-merits of database design tool, Different anomalies in designing a Database, Functional Dependency, Inference Rules, Closure of set

Functional Dependency, Purpose of Normalization, Steps in Normalization: 1 Normal Form(NF), 2NF, 3 NF Boyce-Codd normal form, denormalization: Types of De-normalization, Table De-Normalization Algorithm.

- UNIT III Relational Model and Algebra (06 Hours)**  
**Relational Data Model:** CODD's Rule, Structure Part, Integrity Part, Manipulative, Table & Relation. Concept of Key: Super Key, Candidate Key, Foreign Key. Relational Integrity: Entity Integrity, NULL Integrity, Domain Integrity constraint, Referential Integrity, Data structure, Mapping ER model to Relational model.  
**Relational Algebra:** Unary and Binary Operations, Rename Operation, Union Operation, Intersection, Difference, Division, Cartesian Product, Join Operations. Advantage and Limitation of Relational Algebra.
- UNIT IV SQL and Introduction to PL/SQL (06 Hours)**  
**SQL:** SQL fundamentals, Data Definition Language(DDL), Data Manipulation Language(DML) and Data Control Language(DCL), Basic structure of SQL queries, set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Sub queries, joins, Nested Sub queries, Complex queries, views: Creating, Dropping, Updation using Views.  
**PL/SQL:** Introduction to PL/SQL block, Concept of Cursors, Stored Procedures, Triggers, Java Database Connectivity (JDBC), Open Database Connectivity (ODBC).
- UNIT V Transaction Processing and Query Optimization (06 Hours)**  
**Transaction processing:** Concept of Transaction and its Management, concurrency Anomalies, Schedules, schedules and recoverability, Serializability, Hierarchy of serializable Schedules, Concurrency control and enforcing serializability, Deadlocks, Lock Granularity, Lock based Concurrency control, Multiple Granularity and Intension Locking, Time stamping Control, Optimistic Control, Evaluation of Concurrency Control Mechanism.  
**Query Processing and Optimization:** Issues in Query Processing, Steps in Query Processing, Query decomposition, Query Optimization: Heuristic query optimization, Transformation rules, Heuristics optimization algorithm. Cost estimation in query optimization: Cost of components of query execution, cost for select and join operation, Query execution Plan.
- UNIT VI Data Warehousing and Data mining (06 Hours)**  
**Data Warehousing:** Introduction, Evolution of Data Warehouse, Characteristics, and Benefits, Limitation of Data Warehousing, Main Components of Data Warehouse, Conceptual Models, Data Mart, and Online Analytical Processing (OLAP), Teradata Relational Database Management System(RDBMS), Teradata Technology.  
**Data Mining:** Data Mining Concepts, Knowledge Discovery, Goals of Data Mining, Data Mining techniques, Machine learning using WEKA tool.  
**Emerging Database Technologies:** Introduction to unstructured data, NOSQL, spatial and geographic databases, multimedia databases, Massive Datasets and Hadoop.

### **Term Work:**

**The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. Write a simple PL/SQL program to check whether the given number is palindrome or not and insert into a table reverse if the given number is palindrome?
2. To import various schemas into database system by running the scripts. Schemas are human resource, Order entry, Product Media, Queued shipping, Sales history.
3. To apply the select statements for the given queries.
  - a. Display employees those who make more than \$900 or if their names fall between QUENTIN and ZYRYAB alphabetically.
  - b. Display employees those who make more than \$900 and if their names fall between QUENTIN and ZYRYAB alphabetically.
  - c. Display the name and job title of all employees who do not have a manager.
  - d. Display the name, salary and commission for all employees who earn commissions. Sort data in descending order of salary and commissions.
4. To apply the single column functions:
  - a. WAQ that displays the employee's names with the first letter capitalized and all other letters lowercase and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employee's name.
  - b. For each employee, display the employee's name and calculate the number of months between today and the date employee was hired. Label the column months worked. Order your results by the number of months employed. Round the number of months up to the closest whole number.
  - c. WAQ that produces following for each employee.
    - i. <Employee name> earns <salary> monthly but wants < 3 times salary>. Label the column dream salaries
5. To discuss normalization and build normalized schema of Hospital Management system.
6. To demonstrate queries on Joins.
  - a. Display the employee name and employee number along with their manager's name and manager number.
  - b. To display all employees including king, who as no manager. Order the results by employee number.
  - c. Display employee name, department name and all the employee who work in the same department as a given employee.
  - d. Create a query to display the name and hire date of any employee hired after employees Davies.
7. To demonstrate queries on aggregate functions
  - a. Determine the number of managers without listing them.
  - b. Display the Manager number and the salary of the lowest paid employee for that manager.
  - c. Display each department name, location, number of employee and the average salary for all employee in that department.
  - d. Create a query that displays total number of employees and of that total, the number of employees hired in 1995, 1996, 1997 and 1998.

8. Use WEKA tool to derive analytical model for the given dataset.
9. Apply the association rules on the dataset and derive the inferences from the results given by WEKA tool.
10. Case study on NOSQL database: MongoDB.

**Assignment:**

**NOTE:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Text books:**

- 1) Silberschatz A., Korth H., Sudarshan S, "Database System Concepts", 6th Edition, McGraw Hill Publishers.
- 2) Ramakrishna R., Gehrke J., "Database Management Systems", 3rd Edition, McGraw- Hill.

**Reference books:**

- 1) Elmasri R., Navathe S., "Fundamentals of Database Systems", 5th Edition, Pearson Education.
- 2) Ryan K. Stephens, Ronald R. Plew, "SQL", 4th Edition, Pearson Education.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## ELECTIVE – I: MULTIMEDIA AND MOBILE APPLICATIONS

### TEACHING SCHEME:

Theory: 03 Hours / Week

### EXAMINATION SCHEME:

End Semester Exam: 60 Marks  
Continuous Assessment: 40 Marks

### CREDITS ALLOTTED:

Theory: 03 Credits

The Students should have

1. Basic knowledge of JAVA Programming.
2. Basic knowledge of Data Communication.

### **Course Objectives:**

1. Create awareness among the students about the basic fundamentals in the design and development of multimedia systems and applications.
2. To make students aware of various techniques used for the development of distributed applications for mobile devices as well as introduce them to the design principles for applications for small devices

**Course Outcomes:** After completion of course, students will able to:

1. Recite basic building blocks of Multimedia systems and applications.
2. Differentiate between various Compression and Decompression Techniques.
3. Comprehend various Multimedia I/O, Storage and Retrieval technologies.
4. Analyze various issues pertaining to Multimedia Application Design.
5. Report on Multimedia Networks.
6. Discuss on Mobile Application Development.

**UNIT I Introduction to Multimedia: (06 Hours)**

Multimedia- Building Blocks, Overview of Multimedia Applications, Multimedia Systems- Components, Characteristics, key issues and Challenges, Evolving Technologies for Multimedia Systems, Multimedia Streaming Protocols (MSP).  
**Multimedia Data:** Text and static data, Graphics, Images, audio, video.  
Multimedia Data Compression- Lossy and Lossless compression techniques.

**UNIT II Compression and Decompression Techniques (06 Hours)**

Types of Compression, Binary Image Compression Schemes, Color, grayscale, still-video image compression, Discrete Cosine Transform, Video image compression, MPEG Coding methodology, Audio Compression, Data and File format standards- PDF, RTF, TIFF, RIFF, MIDI, JPEG, AVI, JPEG, MPEG.

**UNIT III Multimedia I/O, Audio and Video (06 Hours)**

Key Technology Issues, Pen Input, Video and Image Display Systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Video Images and Animation, Full Motion Video, Magnetic Media Technology, WORM optical drives, Cloud-Based Multimedia Storage systems.  
**Multimedia Databases:** Design and Architecture of a Multimedia Database, Organizing Multimedia Databases on The Principle of Uniformity, Media Abstractions, Query Languages for Retrieving Multimedia Data.

**UNIT IV Multimedia Application Design (06 Hours)**

Types of Multimedia systems - Virtual Reality Design - Components of Multimedia



system - Distributed Application Design Issues - Multimedia Authoring and User Interface - Hypermedia Messaging- Distributed Multimedia Systems, Multimedia Authoring Tools.

**UNIT Multimedia Networks (06 Hours)**

**V** Basics of Multimedia Networks, Multimedia Network Communications. Applications: Quality of Multimedia Data Transmission, Multimedia over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand (MOD). Video Broadcasting Standards- HDTV, 4K TV and Ultra HD, Multimedia Content Management (MCM).

**UNIT Introduction: Understanding Mobile Platforms, Android as Competition to itself, (06 Hours)**

**VI** Building an App in Android, Debugging Android Apps. Building block of Mobile apps: App user Interface Designing, Layout, User Interface elements, Activity states and lifecycle, Mobile Databases such as SQLite and enterprise data access, Windows Mobile OS (Operating System).

**Assignments:**

**NOTE:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

In case of assignments for internal 10 marks students will be assigned two assignments containing problems of different types or any programming assignment and guided for the solutions of the problem.

The assignments are to be submitted as hard copy.

**Text Books:**

1. Ralph Steinmetz, Klara Nahrstedt –Multimedia computing, Communication & Application– Pearson Education, 6<sup>th</sup> Edition.
2. Ze-Nian Le, Mark.S. Drew, Jiang Chuan Liu, Fundamentals of Multimedia, Springer, 2<sup>nd</sup> edition.
3. JakobIversen, Michael Eierman, Learning Mobile App Development- A Hands-On Guide to Building Apps with iOS and Android, Addison-wesley, 1<sup>st</sup> edition, 2013.

**Reference Books:**

1. Tay Vaughan, “Multimedia making It work”, Tata Mc Graw Hill 5<sup>th</sup> Edition 2001.
2. Fred Halsall, “Multimedia Communications”, Addison Wesley, 1<sup>st</sup> Edition, 2000.
3. Andleigh P K and Thakrar K, “Multimedia Systems”, Addison Wesley , 1999.
4. Jeff Mc Wherter, Scott Gowell, “Professional Mobile Application Development”, Wiley Publications.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

## **ELECTIVE – I: SCRIPTING LANGUAGES**

### **TEACHING SCHEME:**

Theory: 3 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks

### **CREDITS ALLOTTED:**

Theory:03 Credits

### **Course Pre-requisites:**

1. The course prerequisites are some general familiarity with programming language constructs such as loops, functions, and conditionals. And revision of regular expressions.

### **Course Objectives:**

1. The study of the principles of scripting languages
2. Understand the difference between client side and server side scripting.
3. Understand the basic techniques used to create scripts for automating system administration tasks.

### **Course Outcomes:** After completion of course, students will able to:

1. To Exemplify the fundamentals of scripting languages.
2. To design and implement JavaScript programs using web browser.
3. To analyze the DOM model and JSON.
4. To implement JQuery.
5. To demonstrate basics of PHP and implement the program using web server.
6. To exhibit the fundamentals of python script and implement it using python interpreter.

- UNIT I Introduction to Scripting Languages:** Motivation for and applications of Scripting languages; Difference between Scripting languages and non-Scripting languages; Merits of scripting languages; Types of Scripting languages, Client Side Scripting, Scripting for content structuring, Form design, Client Side Validation, dynamic page generation, adding interactivity, Styles, using HTML, DHTML, XHTML, CSS, Java Script. Server Side Scripting, Types of servers - Configuring and Using Web servers, Important features and Examples of other Scripting Languages. **(06 Hours)**
- UNIT II Java Script fundamentals& Working with Java Scripts:** **(06 Hours)**  
Introduction to Java Script, History, Variables, Data Conversions, Interaction with the User, Operators, Math and Date Objects, Flow control, String Objects, String Methods, Number Objects, Formatting Numbers, Common Array Methods, Associative Arrays. Implementing Functions: Declaration & Invocation, Passing Arguments, Returning Values, Anonymous Functions and Event Handling.
- UNIT - III JavaScript Objects and JSON:** **(06 Hours)**  
Browser Object Model, Document Object Model (DOM), JSON, jQuery Selectors and Filters, DOM Manipulation, jQuery Events, jQuery Event Model, Common jQuery Events, Delegated and Direct Events. jQuery Plugins, Ajax Requests Using jQuery.
- UNIT - IV XML:** Creating Markup with XML, Document Type Definition, Schemas Document Object Model, Simple API for XML, Extensible Stylesheet languages, Formatting Objects, Xpath, XLink and Pointer, Introduction to SOAP, Case Studies, Custom markup languages. Parsers: DOM and SAX - Evolution of AJAX. **(06 Hours)**

**UNIT Python Script:** Introduction, Conditional Statements, Looping, Control Statements, (06 Hours)  
- V String Manipulation, Lists, Tuple, Dictionaries, Functions, Modules, Input-Output, Exception Handling.

**UNIT Python Script with OOP:** OOPs concepts, Classes in Python, Principles of Object (06 Hours)  
- VI Orientation, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Regular expressions, CGI, Database, Networking, Multithreading, GUI Programming.

**Assignment:**

**Note:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Text books:**

- 1) Python: The Complete Reference by Martin C. Brown
- 2) JavaScript: The Complete Reference by Thomas Powell, Fritz Schneider.

**Reference Books:**

- 1) JavaScript in 24 Hours, 4th ed. Michael Moncur. 2007. Sams Publishing.
- 2) Python Tutorial by Guido van Rossum, and Fred Drake, Jr., editor, Release 2.6.4.
- 3) Programming Python, by Mark Lutz. O'REILLY
- 4) Xml: The Complete Reference by Willimson, Tata McGraw-Hill Education
- 5) Beginning Python: From Novice to Professional (2nd Edition) Author: Magnus Lie Hetland.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## **ELECTIVE – I: SOFTWARE PROJECT MANAGEMENT**

### **TEACHING SCHEME:**

Theory: 03 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

### **CREDITS ALLOTTED:**

Theory:03 Credits

### **Course Pre-requisites:**

1. Understanding of Software Development Life cycle(SDLC)
2. Knowledge of management skills and strategies.

### **Course Objectives:**

1. Articulate similarities and differences between IT projects and other types of projects
2. The ability to come up with a project schedule and assign resources
3. Identify project risks, monitor and track project deadlines.
4. The capability to work in a team environment and be aware of different modes of communications

### **Course Outcomes:** After completion of course, students will able to:

1. Practice the process of project management and its application in delivering successful IT projects.
2. Distinguish between the different types of project and follow the stages needed to negotiate an appropriate scope.
3. Plan and Complete the tasks in time effectively and efficiently.
4. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities.
5. Identify the resources required for a project and to produce a work plan and resource schedule.
6. Implement the project plans through managing people communications

### **UNIT An overview of IT Project Management**

**(06 Hours)**

**I**

Introduction, the state of IT project management, context of project management, need of project Management, project goals, project life cycle, information technology project methodology (ITPM), project feasibility, project selection and approval, project contracting, PMBOK.

### **UNIT Project Integration & scope Management**

**(06 Hours)**

**II**

Project management process, project Integration management, the project charter, project Management planning framework, the contents of a project plan, the planning process, project scope definition, Management project scope verification, change control, Work Breakdown Structure (WBS), linear responsibility chart.

- UNIT Project Time Management: (06 Hours)**  
**III** Developing the project schedule, Management Scheduling Charts, logic diagrams and network (AOA, AON), critical path, calendar scheduling and time based network, PDM network, PERT, CPM, Resource loading, resource leveling, allocating scarce resources to projects.
- UNIT Project Quality and Cost Management: (06 Hours)**  
**IV** Quality tools and philosophies, Quality management system, IT Project quality plan. Cost estimating, Cost escalation, Management system development cycle, Cost estimating process, Elements of budgets and estimates, Project cost accounting and MIS, Budgeting using cost accounts, Cost schedules and forecasts.
- UNIT Project Human Resource Management: (06 Hours)**  
**V** Organization and project planning, Resource project team, multidisciplinary teams, project Management environment, project leadership, ethics in projects, multicultural projects, Role of project manager, IT governance.
- UNIT Project Human Communication Management: (06 Hours)**  
**VI** Monitoring and controlling the project, Communication project plan, Project metric, Project Management control, designing the control system, the plan-monitor control cycle, data collection and reporting, reporting performance and progress.

**Assignment:**

**Note:** For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy

**Text books**

- 1., Hughes, cotterel, RajibMalll Tata McGraw Hill Software Project Management.
2. Edwin Bennatan Software Project management.

**References**

1. S.A. Kelkar Software Project Management
2. Whitten, Bentley and Dittman System Analysis and Design Methods

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT – III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT – VI  |

## ELECTIVE – I: COMPUTATIONAL GENOMICS

### TEACHING SCHEME:

Theory: 3 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

Total: 100 Marks

### CREDITS

### ALLOTTED:

Theory: 03 Credits

### Course Pre-requisites:

In order to understand the content, gain knowledge and successfully complete this course, students should have a basic understanding of the computer algorithms, Programming skills and basic mathematics.

### Course Objectives:

1. The purpose is to enable students to analyze and Interpret data generated by bioinformatics/genomics technology.
2. Enable student to use statistical concepts to design experiments and analyze high dimensional data.

### Course Outcomes: After completion of course, students will able to:

1. Apply knowledge of data structures, algorithms and analysis of algorithms to problems in Computational Genomics
2. Recite and Express Knowledge needed to read and interpret cutting-edge results in computational genomics.
3. Express the strengths and limits of current genomics data analysis methods
4. Prepare to lead new research projects in computational genomics
5. Formulate and/or model a biological problem/system as a computer science problem
6. Investigate the applicability of algorithms & techniques in other domains such as text mining, speech recognition, pattern matching and string searching

### UNIT Introduction to Genome Computational (06 Hours)

**I** Introduction to Challenges in Computational biology: gene finding, Sequence alignment, Database lookup, genome assembly, Regulatory Motif Discovery etc., Introduction to Probability: Probability Distribution, Multiple Random Variables, Random Variables assuming infinite values.  
Introduction to Markov & Chebycheff inequalities, Hoeffding's inequality, Monte carlo simulation, Cramer's theorem.

### UNIT Algorithms for computational genomics (06 Hours)

**II** Enumeration Approaches: Exhaustive search, Pruning, greedy algorithms, iterative refinement.  
Content based indexing: hashing, database lookup, pre-processing.  
Iterative Method: Combining sub problems, memorization, dynamic programming.  
Statistical Method: Hypothesis testing, Maximum likelihood, Bayes Law, HMM's.  
Machining learning technique: Supervised and unsupervised learning, classification.

### UNIT Hidden Markov Processes (06 Hours)

**III** Markov Processes: Markov property and state transition matrix, estimating the

state transition matrix, stationary Markov chains: recurrent and transient states, hitting probabilities and mean hitting time, Basic properties: Three different looking models, equivalence between three models. The Viterbi algorithm, Baum-Welch Algorithm.

**UNIT BLAST THEORY (06 Hours)**

**IV** Anatomy, Problem formulation, Moment generating function, Finding local Matches, Application of main results, Proofs of main results.  
BLAST & Database: W-mer Indexing data, Search algorithm, karlin-alschul statistics, Filtering, Two hit Blast, substitution matrices, pigeonhole principle.

**UNIT Data Mining (06 Hours)**

**V** Functional Genomics: Splicing & Alternative Splicing, Microarray based Functional genomics.  
Data Transformation: data smoothing by discretization, Normalization and standardization, min-max normalization, z-score standardization, use decimal scaling.  
Feature Selection: Filter Approaches, Wrapper Approaches.  
Clustering Technique: Distance based clustering and measures, K-means Algorithm, k-modes algorithm, Genetic Distance measure, hierarchical clustering, Graph based clustering.

**UNIT Classification in Genome and bioinformatics (06 Hours)**

**VI** Bias variance tradeoff in supervised learning, Linear and Nonlinear classifiers, Model complexity and training data set size, support vector machines, Bayesian Approaches, Bayesian Network, Decision tree: tree pruning.  
Applications: Sequence alignment using dynamic programming, Scoring matrices for protein sequences.

**Assignments:**

**Note**

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Reference Books**

- [1] Data Mining for Bioinformatics, Sumeet Dua, Pradeep Chowriappa, CRC Press, 06-Nov-2012
- [2] Data Mining in Bioinformatics, Jason T. L. Wang, Mohammed J. Zaki, HannuToivonen, Dennis Shasha
- [3] Springer Science & Business Media, 30-Mar-2006
- [4] Hidden Markov Processes: Theory and Applications to Biology, M. Vidyannagar Princeton University Press, 24-Aug-2014
- [5] Theoretical and Computational Methods in Genome Research, Sandor Suhai, Springer Science & Business Media, 06-Dec-2012
- [6] Computational Genome Analysis: An Introduction, Richard C. Deonier, Simon Tavaré, Michael Waterman, Springer Science & Business Media, 13-Aug-2007

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

**ENGINEERING MATHEMATICS-IV (OPTIONAL SUBJECT)**

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS  
ALLOTTED:**

Theory: 04 Hours / Week

End Semester Examination: 60 Marks

04 Credits

Practical: -- Hours / Week

Continuous Assessment: 40 Marks

**Course Pre-requisites:**

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

**Course Objectives:**

The course aims at making the students familiar about the most basic numerical methods and concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

**Course Outcomes:**

**The student should be able to**

1. Derive appropriate numerical methods to solve algebraic and transcendental equations
2. Evaluate the accuracy of common numerical methods.
3. Develop appropriate numerical methods to solve a difference equation.
4. Be familiar with numerical interpolation and approximation of functions, numerical integration and differentiation.
5. Be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

**UNIT - I Numerical solutions of algebraic and transcendental equations: (08 Hours)**

Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.

**UNIT - II Solution of system of linear algebraic equation (08 Hours)**

Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.



- UNIT - III**      **Difference equation and Solution of difference equations**      **(08 Hours)**  
 Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.
- UNIT - IV**      **Interpolation and Numerical differentiation and integration**      **(08 Hours)**  
 Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting : Method of least squares. Straight line, Second degree, parabola, Exponential curve.  
 Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.
- UNIT - V**      **Numerical solution of I order ordinary differential equation**      **(08 Hours)**  
 Solution by Euler's, method Euler' Modified method Taylor's series. Runga-kutta method. Milne's Predictors and Correctors method.
- UNIT - VI**      **Numerical Solution of Partial Differential Equations**      **(08 Hours)**  
 Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.

**Text Books:**

1. Gupta P.P.& Malik G.S., *Calculus of Finite Differences and Numerical Analysis*, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
2. B.S.Grewal, *Engineering Mathematics*, Khanna Publishers, 12/e, 2006.

**Reference Books:**

1. Francis J. Scheid, *Schaum's Outline of Numerical Analysis*, McGraw-Hill, New York, 1989.
2. S. S. Sastry, *Engineering Mathematics*, Vol I, II Prentice Hall Publication, 3/e, 2004.
3. C.Ray Wylie & Louis C. Barretle, *Advanced Engineering Mathematics*, Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I,II,III
Unit Test -2	UNIT – IV,V,VI

## **Programming Lab-III**

**TEACHING SCHEME:**

Practical: 04 Hours / Week

**EXAMINATION SCHEME:**

Term Work/Practical: 50 Marks

**CREDITS  
ALLOTTED:**

TW/PR: 02 Credits

**Course Pre-requisites:**

The Students should have

1. Basic knowledge of object oriented programming.

**Course Objectives:**

1. To develop ability to use the computational languages necessary for engineering practice.

Course Outcomes: After completion of course, students will able to:

1. Recite and Express fundamentals of Visual Basic .NET Programming.
2. Illustrate Object Oriented Programming in VB.NET.
3. Demonstrate Windows Forms Application.
4. Apply the concept of developing Console Application.
5. Illustrate Inheritance and Polymorphism.
6. Experiment the data access using ADO.net.

**UNIT Getting Started with Visual Basic .NET: (06 Hours)**

**- I**

Introduction to Visual Basic .NET, MS. Net Project, MSIL, JIT, .NET frame

work class library.

Module and Variable: Module and Namespace, Variables, array and structure.

Control flow and Error Handlings: Execution flow control. commands, functions & constants. Error Handling, Debugging .NET applications.

**UNIT Object Oriented Programming using VB.NET: (06 Hours)**

**- II**

Methods, properties, constructors, object lifetime, events, Inheritance, in VB.NET., Interfaces, Attributes.

Programming in .NET Framework: Array, Lists and collection file, directories and streams.

**UNIT - III** Windows Forms Application: **(06 Hours)**

Windows forms Applications, Controls, Data Access in visual basic .NET, ADO.NET, Database connectivity.

**UNIT - IV** C#.net Language Basics **(06 Hours)**

Datatypes, Common Type System, Reference Type and Value Type, Variables Declaration, Concept of Class and Object.

Implicit and Explicit Casting, casting between other datatypes, Boxing and Unboxing, Enum and Constant, Operators, Control Statements, working with Arrays, working with Methods - Pass by value, Pass by reference.

Developing Console Application

Introduction to Project and Solution in Studio, compiling a C# program, Compiling and Building Projects, Using Command Line Arguments, Importance of Exit code of an application.

**UNIT - V** Inheritance, Polymorphism and Interface in C#.NET **(06 Hours)**

Exception Handling

Exception, Rules for Handling Exception, Exception classes and its important properties, use of try and catch, throwing exceptions, Importance of finally block.

Introduction to Operator Overloading, DLL, DLL Vs Exe., Types of DLL, concept and use of Class Library, Namespace.

WinForms

Introduction to Windows Forms, Controls, Menus and Context Menus, MenuStrip, ToolStrip, Graphics and GDI, SDI and MDI Applications, Dialogbox (Modal and Modeless), Form Inheritance.

**UNIT - VI** Data Access using ADO.NET **(06 Hours)**

Introduction to SQL. Creating Database using VS.NET, Establishing Connection with Database. Executing simple Insert, Update and Delete Statements, Executing Select Statement and using SqlDataReader

Data Access using ADO.NET – Dataset, Advantages of Dataset, Concept of Data Adapter, Data Table, DataGridView, Data Row, Adding / Editing / Deleting rows in the Data Table, Working with Data View.

Multithreading: Creating and Managing Threads, Threads Priority, Thread States, Thread Synchronization & Inter-thread Communication., Using Monitor

Delegates & Events: Delegate Declaration, Sample Application.

**Term Work:**

Concern Staff should frame assignments on Each Unit.

**Text Books:**

Jesse Liberty Learning Visual Basic .NET, O'Reilly.

Andrew Troelsen Pro C# 2008 and the .NET 3.5 Platform, Apress

**Reference Books:**

Steven Holzner, VB.NET Programming Black Book, Dreamtec Publications.

Matt Telles, C#Programming Black Book, Dreamtec Publications.  
Syllabus for Unit Test: NA

## **OPERATING SYSTEM**

### **TEACHING SCHEME:**

Theory: 3 Hours / Week  
Practical: 2 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks  
TW/Oral: 50 Marks

### **CREDITS ALLOTTED:**

Theory: 03 Credits  
TW/OR:01 Credit

### **Course Pre-requisites:**

1. Concept of system software, application software, knowledge of input output devices and its usage

### **Course Objectives:**

1. To enable the students to understand basic concepts of operating system.
2. To brief the students about various design aspects of operating system functionality
3. To give hands on exposure to Linux commands and system.

**Course Outcomes:** After completion of course, students will able to:

1. Recite and Express theoretical and practical aspects of operating system.
2. Infer the concept of process, thread and Inter process communication
3. Outline the concept of deadlocks, necessary conditions for deadlock and various techniques to handle deadlock
4. Analyze memory management policies.
5. Describe file system File and Input /output structure.
6. Infer LINUX and Android Operating system.

<b>UNIT I</b>	<b>OPERATING SYSTEMS OVERVIEW</b> Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Multiprocessor and Multicore Organization. Operating system Overview-Kernel, Shell, objectives and functions, Evolution of Operating System- Computer System Organization- Operating System Structure and Operations- System Calls, OS Generation and System Boot., Virtual Machines.	<b>(06 Hours)</b>
<b>UNIT II</b>	<b>PROCESS MANAGEMENT</b> Processes-Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; Threads- Overview, Multicore Programming, Multithreading Models; Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semaphores, Monitors.	<b>(6 Hours)</b>
<b>UNIT IV</b>	<b>MEMORY MANAGEMENT</b> Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64-bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.	<b>(6 Hours)</b>
<b>UNIT V</b>	<b>INPUT/OUTPUT SYSTEMS</b> Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation- File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems.	<b>(6 Hours)</b>

**UNIT CASE STUDY****(6 Hours)**

**VI** Basic Concepts, of LINUX Multifunction Server, Virtualization- Xen, VMware with Linux Host, Android operating system –Features, characteristics, Basic building blocks, Architecture, System services.

**Term Work:**

**The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. Demonstrate the process creation and various states of a process
2. Apply various scheduling algorithms on a process.
3. Apply Banker's algorithm
4. Predict whether a system is in a Safe or Unsafe state.
5. Demonstrate various contiguous memory allocation strategies
6. Demonstrate various page replacement strategies
7. Apply disk Scheduling algorithms

**Assignments:****Note:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Reference Books**

- 1) Dhananjay M Dhamdhare, 'Operating Systems - A Concept Based approach', Tata McGraw, Hill publication
- 2) Abraham Silberschatz, Peter B. Galvin & Grege Gagne (Wiley)). Operating System Concepts'
- 3) Sumitabha Das, 'Unix Concepts and Applications, Tata McGraw Hill
- 4) Milan Milinkovic, 'Operating System: Concepts and Design, Tata McGraw Hill
- 5) Achyut S. Godbole, 'Operating System with case studies in Unix, Netware and Windows NT' Tata McGraw Hill
- 6) Karim Yoghmour 'Embedded Android', O'Reilly Publication

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

## DESIGN AND ANALYSIS OF ALGORITHMS

### TEACHING SCHEME:

Theory: 3 Hours / Week  
Practical: 2 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks  
TW/Oral: 50 Marks

### CREDITS ALLOTTED:

Theory: 03 Credits  
TW/OR: 01Credit

### **Course Pre-requisites:**

1. The students should possess the knowledge of Data Structures

### **Course Objectives:**

1. To be able to understand the performance analysis of algorithms.
2. To analyze Dynamic Programming Algorithms.
3. Understand NP-Hard, NP- complete Problems.

### **Course Outcomes:** After completion of course, students will able to:

1. Analyze time complexity
2. Analyze space complexity
3. Discuss Divide and Conquer Method
4. Design algorithms using greedy Methods
5. Infer Backtracking
6. Outline NP-Hard and NP-Complete Problems

<b>UNIT I</b>	<b>Introduction:</b> Algorithm Specification, Pseudocode Conventions, Recursive Algorithms, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations, Performance Measurements.	<b>(06 Hours)</b>
<b>UNIT II</b>	<b>Basic Algorithms:</b> Basics of Probability Theory, Primality testing, Its Advantages and Disadvantages. Elementary Data Structures: Stack, Queues, Binary Trees, Binary Search trees, Heaps, Heap sort, Graphs, Basic Traversal and Search Techniques. Analysis for complexity of all algorithms.	<b>(06 Hours)</b>
<b>UNIT III</b>	<b>Divide and Conquer:</b> General Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick sort, Performance Measurement, Worst case Analysis. Strassens's matrix multiplication.	<b>(06 Hours)</b>
<b>UNIT IV</b>	<b>Greedy Method:</b> The General Method, Knapsack problem, tree vertex splitting, Job sequencing. Minimum Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Optimal Merge Patterns, Single-Source shortest path. Dynamic Programming: The General Method, Multistage Graph, All pair shortest path, Single Source shortest path, General Weights, Optimal Binary Search Trees, String Editing, 0/1 Knapsack, Traveling Salesman Problem.	<b>(06 Hours)</b>

**UNIT V Backtracking:** The General Method, The 8- Queens Problem, Sum of Subsets, Graph Coloring, and Hamiltonian Cycles. Branch and Bound: Least Cost (LC) Search, the 15-puzzle Control abstraction of LC Search, Bounding, FIFO Branch and Bound, LC Branch and Bound. **(06 Hours)**

**UNIT VI Algorithm Complexities:** Non deterministic Algorithms, The classes NP- Hard and NP- Complete, Cook's Theorem, NP-Hard Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation Problems. Approximation Problems. **(06 Hours)**

### **Term Work:**

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Calculate the time complexity of various algorithms.
2. Calculate the space complexity of various algorithms.
3. Implement Knapsack Algorithm.
4. Implement Prim's Algorithm
5. Study and analysis of 8-Queens Problem.
7. Implement Optimal Binary Search Tree.
8. Analyze Quick Sort for Best Case, Worst Case.

### **Assignments:**

Note

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

### **Text books**

1) ElitzHorowith and SartajSahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.

2) Alfred Aho, John E. Hopcroft, "Design and Analysis of Computer Algorithms", Pearson Education

References:  
1) Thomas Cormen, Charles E Leiserson, Ronald Rivest, "Introduction to Algorithms, Tata Mc-Graw Hill Publication, Second Edition.

2) Rod Stephens, "Essential Algorithms: A Practical Approach to Computer Algorithms", John Wiley and Sons Publications

3) Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Education

4) Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publication, Second Edition

5) Steven S. Skiena, "The Algorithm Design Manual", Springer Publication, Second Edition.

### **Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI



## **DIGITAL SIGNAL PROCESSING**

### **TEACHING SCHEME:**

Theory: 3 Hours / Week  
Practical: 2 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks  
TW/Oral: 50 Marks

### **CREDITS**

#### **ALLOTTED:**

Theory: 03 Credits  
TW/OR: 01 Credit

### **Course Pre-requisites:**

Basic knowledge of Mathematics, Data communication and Microprocessor

### **Course Objectives:**

1. To analyze discrete time signals and systems in time and frequency domain.
2. To represent structures for discrete time systems.
3. To design digital filters and implement using open source software
4. To understand DSP processors and DSP based applications in real world.

**Course Outcomes:** After completion of course, students will able to:

1. Classify discrete-time signals and discrete time systems.
2. Evaluate LTI system in frequency domain using Fourier Transform, DFT and FFT.
3. Analyze discrete time signals and LTI system using Z transform.
4. Design structures for discrete time systems
5. Design and implement FIR and IIR filters using different methods.
6. Exhibit enhanced architecture and features of DSP processor.
7. Illustrate applications of DSP in speech and Image Processing.

### **UNIT Signals and Systems:**

**I** Basic elements of DSP system, Analog to Digital conversion process, Aliasing effect Standard signals, Discrete time systems, classification and properties of discrete time systems, Linear Shift Invariant (LSI) systems, Impulse response, Conditions for causality and stability for LTI systems, Linear convolution. **(06 Hours)**

### **UNIT Fourier Transform**

**II** Fourier transform of standard signals, Discrete Fourier Transform (DFT), DFT of standard signals, properties of DFT, Circular convolution, correlation, Radix-2 FFT algorithms, Decimation in Time (DIT) and Decimation in Frequency (DIF), Inverse DFT and computation of IDFT, relation between ZT, FT and DFT. **(06 Hours)**

### **UNIT Z transform**

**III** Region of Convergence (ROC) and its properties, Z transforms of standard signals, properties of Z transform, Inverse Z transform, System functions from Z transform and pole-zero plots, computation of poles and zeros. **(06 Hours)**

### **UNIT Structures for discrete time systems:**

**IV** Implementation of general difference equation, Basic structures for FIR systems, Basic structures IIR systems, Representation of structures using signal flow graphs, Feedback in IIR systems, Linear phase FIR filters. **(06 Hours)**

### **UNIT Digital Filters**

**V** Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) filters, IIR filter **(06 Hours)**

design using impulse invariance and bilinear transformation method, Butterworth approximation, FIR filter design using Windows, Gibb's phenomenon.

<b>UNIT VI</b>	<b>DSP Processors Architecture and applications</b> DSP processors fundamentals, Characteristics, Evolution of DSP processors, Comparison of DSP processor and microprocessor, conventional and Enhanced architecture of DSP Case study: - TMS 320C64X Applications of DSP in image processing, Feature extraction and pattern matching. Applications of DSP in speech processing, Speech recognition, speech synthesis, Echo cancellation. Case study: - Multi-rate signal processing.	<b>(06 Hours)</b>
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### **Term Work:**

**The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.**

1. WAP to generate samples of Sine, Cosine, Square and Random signal.
2. WAP to compute linear convolution
3. WAP to find N point DFT of a given sequence.
4. WAP to compute Circular convolution
5. WAP to implement Radix-2 DIT FFT Algorithm.
6. WAP to compute Z transform and draw pole zero plot
7. WAP to compute Z transform and draw pole zero plot
8. Find Fourier transform of various window functions
9. Assignment based on DSP applications in Image processing
10. Assignment based on DSP applications in speech processing

### **Assignment:**

#### **Note:**

In case of assignments for internal 10 Marks students will be assigned two assignments based on different computer organization and architecture concepts and guided for the respective assignment.

The assignments are to be submitted as a hard copy

### **Text books**

1. John G. Proakis, D.G. Manolakis, "Digital Signal Processing", Pearson Prentice Hall.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press.

### **Reference Books**

1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", Architecture programming & applications, TMH.
2. S.K. Mitra, "Digital Signal Processing Computer Based Approach", TMH.
3. M.H. Hayes "digital signal Processing" Schaum's outlines TMH
4. "TMS 320 C64X CPU & instruction set" Texas instruments reference guide
5. Fredic Harris "Multirate signal processing for communication System", PHI

### **Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## COMPUTER ORGANIZATION AND ARCHITECTURE

### TEACHING SCHEME:

Theory: 3 Hours / Week  
Tutorial: 1 Hour / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks

### CREDITS ALLOTTED:

Theory: 04 Credits

### Course Pre-requisites:

1. Concept of digital logic and microprocessors
2. Basic Understanding of Computer System

### Course Objectives:

1. To understand the core concepts about the computer architecture and computer organization.
2. To understand the design of the various functional units of computer system.

### Course Outcomes: After completion of course, students will able to:

1. Solve fixed point and floating point arithmetic problems using algorithms.
2. Infer the architecture and functions of Central Processing Unit.
3. Outline the design approaches and functional requirements for implementing control unit.
4. Describe the I/O organization and interconnections
5. Analyze the characteristics of memory system.
6. Infer multiprocessor configuration and modern computer organization.

<b>UNIT I</b>	<b>CPU structure and function:</b> Components and functions of computer system, CPU architecture, Processor organization, Register Organization, Instruction Cycle, instruction pipeline. RISC and CISC architecture, The Pentium Processor, Power PC., Superscalar processors.	<b>(06 Hours)</b>
<b>UNIT II</b>	<b>Computer Arithmetic</b> ALU, Fixed and Floating point numbers, Integer arithmetic, Booth's algorithm, Hardware implementation, Restoring and Non-Restoring Division algorithm, Floating point representation, IEEE standards.	<b>(06 Hours)</b>
<b>UNIT III</b>	<b>Control Unit Organization</b> Micro-operation and their Register Transfer Language (RTL) specification, Hardware control design methods and implementation, Micro program control, Micro instruction Sequencing, Micro instruction execution.	<b>(06 Hours)</b>
<b>Unit IV</b>	<b>Input/output Organization</b> Computer system, I/O modules, Programmed I/O, Interrupt driven I/O, Interrupt processing, I/O channels and Processor, DMA, Interface circuits, Bus interconnection, Bus arbitration, Standard buses, Standard interfaces, PCI, SCSI,	<b>(06 Hours)</b>

USB bus.

**UNIT Memory Organization (06 Hours)**

**V** Internal memory, Characteristics of memory systems, Memory hierarchy, Error correction, Cache memory organization, Mapping, Replacement algorithms, Pentium cache organization, DDR3 Memory Organization, NUMA and UMA caches.  
Hard disk drives, RAID levels, Flash drives, USB stick.

**UNIT Multiprocessor Configuration: (06 Hours)**

**VI** Flynn's classification for multiprocessor system, closely coupled, loosely coupled and tightly coupled configurations. Problems of Bus contentions, Inter Processor communication.  
Multi core systems, Virtual processors. Case study: - Processor architecture in latest Mobile /Laptop.

**Assignment:**

**Note:**

The Term Work prescribed in the syllabus is continuous assessment by the concerned subject faculty.

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Text Books**

1. William Stalling, "Computer Organization and Architecture", Fifth edition, PHI
2. Zaky S, Hamacher, "Computer Organization", Fifth Edition, McGraw-Hill Publications, 2001, ISBN 0071122184

**Reference books**

1. John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 2001, ISBN 0071004793.
2. Carpinelli, "Computer systems Organization & Architecture", Pearson Education India, 2001, ISBN: 8177587676, 9788177587678
3. Morris Mano, "Computer System Architecture, Pearson", Third edition (2008), ISBN: 978-8131700709
4. Andrew S. Tanenbaum "Structured Computer Organization "(5th Edition) ISBN-13: 978-0131485211
5. D.A. Patterson and J.L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann ISBN: 9780124077263

**Syllabus for Unit Test:**

Unit Test -1 UNIT – I, UNIT – II, UNIT - III

Unit Test -2 UNIT – IV, UNIT – V, UNIT - VI

## **ELECTIVE –II: VLSI**

### **TEACHING SCHEME:**

Theory: 03 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

### **CREDITS ALLOTTED:**

Theory:03 Credits

### **Course Pre-requisites:**

1. Analog and Digital Electronics.
2. Semiconductor physics.

### **Course Objectives:**

1. Introduce students to VLSI Design.
2. Introduce students to fabrication and testability techniques.
3. Introduce students to design Low-Power CMOS Logic Circuits.
4. Introduce students to design and simulate digital circuits using FPGA.

**Course Outcomes:** After completion of course, students will able to:

1. Express concept of Microelectronics and Introduction to MOS Technologies.
2. Outline Layout Design and Tools.
3. Infer Combinational Logical & Sequential Systems.
4. Identify and discuss key problems Dynamic Logic Circuits and its solutions.
5. Relate importance of Low-Power CMOS Logic Circuits.
6. Apply useful criteria for guiding design and evaluation of Chip Input and Output (I/O) Circuits.

**UNIT I Review of Microelectronics and Introduction to MOS Technologies: MOS, CMOS, (06 Hours)**

**I**

BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits:  $I_{ds} - V_{ds}$  relationships, Threshold Voltage  $V_T$ ,  $G_m$ ,  $G_{ds}$  and  $\omega_0$ , Pass Transistor, MOS, CMOS & Bi CMOS Inverters,  $Z_{pu}/Z_{pd}$ , MOS Transistor circuit model, Latch-up in CMOS circuits.

**UNIT II Layout Design and Tools: (06 Hours)**

**II**

Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.

Logic Gates & Layouts:

Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

**UNIT III Combinational Logic: (06 Hours)**

Layouts, Simulation, Delay, Interconnect design, Power optimization, Switch logic and

**III** Gates.

**Sequential Systems:**

Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

**UNIT Dynamic Logic Circuits:**

**(06 Hours)**

**IV**

Introduction, Basic Principles of Pass Transistor Circuits, Voltage Bootstrapping, Synchronous Dynamic, Circuit Techniques, Dynamic CMOS Circuit Techniques, High Performance Dynamic CMOS Circuits, Semiconductor Memories: Introduction, Dynamic Random Access Memory (DRAM), Static Random Access Memory (SRAM), Nonvolatile Memory, Flash Memory, Ferroelectric Random Access Memory (FRAM).

**UNIT Low-Power CMOS Logic Circuits:**

**(06 Hours)**

**V**

Introduction, Overview of Power Consumption, Low-Power Design Through Voltage Scaling, Estimation and Optimization of Switching Activity, Reduction of Switched Capacitance, Adiabatic Logic Circuits. BiCMOS Logic Circuits: Introduction, Bipolar Junction Transistor (BJT): Structure and Operation, Dynamic Behavior of BJTs, Basic BiCMOS Circuits: Static Behavior, Switching Delay in BiCMOS Logic Circuits, BiCMOS Applications.

**UNIT Chip Input and Output (I/O) Circuits:**

**(06 Hours)**

**VI**

Introduction, ESD Protection, Input Circuits, Output Circuits and  $L(di/dt)$  Noise, On-Chip Clock, Generation and Distribution, Latch-Up and Its Prevention. Design for Manufacturability: Introduction, Process Variations, Basic Concepts and Definitions, Design of Experiments and Performance Modelling, Parametric Yield Estimation, Parametric Yield Maximization, Worst-Case Analysis, Performance Variability Minimization. ASIC Design Flow, Introduction to Verilog, Language Constructs and Conventions in Verilog, Gate Level Modeling, Architecture of FPGA.

**Assignments:**

**Note:**

1. For internal assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.
2. The assignments are to be submitted as a hard copy.

**Reference books**

- 1) Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.
- 2) Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.
- 3) Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
- 4) Principles of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.
- 5) Sung Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis and Design”, Tata McGraw-Hill, Third Edition
- 6) Neil Weste and K. Eshragian, “Principles of CMOS VLSI Design: A System Perspective”, Second Edition,

Pearson Education (Asia) Pvt. Ltd. 2000.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## **ELECTIVE –II: NATURAL LANGUAGE PROCESSING**

### **TEACHING SCHEME:**

Theory: 3Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks

### **CREDITS ALLOTTED:**

Theory:03 Credits

### **Course Pre-requisites:**

Basic understanding of Theory of Computer Science, Systems Software,  
Basic mathematics, Probability theory.

### **Course Objectives:**

1. To understand approaches to syntax and semantics in Natural Language Processing and levels of language analysis.
2. To understand current methods for statistical approaches to machine translation.
3. To develop problem solving abilities using Mathematics.

**Course Outcomes:** After completion of course, students will able to:

1. Outline the Natural Language Processing basics and language representation.
2. Apply various parsing algorithms and its application.
3. Describe language modeling and various clustering techniques.
4. Recite the use of Machine Translation in Natural Language Processing.
5. Apply various filtering methods and semantic networks.
6. Infer advanced tools and parsers for Natural Language Processing.

<b>UNIT I</b>	<b>Introduction to Natural Language Understanding</b> The Study of Language Applications of Natural Language Understanding, Evaluating Language Understanding Systems, The Different Levels of Language Analysis, Representations and Understanding the Organization of Natural Language Understanding Systems, Structure of Natural Language Processing (NLP).	<b>(06 Hours)</b>
<b>UNIT II</b>	<b>Grammars for Natural Language</b> Parsing Algorithms, Robust and Scalable Parsing on Noisy Text as in Web documents, Hybrid of Rule Based and Probabilistic Parsing, Human Preferences in Parsing Encoding Uncertainty: Shift-Reduce Parsers, Deterministic Parser Techniques for Efficient Encoding of Ambiguity Partial Parsing, Part of speech tagging.	<b>(06 Hours)</b>
<b>UNIT III</b>	<b>Natural Language Processing Modeling</b> Automatic Morphology Learning, Named Entities, Maximum Entropy Models, Random Fields, Estimation Techniques, and Language Modeling, Parsing and Syntax, The EM Algorithm in Natural Language Processing, Stochastic Tagging, and Log-Linear Models, Probabilistic Similarity Measures and Clustering, Machine Translation, Discourse Processing: Segmentation.	<b>(06 Hours)</b>
<b>UNIT IV</b>	<b>Natural Language Understanding Methods</b> Finite State Machine Based Morphology; Automatic Morphology Learning;	<b>(06 Hours)</b>



Unsupervised Methods in NLP, Introduction to HMM, HMM Ergodic models, Graphical Models for Sequence Labeling in NLP, Probabilistic parsing, Forward Backward probability, Viterbi Algorithm.

**UNIT V Ambiguity Resolution (06 Hours)**  
Selectional Restrictions, Semantic Filtering Using Selectional Restrictions, Semantic Networks, Statistical Word Sense Disambiguation, Statistical Semantic Preferences, Combining Approaches to Disambiguation.

**UNIT VI Advanced tools, techniques and applications of NLP (06 Hours)**  
Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Cross Lingual Information Retrieval, Some applications like machine translation, database interface, Programming language Python Natural Language Tool Kit (NLTK), NLP applications in web mining and text mining, Parsers for NLP such as Stanford, Open NLP.

**Assignments:**

**Note:**

1. For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.
2. The assignments are to be submitted as a hard copy.

**Text books**

- 1) James Allen, "Natural Language Understanding", Pearson Publication, ISBN: 978-81-317-0895-8 2nd Edition
- 2) D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education, 2002, 2nd Edition

**Reference Books**

- 1) Christopher D. Manning, HinrichSchutze, "Foundations of Statistical Natural Language Processing", 1<sup>st</sup> edition, Cambridge, Massachusetts, 1999.
- 2) Tanveer Siddiqui, US Tiwari, "Natural Language Processing and Information Retrieval" Oxford Higher Education.
- 3) Daniel M. Bikel, ImedZitouni, "Multilingual Natural Language Processing Applications" Pearson Education 1<sup>st</sup> edition.
- 4) Lutz and Ascher "[Learning Python](#)" O'Reilly ISBN: 0596002815

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## **ELECTIVE – II: HUMAN COMPUTER INTERACTION**

**TEACHING SCHEME:**

Theory: 03 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Continuous Assessment: 40 Marks

**CREDITS  
ALLOTTED:**

Theory:03 Credits

**Course Pre-requisites:**

1. Knowledge of user interface and human psychology.
2. Understanding of Input Output devices.

**Course Objectives:**

1. To apply knowledge of human psychology, design process on user interface development projects.
2. To provide the user interface designer with concepts and strategies for making design decisions.
3. To expose the user interface designer to tools, techniques and ideas.
4. To identify the importance of good user interface design.

**Course Outcomes:** After completion of course, students will able to:

1. Express the concept of human computer interaction.
2. Describe the principles of human computer interaction.
3. Outline design goals and standards of HCI designs.
4. Identify and discuss key problems in HCI and its solutions.
5. Recite the importance of software tools and techniques of human factors in developing an interactive system.
6. Apply useful criteria for guiding design and evaluation of user interfaces.

<b>UNIT I</b>	<b>Introduction:</b> Human interaction with computers, importance of human characteristics, human consideration, Motivations for Human Factors in design, Eight golden rules of HCI, Murphy’s law. Human Psychology and understanding. Case study on human factors.	<b>(06 Hours)</b>
<b>UNIT II</b>	<b>The graphical user interface:</b> Popularity of graphics, the concept of direct manipulation, graphical system, Web user – Interface popularity, Principles of user interface. Current trends in GUI.	<b>(06 Hours)</b>
<b>UNIT III</b>	<b>Design process:</b> Importance of user interface, definition, importance of good design. Benefits of	<b>(06 Hours)</b>

good design, study of design process components, three Pillars of design, Social Impact for early design review.

- UNIT Software Tools and Techniques in Interface: (06 Hours)**  
**IV** Specification methods, interface building tools, Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, pointing devices, navigation schemes.
- UNIT Screen Designing: (06 Hours)**  
**V** Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow – visually pleasing composition, presentation information simply and meaningfully information retrieval on web, Case study on screen design. Evaluation of user interface.
- UNIT Windows & Components: (06 Hours)**  
**VI** Selection of window, individual, multiple window design, image browsing and tightly coupled windows. Selection of devices based and screen based controls. Components – text and messages, icons and increases, Multimedia, colors, uses, problems, choosing colors.

#### **Assignment:**

#### **Note:**

For internal assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

#### **Reference books**

- 1) Prece, Rogers, “Sharps Interaction Design”, Wiley India.
- 2) Ben Shneiderman, “Designing the user interface”. 3rd Edition, Pearson Education Asia
- 3) Soren Lauesen, “User Interface Design”, Pearson Education.
- 4) Alan Cooper, Robert Reimann, David Cronin, “Essentials of Interaction Design”, Wiley.
- 5) Alan Dix, Janet Finckay, Gregory, Abowd, Russell, Beaulieu, “Human Computer Interaction”, Pearson Education.

#### **Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## ELECTIVE – II: DATA STORAGE SYSTEMS

### TEACHING SCHEME:

Theory: 3 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Continuous Assessment: 40 Marks

### CREDITS ALLOTTED:

Theory: 03 Credits

### Course Pre-requisites:

In order to understand the content, gain knowledge and successfully complete this course, students should have a basic understanding of the computer architecture, file systems, operating system and networking.

### Course Objectives:

1. To enlighten the students with the knowledge of storage systems and to gain exposure to the storage industry

**Course Outcomes:** After completion of course, students will able to:

1. Describe the data storage systems and its elements
2. Evaluate various types of intelligent storage systems
3. Describe and Evaluate the deployment model of storage systems
4. Evaluate the various storage networking technologies
5. Infer the key processes for managing the storage infrastructure
6. Determine the appropriate storage solution for a given scenario

### UNIT Introduction to Data Storage

(06 Hours)

- I** Data, Data Variety, Information, knowledge, Big Data, Data explosion, Storage, **Storage devices and its types**, Memory hierarchy, Secondary storage, tertiary storage. Storage architecture and its evolution, Data center, Components of Data center, Managing Data center.  
Introduction to Application workloads, DBMS, Compute, Memory Virtualization, Device Driver, Volume Manager, File System, Object storage, Block storage, Server Virtualization.

### UNIT File System and Storage System

(06 Hours)

- III** Local file system, Journaling, Snapshots, Network file systems, Principle, NAS, SAN, DAS.  
Case Study: DAFS, Shared Disk File System, GPFS, Comparison of FC SAN, FCoE SAN, iSCSI SAN and NAS. Scale up and scale out architectures.  
Protocols: SCSI, iSCSI, SC,FCoE, CIFS vs NFS

### UNIT I/O path and Storage Virtualization

(06 Hours)

- IV** Define Virtualization, define storage virtualization, I/O path, Physical channel, Elements in Physical I/O Path, software Layers of I/O Path, Software stack, I/O path virtualized, Demerits and need of storage virtualization, Virtualization entity, replaceable storage device, use of dynamic storage allocation, use of data migration, virtualization on block and file level, virtualization at network level, symmetric and asymmetric.

**UNIT Function and Network technologies (06 Hours)**

- V** Functions: Instant Copies, Remote Mirroring, consistency groups, LUN Masking, Availability of Disk Storage systems.  
Storage network: Transmission technique and protocol, SCSI and storage network, Fiber channel, Link, ports and Topology, IP storage, InfiniBand.

**UNIT Performance Monitoring and Management (06 Hours)**

- VI** Performance management: Why analyze performance, Capacity Management: capacity planning, I/O Capacity, SLA's, Reactive Style, Casually Observant, Actively Observant, Proactive style, Performance Lifecycle, Performance Hierarchy. Performance Metrics: IOPS, part of an I/O, Throughput, Latency, Utilization, understanding application workload.  
Tools: Linux performance commands: TOP, IOSTAT, SAR, IOMeter and Iozone.

**Assignments:**

**Note**

For internal Assessment of 10 Marks, students have to submit two assignments based on problems of different types of any programming assignment or theory assignment or any case study or quiz or Multiple Choice Questions etc.

The assignments are to be submitted as a hard copy.

**Reference Books**

- 1) Information Storage and Management, second edition, EMC education Services, John Wiley & Sons, Inc.
- 2)Storage Networks Explained, second edition, Ulf Troppens, Rainer erkens, Wolafka, haustein, Wolfgang, Wiley, SNIA.
- 3)Introduction to storage area networks and system networking, An IBM Redbooks Publication, Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel, Libor Miklas
- 4)The Design and Implementation of a Robust-storage-system Architecture, Robert C. Good, University of Waterloo, 1995,

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## PROGRAMMING LAB- IV

**TEACHING SCHEME:**

Practical: 4 Hours / Week

**EXAMINATION SCHEME:**

Term Work (Practical): 50 Marks

**CREDITS  
ALLOTTED:**

Credits: 02 Credits

**Course Pre-requisites:**

1. Students are expected to have some rudimentary knowledge of computer networking in general and a working knowledge of system programming in C/C++ under Unix/Linux.

**Course Objectives:**

1. To understand inter-process and inter-system communication.
2. To understand socket programming in its entirety.
3. To understand usage of TCP/UDP / Raw sockets.

**Course Outcomes:** After completion of course, students will able to:

1. Outline the fundamentals of Unix environment.
2. State Process handling.
3. Recite Inter-Process Communication
4. Implement Unix Socket Programming.
5. Infer fundamental concepts of Shell Programming.
6. Implementation of shell meta-characters.

**UNIT Overview of Unix OS**

**I** UNIX Architecture, UNIX Standardization, Files and Directories, Unix Installation, Input and Output, Programs and Processes, Error Handling, Logging in, User Identification, System Calls and Library Functions, Signals & Time Values **(06 Hours)**

**UNIT Process Environment**

**II** Process Identifiers, Fork Function, Vfork Function, Exit Functions, Wait and Waitpid Functions, Waitid Function, Wait3 and Wait4 Functions, Process Accounting, User Identification, Terminal Logins, Network Logins, Process Groups, Sessions, Introduction of Daemon Processes. Performance Monitoring Tools: Process Status (ps), Top, Xosview, Treeps. **(06 Hours)**

**UNIT Inter-process Communication**

**III** System V IPC. Message Passing: Pipes and FIFOs, Message Queues: System V, Synchronization: Mutexes and Condition Variables, Read-Write Locks, Record Locking, System V Semaphores, System V Shared memory. **(06 Hours)**

**UNIT Network IPC: Sockets**

**IV** Introduction, Socket Descriptors, Addressing, Connection Establishment, Transport Layer, Socket Introduction, TCP Sockets, UDP Sockets, Raw Sockets, Socket Options, I/O Multiplexing, Name and Address Conversions. **(06 Hours)**

**UNIT Introduction to Unix Shell Programming**

**V** Types of Shells, Interactive Shell Scripts, Shell variables, Shell keywords, Positional Parameters, Command line arguments, shell script Arithmetic, Control Instructions, Loop control structure. Shell Metacharacters: Filename Substitution Metacharacters, I/O Redirection, **(06 Hours)**

Process execution, Conditional execution using && and ||, Quoting metacharacters, Special Parameters, Debugging a Script \$\* and S@

**UNIT    Unix Network Tools**

**(06 Hours)**

- VI**    Unix Network Commands related to Connectivity, network interface commands, Routing, Arp, NFS/NIS etc.  
Windows power shell: purpose of PowerShell, Windows management framework, cmdlets and understanding syntax.

**Term Work:**

The sample practical assignments are given below. This can be used as a guideline and course coordinator can recommend the list of practical assignments.

1. Introduction to Unix commands using vi editor.
2. Implementation of Unix System calls
3. Write a program to implement message passing using Pipes and FIFOs.
4. Write a program to implement synchronization using semaphores.
- 5 Write a program to implement synchronization using Mutex variable.
- 6 Write a program to implement client-server communication using TCP sockets.
7. Write a program to implement client-server communication using UDP sockets.
8. Write a program to implement client-server communication using Raw sockets.
9. Write a shell script to pass command line arguments.
10. Write a shell script using metacharacters for I/O redirection.

**Reference books**

1. W. Richard Stevens, Stephen A. Rago, “Advanced Programming in Unix Environment”,3<sup>rd</sup> Edition, Addison-Wesley Professional.
2. W. Richard Stevens “UNIX Network Programming-Interprocess communication”, Volume 2, Second Edition, Prentice Hall Publication.
3. “UNIX Network Programming: The Sockets Networking Api”, Volume 1, 3rd Edition, Addison-Wesley Professional Computing.

**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (Computer) – SEM VII – 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
1	Distributed Systems	3		1	60	20	10	10	--	--	100	3	--	3
2	Network Security and Cryptography	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Big Data Analytics and Architecture	3		--	60	20	10	10	--	--	100	3	--	3
4	Compiler Design	3		--	60	20	10	10	--	--	100	3	--	3
5	Elective III	3		--	60	20	10	10	--	--	100	3	--	3
6	Programming Lab - V	--	2	--	--	--	--	-	50	--	50	--	1	1
7	*Industrial Training	--		--	--	--	--	--	--	50	50	--	3	3
8	*Seminar	--	2		--	--	--	-	--	50	50	-	1	1
9	*Project Stage- I	--	8		--	--	--	-	--	50	50	-	4	4
	<b>TOTAL</b>	<b>15</b>	<b>14</b>	<b>1</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>750</b>	<b>15</b>	<b>10</b>	<b>25</b>

**Elective -III:** a) Grid Computing b) VLSI and Embedded System c) Artificial Intelligence and Robotics d) Ad-Hoc and Sensor Networks



**BHARATI VIDYAPEETH UNIVERSITY, PUNE**

**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (Computer) – SEM VIII– 2014 Course**

Sr.no	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits		
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	TW	Total
						Unit Test	Attendance	Assignments						
10	Machine Learning	3	2	1	60	20	10	10	--	50	150	4	1	5
11	Image Processing and Pattern Recognition	3	2	--	60	20	10	10	50	--	150	3	1	4
12	Elective -IV	3	2	--	60	20	10	10	50	--	150	3	1	4
13	Data Mining and Knowledge Discovery	3	2	--	60	20	10	10	50	--	150	3	1	4
14	*Project Stage - II		16	--	--	--	--	--	--	150	150	--	8	8
	<b>TOTAL</b>	<b>12</b>	<b>24</b>	<b>1</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>150</b>	<b>200</b>	<b>750</b>	<b>13</b>	<b>12</b>	<b>25</b>

**Elective - IV:** a) Mobile Computing b) Design Patterns c) Network Management System d) Parallel and Distributed Computing

**Total Credits**

**Semester - VII = 25**

**Semester –VIII = 25**

**Grand Total = 50**

# Distributed Systems

## TEACHING SCHEME:

Theory: 3 Hours / Week

## EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

## CREDITS ALLOTTED:

Theory: 03

## Course Pre-requisites:

Data Structures, Operating System, Computer Networking.

## Course Objectives:

1. Understand foundation of distributed system
2. Introduce the idea of peer to peer services and file system
3. Understand in detail the system level and support required for distributed system
4. Understand the issues involved in studying process and resource management

## Course Outcomes: Upon completion of the course student will able to

1. Discuss trends in distributed Systems.
2. Apply network virtualization.
3. Apply remote method interaction and objects.
4. Design process and resource management systems

**UNIT - I Introduction:**

**(6 Hours)**

Need of Distributed system(DS), Examples of Distributed Systems, Pros and Cons of distributed System, models of DS, Trends in Distributed Systems ,focus on resource sharing, challenges, case study world wide web, System model , Inter process communication, The API for internet protocols, External data representation and multicast communication network, Virtualization, Overlay networks.

**UNIT - II      Communication in Distributed System :      (6 Hours)**

Case study MPUI remote method Invocation and object : Remote invocation and object : Remote invocation introduction, request reply protocols, remote procedure call, remote method invocation, case study java RMI group communication, publish, subscribe system message queues, shared memory approaches. Distributed objects case study Enterprise java beans from objects to components.

**UNIT - III      Peer to peer services and file system:      (6 Hours)**

peer to peer system introduction, napster and its legacy peer to peer systems middleware routing overlays case studies: pastry , japestry, distributed file system introduction file service architecture Andrew file system file system features file model file accessing models file sharing semantics Naming identifiers, address Name resolution, Name space Implementation, name cache LDAP.

**UNIT - IV      Synchronization and replication:      (6 Hours)**

Introduction, clocks, events and process states, synchronizing physical clock, logical time and logical clocks, global states, coordination and agreement, Introduction of distributed mutual exclusion, elections transactions and concurrency control, nested transactions, locks, optimistic concurrency control, time stamp ordering, atomic commit

protocols, distributed deadlocks, Replication , Case study CODA.

**UNIT - V Process and resource management: (6 Hours)**

Process management, process migration, features, mechanism, Threads, models, issues, implementation resource management, introduction, features of scheduling algorithms, task assignment approach, load balancing approach, load sharing approach.

**UNIT - VI Security: (6 Hours)**

Main threads and techniques for ensuring security (secure channels, firewalls) Fault tolerance and availability (passive /active replication, gossip architectures) application. Pervasive computing environments: active office, home and city, mobility and location- tracking etc.

**Assignment:**

1. Study of design and implementation issues of Distributed System.
2. Demonstrate the Mutual Exclusion and Deadlock detection of any Distributed System.
3. Study of CORBA RMI and CORBA-SERVICES.
4. Design and implementation issues of Distributed Shared Memory (DSM).
- 5.Design and implementation of any scheduling algorithm of any new DS
6. Study of Security aspects in Distributed System.
7. Case Study NFS and AFS.
8. Study of process management in CODA.
- 9.Case study : applications of pervasive Computing
10. Study of recourse management in Amoeba.

**Text books:**

1. George Coulouris, Jean Dolimore and Jim Kindberg “Distributed Systems Concepts and Design” fifth edition, Pearson education, 2012.
2. Pradeep K Sinha, “Distributed Operating Systems Concept and Design” Prentice Hall of India .

3. Tanenbaum A.S., Van Steen M “.Distributed Systems, Principles and Paradigms.” Pearson education 2007.

**References:**

1. Liu M. L. “ Distributed Computing Principles and Applications,” Pearson Education 2004.
2. Nancy A. Lynch, “Distributed Algorithms” Morgan Kaufman publishers USA.
3. Speciner, Kaufman and Perlman, “Network Security” Pearson Education 2009.

## Network Security and Cryptography

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 2 Hours / Week	Internal Assessment: 40 Marks	TW & Practical: 01
	Term Work & Practical: 50 Marks	

**Course Pre-requisites:**

Basic knowledge of computer network.

**Course Objectives:**

- 1 To understand basics of cryptography, how it has evolved, and some key encryption techniques.
- 2 To learn security policies such as authentication, integrity and confidentiality.

**Course Outcomes: Upon completion of the course student will able to**

- 1 Understand the basics of network security
- 2 Learn different techniques of cryptography
- 3 Discuss details of key and certificate management
- 4 Learn about system security
- 5 Recite Network and Transport Layer security
- 6 Apply knowledge of network security and cryptography in real life

UNIT - I      **Introduction to network security:**      **(6 Hours)**  
Goals of security, Threat scenarios, Types of attacks: Denial of service, Non-repudiation, Principles of security, A Model for

Network Security, Security approaches and policies, Authentication, Authorization and Accounting, Physical and logical access control, User authentication, Biometrics devices, Security services and mechanisms, Privacy and data protection, Cyber laws.

**UNIT - II      Symmetric and Asymmetric key cryptography:      (6 Hours)**

Symmetric and Asymmetric key cryptography:-Plain Text and Cipher Text, Substitution techniques, Transposition Techniques, Encryption and Decryption, Data Encryption standards, Block Cipher Design Principles ,Advanced Encryption Standards, RC4/RC5 algorithm, IDEA, RSA, Blowfish, S-Box theory, ElGamal Cryptosystem. Steganography, COMSEC, TRANSEC.

**UNIT - III      Key and Certificate Management      (6 Hours)**

Hash Functions, Digital Signatures, Digital Certificates, Knapsack Algorithm, Certificate & DDOS-Distributed Dos based authentication, Smart Cards, PKIX model, PKI components and Applications, LDAP protocol, Creating Digital certificates using Java, DNS certificates, Key agreement protocols: STS protocol, Diffie-Hellman Key Exchange

**UNIT - IV      System Security:      (6 Hours)**

Secure Socket Layer, Secure Electronic Transaction, 3-D Secure protocol, Secure HTTP, Time stamping protocol, Email Security, SMTP, PEM, PGP, Wireless Application protocol, Authentication applications- X.509, Kerberos. Key Distribution Centre, Single Sign ON approaches, Security in GSM and 3G.

**UNIT - V      Security in Network and Transport Layer:      (6 Hours)**

ICMP redirect hazard, ARP hazard, secures network infrastructure services: DNS, NTP, SNMP, Secure RSVP, TCP/IP protocol Suite, IP Security-IP security services, Security Associations. IPv4/IPv6 encapsulation header, IKE protocol,

Point to Point Tunneling Protocol, Layer 2 Tunneling Protocol, Replay Attacks, Encapsulating Security Payloads, Data Compression Using Zip.

**UNIT - VI Network Security Practices:**

**(6 Hours)**

Types of firewalls, Firewall Configurations and Implementation, Firewall forensic, Firewall services and limitations, Network address Translation (NAT), DMZ networks, Source masking and hidden channels, VPN Architecture, Intruders, Intrusion Detection, Network based and host based Intrusion Prevention System, Intrusion Detection tools, Architecture for Distributed Intrusion Detection, System Integrity Verifiers, Log File Monitors, Honeypots.

**Term Work:**

1. Introduction to Cryptography based Security Tools.
2. Write a Program in C/Java to implement symmetric encryption.
3. Write a Program in C/Java to implement asymmetric encryption.
4. Introduction to GnuPG encryption system.
5. Implementation of Decryption techniques using secret key in GnuPG.
6. Implementation of various cryptographic algorithms using HashCalc.
7. Study of how Firewall works in computing.
8. Study of how Antivirus works according to offline or online mode.
9. Implement mini project to develop antivirus application.
10. Case study on cyber security

**Assignments:**

1. Introduction to security and types of attacks.
2. Discuss Security approaches and policies.
3. Study of any one Symmetric key cryptography algorithm.
4. Explain any one Asymmetric key cryptography algorithm.
5. Explain the concept of digital certificates.
6. Explain email security and its security protocols.
7. Study of Key agreement protocols
8. Discuss system level security
9. Study of various protocols in network security

## 10. Study of network security practices

### **Text books:**

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGrawHill
2. William Stallings, “Cryptography and Network Security”, Pearson Education.

### **References:**

1. Bruce Schneier ,“Applied Cryptography-Protocols, Algorithms, and Source Code in C”.
2. William R. Cheswick. Steven M. Bellovin, Aviel D. Rubin, Addison-Wesley. “*Firewalls and Internet Security, Repelling the Wily Hacker*”.
3. J.W. Rittiaghouse and William M.Hancok – Elseviers. “Cyber Security Operations Handbook”.
4. Menezes, van Oorschot and Vanstone, “*Handbook of Applied Cryptography*”.

### **Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT – III

Unit Test -2

UNIT – IV, UNIT – V, UNIT – VI

## **Big Data Analytics and Architecture**

### **TEACHING SCHEME:**

Theory: 3 Hours / Week

### **EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

### **CREDITS ALLOTTED:**

Theory: 03

### **Course Pre-requisites:**

Knowledge on Database Management System, Distributed Computing, Data Mining, File



System, Statistics.

**Course Objectives:**

This course focuses on the basic concepts of big data, methodologies for analyzing structured and unstructured data using Hadoop & R.

**Course Outcomes: Upon completion of the course student will able to**

- 1 To outline the Big Data fundamentals and various data challenges getting introduced.
- 2 To accurately and objectively examine, and critically investigate Big Data Technologies and Infrastructure concepts, theories.
- 3 To apply the novel architectures and platforms introduced for Big data, in particular Hadoop and MapReduce.
- 4 Being able to describe and apply the Data Analytics lifecycle to Big Data projects
- 5 To analyze methods and algorithms with respect to data and application requirements, and make appropriate design choices when solving real-world problems.
- 6 To Understand and apply secured policy oriented techniques for solving real-world problems.

**UNIT - I Introduction to Big Data:**

**(6 Hours)**

Types of Data, Characteristics of big data Information, Phases: capture, organize, integrate, analyze, and act, Defining Structured Data, exploring sources of big structured data, Understanding the role of relational databases in big data, Defining Unstructured Data, exploring sources of unstructured data, Understanding the role of a CMS in big data management, Integrating data types into a big data environment.

**UNIT - II      Statistics & Analytics:      (6 Hours)**

Numerical Data, Summary Statistics, Sampling and Confidence Intervals, From Population to Sampled Data, Different Types of Biases, Probability, Statistical Inference, Conditional Probability and Bayes Rule, Random Variables, Linear Regression, Bayesian Modeling, , Text Analytics, Characteristics of big data analysis, Linear Models, Decision trees, Neural Networks,

**UNIT - III      Predictive Analysis Process and R:**

Data Analytics Lifecycle, Discovery, Data Preparation, Model Planning, Model Building, communicate results, Operationalize, Building a Predictive model.

Introduction to R, R graphical User Interfaces, Data import and Export, Dirty Data, Data Analysis, Statistical Methods for Evaluation, Linear regression with R, Clustering with R hypotheses testing.

**UNIT - IV      Big Data Storage and Computing Platforms:      (6 Hours)**

Distributed computing for big data, the changing economics of computing, the problem with latency, Demand meets solutions, Physical infrastructure layer, Big Data Stack, Layer 0: Redundant Physical Infrastructure, Layer 1: Security Infrastructure, Layer 2: Operational Databases, Layer 3: Organizing Data Services and Tools, Layer 4: Analytical Data Warehouses, virtualization in big data, Traditional RDBMS, NoSQL, Design Goals for MongoDB

**UNIT - V      Hadoop:      (6 Hours)**

The Core of Hadoop: MapReduce, Hadoop's Lower Levels: HDFS and MapReduce, Improving Programmability: Pig and Hive, Common

building blocks, Key/value pairs, Getting your data into Hadoop, Other Hadoop Components, Hadoop in action.

**UNIT - VI Case Studies and Data Privacy:**

**(6 Hours)**

Defining Privacy and Security, Data and User Anonymization Fraud and Big Data, Risk and Big data, Credit Risk Management, Big Data & Algorithm Trading, Advertising and Big Data, The Privacy Landscape, Rights and Responsibilities, Case Study: Recommendation Engine, Sentiment Analysis and Digital Marketing, Healthcare applications.

**Assignment:**

1. Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.
2. Case study on Resilient Distributed Datasets.
3. Case study on Big Data Analytics with Hadoop.
4. Case study on Big Data Analytics with Spark.
5. Case study on how data analytics stacks work and the factors influencing their performance.
6. Discuss in brief the Association analysis.
7. Prepare a case study on Deep Analysis.
8. Illustrate how WEKA can be used for big data Analysis
9. Illustrate and setup a single node Hadoop cluster.
10. Illustrate the best practices for setting-up and using Hadoop.

**Text books:**

Vignesh Prajapati, "Big Data Analytics with R and Hadoop," Packt Publishing Ltd, 2013,

**References:**

1. John Wiley & Sons, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, 2015, 1118876059, 9781118876053
2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global, 2014, 1466658657, 9781466658653,
3. Wiley CIO, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley & Sons, " Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 2012, 1118239156, 9781118239155

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Compiler Design

**TEACHING SCHEME:**

Theory: 3 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
Internal Assessment: 40 Marks

**CREDITS ALLOTTED:**

Theory: 03

**Course Pre-requisites:**

1. The students should have learnt Theory of Computation.
2. Basic of the structure of any Programming Language and Grammars.
3. Know the basics of Computer organization and Assembly Language Programming.

**Course Objectives:**

1. To study the Compiler Design Tools.
2. To understand the Compiler for various Programming Languages.

**Course Outcomes: Upon completion of the course student will able to**

1. To have knowledge of LEX and YACC Tools.
2. The students will have the knowledge of Lexical Analysis and formation of TOKENS.
3. Understand Parser and its various techniques.
4. Understand Syntax Directed Translation Scheme
5. Understand the use of Hash Tables and Symbol Tables.
6. Learn the techniques of Code Optimization

**UNIT - I      The Phases of a Compiler:**

**(6 Hours)**

Translator issues, why to write Compiler, Compilation process in brief, Frontend and Backend Model, Compiler Construction tools, Interpreter and the related issues, Cross Compiler, Incremental Compiler, Boot Strapping, Byte code Compilers.

**Lexical Analysis:** The role of Lexical Analyzer, Input Buffering, Specification of tokens, recognition of tokens, and language for specifying Lexical Analysis alphabet, Token, Lexical error, Block schematic of Lexical Analyzer, "Automatic Construction of Lexical Analyzer-(LEX), LEX Specification and Features. Pattern Matching Algorithms and their Optimization, use of LEX.

**UNIT - II      Syntax Analysis Introduction:**

**(6 Hours)**

Role of Parsers, Review of Context Free Grammar for Syntax Analysis. Top down-RD parser, Predictive parsers, LL (k) parsers, Bottom up Parsers - Operator Precedence Parsers, Shift-Reduce: SLR, LR (k),

LALR etc. using Ambiguous Grammars. Error Detection and Recovery, Automatic Construction of Parsers (YACC), YACC specifications. Canonical LR parsers, handling of ambiguous grammars, Error Reporting in LL (1), Operator Precedence and LR Parsing, Efficient Generation of LALR (1) sets, Optimization of LR parsers, Optimization of transformations, Detection, Reporting, Recovery and Repair of errors in the Compilation Process.

Semantic Analysis Need of Semantic Analysis, Type Checking and type Conversion Overloading of Functions and Operators, Polymorphic Functions, Unification Algorithm.

**UNIT - III    Syntax Directed Translation:**

**(6 Hours)**

Syntax Directed Translation Schemes, Implementation of Syntax Directed Translators , Intermediate Code, Postfix Notation, Parse Trees and Syntax Trees, Three-Address code, Quadruples, and Triples, Translation of Assignment Statements, Boolean Expressions, Translation with a Top-Down Parser. Runtime Environment.

**UNIT - IV    Code Optimization:**

**(6 Hours)**

Basic blocks and folding, optimization within iterative loops, global optimization through flow graph analysis, Code-Improving Transformations, Machine Dependent Optimization

Introduction, Classification of optimization, Principle sources Of Optimization, optimization of basic blocks, Loops in flow graphs, Optimizing transformations: compile time evaluation, Common sub-expression elimination, variable propagation, code movement, strength reduction, dead code elimination and loop optimization, Local optimization, Global Optimization: Control and data flow analysis, Computing Global Data flow information: Meet over paths, Data flow equations, Data flow analysis, Iterative Data Flow Analysis: Available

expressions, Live Range Identification.

**UNIT - V      Code Generation Introduction:      (6 Hours)**

Intermediate languages, Translation of Declarations & Assignments statements. Design issues of a Code generator, Target machine, Runtime storage Management, Basic blocks and flow graphs. Issues in code generation, Target machine description, Basic blocks and flow graphs, next-use information, Register allocation and assignment, Dag representation of basic blocks, Peephole optimization, Generating code from a DAG, Dynamic programming, Semantic stacks, Attributed Translation, Analysis of syntax, Directed Translation, Evaluation of expressions, control structures, Procedure calls.

**UNIT - VI      Case Study of GCC:      (6 Hours)**

Architecture, Command Line Options for assembly, preprocessing and Intermediate tokens. Optimization Levels of GCC. GCC Help

**Assignment:**

1. Study LEX and YACC Tools.
2. Divide a 'C' Language Program into Tokens and design a Lexical Analyzer Program to display the list of tokens in it. Display Libraries used, functions and variables defined
3. Study Top down Parser.
4. Study Bottom up Parser.
5. Study Different Syntax Directed Translation Scheme.
6. Represent High Level Language Instruction in the form of 3 address Code, Quadruples and Triples.
7. Study the different methods of Code Optimization.
8. Write a program to generate a Code for C Language Statements.
9. Study of GCC
10. Create a language translator from C to PHP.

**Text books:**

1. K. Cooper, L. Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers, ISBN 81-8147-369-8.
2. K. Louden, "Compiler Construction: Principles and Practice", Thomson Brookes/Cole (ISE), 2003, ISBN 981 - 243 - 694-4.
3. J. R. Levine, T. Mason, D. Brown, "Lex & Yacc", O'Reilly, 2000, ISBN 81-7366 -061-X.
4. S. Chattopadhyay, "Compiler Design", Prentice-Hall of India, 2005, ISBN 81-203-2725-X.
5. D. M. Dhamdhare, "Compiler Construction—Principles and Practice", (2/e), Macmillan India.
6. Andrew Appel, "Modern Compiler Implementation in C", Cambridge University press.
7. K C. Louden "Compiler Construction—Principles and Practice" India Edition, CENGAGE.
8. Bennett J.P., "Introduction to Compiling Techniques", 2/e (TMH).

**References:**

1. A V Aho, R. Sethi, J D Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Education, ISBN 81 - 7758 - 590 – 8.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Elective –III a):Grid Computing**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03

**Course Pre-requisites:**

Knowledge of distributed systems.



**Course Objectives:**

1. Understand how Grid computing helps in solving large scale scientific problems.
2. Learn how to program the grid.
3. Understand the security issues in the grid.

**Course Outcomes: Upon completion of the course student will able to**

1. Understand basic concepts grid computing with the help of case studies.
2. Understand basic architecture of grid.

**UNIT - I Introduction to the Grid:****(6 Hours)**

History and Evolution of Computing from Mainframe to Grid, Difference between Grid and Cloud Computing, Introduction to High Performance Computing and Distributed Computing, Definition of Grid, Characterization of the Grid, Architecture of the Grid, Types of Grids, Scope and Applications of Grid Computing Applications. Grid Computing Organizations and Their Roles: Developing Grid Standards & Best Practice Guidelines.

**UNIT - II Grid Services and Monitoring :****(6 Hours)**

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services. Grid Monitoring Architecture.

**UNIT - III Grid Development Toolkits:****(6 Hours)**

GlobusGT3 Toolkit :Architecture - Programming Model Implementation-

## High-Level Services

### **UNIT - IV Grid Scheduling and Resource Management: (6 Hours)**

Introduction, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF, Grid Scheduling with QoS.

### **UNIT - V Grid Security: (6 Hours)**

Introduction, Cryptography, Grid Security Infrastructure and Authorization Models, Possible Vulnerabilities.

### **UNIT - VI Grid Portals and Grid Applications: (6 Hours)**

Introduction, First and Second Generation of Grid Portals, GT3 Use Cases, Resource Management Case Studies, Grid Portal Use Cases.

### **Assignment:**

1. Case Studies on Grid Computing.
2. Case Studies on Performance Analysis.
3. Illustrate difference between Grid Computing & Cloud Computing.
4. Explain Grid Monitoring Architecture in detail.
5. Describe Scheduling Paradigms of Grid Computing.
6. Illustrate difference between Condor, SGE, PBS and LSF.
7. Explain Grid Security Infrastructure.
8. Describe Grid Services.
9. Case study of GlobusGT3 Toolkit.
10. Case study of Resource Management.

### **Text books:**

1. Joshy Joseph, and Craif Fellenstein, "Grid Computing", IBM Press, Pearson education, 2011.

2. Maozhen Li, Mark Baker, "The Grid: Core Technologies", ISBN: 978-0-470-09417-4.
3. Paul E. Ceruzzi, "A History of Modern Computing" Second Edition

**References:**

1. [Fran Berman](#), [Geoffrey Fox](#), Anthony J. G. Hey “Grid Computing: Making the Global Infrastructure a Reality”, John Wiley & Sons.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Elective –III b):VLSI and Embedded System**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03

**Course Pre-requisites:**

Digital Logic, Analog Circuits, Operating system, System Software, Computer Architecture and Organization, Basic Microprocessors, Theory of Computation, Discrete Mathematics.

**Course Objectives:**

To make students aware of basic embedded system architecture ,tools for developing embedded systems and to develop ARM programming model

**Course Outcomes: Upon completion of the course student will able to**

- 1 Understand the basic architecture of Embedded System.
- 2 Describe the various embedded system development tools
- 3 Develop a ARM programming model
- 4 Explain basic MOS transistor action
- 5 Analyze Combinational and Sequential Logic
- 6 Design Mealy and Moore state models using Verilog.

<b>UNIT - I</b>	<p><b>Introduction to Embedded Systems:</b>  Architecture of Embedded System, Design Methodology, Design Metrics, General Purpose Processor, System On chip. Embedded system design and development, Life-Cycle Models, Development tools. System design specifications Functional design, Architectural design, Prototyping.</p>	<b>(6 Hours)</b>
<b>UNIT - II</b>	<p><b>ARM Architecture:</b>  ARM Design Philosophy, Registers, PSR, Pipeline, Interrupts and Vector Table, Architecture Revision, ARM Processor Families ARM architectural support for operating System, Memory subsystem architecture, Designing a cache system, Memory allocation, Communication protocols.</p>	<b>(6 Hours)</b>
<b>UNIT - III</b>	<p><b>ARM Programming Model:</b>  Instruction Set: Data Processing Instructions, Branch, Load, Store Instructions, PSR Instructions, Conditional Instructions. Register Usage, Other Branch Instructions, Data Processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions ,Instruction Scheduling, Register Allocation, Conditional Execution and Loops.</p>	<b>(6 Hours)</b>
<b>UNIT - IV</b>	<p><b>Introduction to MOS Technology:</b>  Basic MOS Transistor action: Enhancement and Depletion Modes. Basic electrical properties of MOS, Threshold voltage and Body Effect. Design of MOS inverters with different loads, Basic Logic Gates with CMOS: INVERTER, NAND, NOR, AOI and OAI gates. Transmission gate logic circuits, Bi-CMOS inverter.</p>	<b>(6 Hours)</b>
<b>UNIT - V</b>	<p><b>Combinational Logic:</b>  Manchester, Carry select and Carry Skip adders, Crossbar and barrel shifters, Multiplexer.</p> <p><b>Sequential Logic:</b>  Design of Dynamic Register Element, Dynamic RAM Cell, Static RAM Cell.D flip flop using Transmission gates. NOR and NAND based ROM Memory Design.</p>	<b>(6 Hours)</b>
<b>UNIT - VI</b>	<p><b>Introduction to HDLs:</b>  Basic Concepts of Verilog, Data Types, System Tasks and Compiler Directives. Behavioural Modelling: Structured Procedures,</p>	<b>(6 Hours)</b>

Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks, Generate Blocks. Switch level Modelling.

Tasks, Functions, Procedural Continuous Assignments, Design of Mealy and Moore state models using Verilog.

**Assignment:**

1. Define Embedded system and explain it's architecture
2. Study various tools used in development of embedded systems
3. Analyze various memory allocation algorithms
4. Explain in detail ARM architecture
5. Study instruction set required for developing ARM programming model
6. Explain use of basic logic gates in designing a transmission circuit
7. Distinguish between combinational and Sequential logic
8. Explain in detail various types of flip-flops
9. Describe in detail concept of Verilog
10. Case study Embedded system

**Text books:**

1. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, 2008.
2. Michael D. Ciletti, "Advanced Digital Design with Verilog HDL", PHI, 2005.
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, "Essentials of VLSI circuits and Systems", PHI, 2011.
4. John P. Uyemura, "Introduction to VLSI Circuits and Systems", Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.
5. Steve Furber, "ARM System-on-Chip Architecture", Second Edition, Pearson Education Publication.
6. James K. Peckol, "Embedded Systems: A Contemporary Design Tool", WILEY Student Edition Publication.
7. Tammy Noergaard, "Embedded Systems Architecture", Elsevier Publication.

**References:**

1. "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", Ming-BO Lin, CRC Press, 2011.
2. "Principals of CMOS VLSI Design", N.H.E Weste, K. Eshraghian,, 2nd Ed., Addison Wesley.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

# Elective –III c):Artificial Intelligence and Robotics

## TEACHING SCHEME:

Theory: 3 Hours/Week

## EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Internal Assessment: 40 Marks

## CREDITS ALLOTTED:

Theory: 03

## Course Pre-requisites:

Data Structures, Algorithms, Discrete Mathematics,

## Course Objectives:

To make student aware of basics of Artificial Intelligence (AI), Knowledge representation methods, learning concept and basics of robotics

## Course Outcomes: Upon completion of the course student will able to

- 1 Understand the basic search algorithms
- 2 Describe the various knowledge representation strategies
- 3 Understand plan generation systems
- 4 Describe various learning methods
- 5 Understand basic robotics concepts
- 6 Understand kinematics of robot

## UNIT - I Introduction to AI and Production systems:

(6 Hours)

Definition, Problem formulation Control strategies ,Search strategies, Problem Characteristics, Production systems, Problem Solving methods,- Problem Graphs Indexing, Heuristic functions, Hill Climbing, Best First Search, Minimax Search for two player games Constraints Satisfaction,- Related algorithms, Performance measure and analysis of search algorithms

## UNIT - II Knowledge Representation:

(6 Hours)

Knowledge Representation using predicate logic, Predicate calculus, Resolution, Knowledge representation using predicate calculus Knowledge representation using other logic, Structured representation of knowledge. Production based systems, Frame based systems, Scripts, Conceptual dependency Forward and backward chaining, Rule value approach, Fuzzy

reasoning., Bayesian theory

<b>UNIT - III</b>	<b>Planning:</b> Basic plan generation systems, Components of planning system Advanced, Strips plan generation systems, K-strips strategic explanation Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world	<b>(6 Hours)</b>
<b>UNIT - IV</b>	<b>Learning:</b> Learning concept, Supervised and unsupervised learning, Learning from observation - Inductive learning – Decision trees – Explanation based learning – Statistical Learning methods - Reinforcement Learning	<b>(6 Hours)</b>
<b>UNIT - V</b>	<b>Robotics an Application of AI :</b> Brief history, types, classification and usage, Science and Technology of robots, Elements of robots -- joints, links, actuators, and sensors Position and orientation of a rigid body, Homogeneous transformations, Representation of joints, link representation using D-H parameters,	<b>(6 Hours)</b>
<b>UNIT - VI</b>	<b>Kinematics of Robots:</b> Kinematics of serial robots, Mass and inertia of links, Lagrangian formulation for equations of motion for serial and parallel manipulators, Generation of symbolic equations of motion using a computer, Simulation Kinematics of parallel robots Dynamics of serial and parallel robots , Modeling and analysis of wheeled mobile robots	<b>(6 Hours)</b>

**Assignment:**

1. Analyze various search algorithms.
2. Illustrate different knowledge representation strategies with example.
3. Explain in detail Bayesian theory.
4. Describe in detail components of planning system.
5. Describe in detail planning and acting in the real world.
6. Case study learning.
7. Explain in detail the basics of robotics.
8. Describe in detail link representation using DH parameters.
9. Describe in detail kinematics of robotic.
10. Case study robotics.

**Text books:**

1. Stuart Russel and Peter Nurving, “AI-A Modern Approach”, 2nd Edition, Pearson Education.

2. Peter Jakson, ' Introduction to expert systems",3 rd Edition ,Pearson Education,2007
3. Ashitava Ghoshal "Robotics:Fundamental Concepts and Analysis", Oxford University Press,Second reprint, May 2008.
4. Deepak Khemani , "Artifitial Intelligence", Tata Mc Graw Hill Education ,2013

**References:**

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence :a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

**Syllabus for Unit Test:**

- |              |                                 |
|--------------|---------------------------------|
| Unit Test -1 | UNIT – I, UNIT – II, UNIT - III |
| Unit Test -2 | UNIT – IV, UNIT – V, UNIT - VI  |

## **Elective – III d): Ad-Hoc and Sensor Networks**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03

**Course Pre-requisites:**

1. Knowledge of Internet and its working, types of networks.

**Course Objectives:**

1. Create awareness among the students about the basic fundamentals of Ad-Hoc and Sensor networks.
2. Developing the students with the knowledge of updated networking technology.

**Course Outcomes: Upon completion of the course student will able to**

1. Understand the basics of ad hoc and sensor networks.
2. Understand the communication mechanism of Ad-Hoc & sensor networks.
3. Learning different routing protocols in Ad-Hoc & sensor networks.
4. Discuss the importance of security in Ad-Hoc & sensor networks.
5. Apply the knowledge about quality of service to Ad-Hoc networks.
6. Learning the structure of Ad-Hoc & Sensor networks by considering real life applications.



<b>UNIT - I</b>	<b>Introduction:</b> Basics of Ad Hoc and Sensor networks, Need of Ad-hoc networks, Types of Ad-hoc networks, Ad-hoc network architectures, Need of sensor networks, Types of sensor networks, Combined approach: Architectures of Ad-hoc & Sensor networks, Working of Ad-hoc & Sensor networks.	<b>(6 Hours)</b>
<b>UNIT - II</b>	<b>Communication in Ad-hoc &amp; Sensor Networks:</b> Wireless communication technology, information transport through electromagnetic spectrum, role of radio waves in wireless networks, wireless channels, wired channels, internet working, Ad-hoc and Sensor network connections, requirement for Ad-Hoc and sensor network connectivity, wireless LAN configuration, multichannel MAC, IEEE 802.11 standards.	<b>(6 Hours)</b>
<b>UNIT - III</b>	<b>Ad-Hoc &amp; Sensor Network Protocols:</b> TCP/IP in Ad-hoc networks, MAC protocols: Ad-hoc networks, sensor networks, Routing Protocols: Ad-hoc networks, multicast routing protocols: an architecture reference model for multicast routing protocols, classifications of multicast routing protocols, comparisons of multicast routing protocols.	<b>(6 Hours)</b>
<b>UNIT - IV</b>	<b>Security in Ad-hoc and Sensor Networks:</b> Need of security in Ad-hoc and sensor network , role of transport layer in ad-hoc and sensor networks, architecture of security layer in Ad-hoc networks, transport layer security protocols, TCP over Ad-hoc wireless networks, security in sensor networks, network security requirements, issues and challenges in security provisioning, network security attacks , secure routing in Ad-hoc and wireless sensor networks, issues in designing a transport layer protocol for Ad-hoc and sensor networks, real life example to understand need of security in Ad-hoc and sensor networks.	<b>(6 Hours)</b>
<b>UNIT - V</b>	<b>QoS and Energy Management :</b> Classifications of QoS Solutions: MAC Layer, Network Layer, Security, QoS Frameworks for Ad hoc Wireless Networks, energy management in Ad-hoc wireless networks, different schemes, types of energy resources, transmission power management schemes, system power management schemes, energy efficiency and utilization schemes in Ad-hoc and Sensor networks, issues and challenges in providing QoS in Ad-hoc and sensor Networks.	<b>(6 Hours)</b>

## UNIT - VI Applications of Ad-hoc and Sensor Networks:

(6 Hours)

Mobile Ad-Hoc Network (MANET), Wireless Sensor Networks (WSNs), role and applications of Ad-hoc and Sensor networks in Internet of Things, Ad-hoc and sensor network approach: Zigbee, Raspberry pi, Arduino, Wi-Fi modems, Real life examples of Ad-hoc & Sensor networks, Case studies of Ad-hoc and sensor networks.

### Assignment:

1. Explain working of Ad-Hoc networks with considering real life example.
2. Explain working of Wireless Sensor networks with real life example.
3. Explain working of MAC protocol with real life example.
4. Explain different IEEE 802.11 standards.
5. Problems based on Ad-hoc routing/ multicast routing protocols.
6. Program code in C/Java/ other to implement any functionality of Ad-hoc and sensor networks.
7. Explain role of transport layer in Ad-hoc networks.
8. Research proposal of mini project to establish own Ad-hoc & Sensor networks.
9. How the QoS can be maintained while establishing Ad-hoc & Sensor networks.
10. Case study of Ad-hoc & Sensor networks.

### Text Books:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. [Adrian McEwen](#), [Hakim Cassimally](#) "Designing the Internet of Things", WILEY, 2013.

### References:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", ISBN: 978-81-7596-792-2 Cambridge University Press India Pvt. Ltd.
3. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall
4. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000
5. [Erdal Cayirci](#), [Chunming Rong](#), "Security in Wireless Ad Hoc and Sensor Networks", WILEY, 2009.

### Syllabus for Unit Test:

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

# Programming Lab- V

## TEACHING SCHEME:

Practical: 2 Hours / Week

## EXAMINATION SCHEME:

Term Work & Practical: 50 Marks

## CREDITS ALLOTTED:

TW & Practical: 01

## Course Pre-requisites:

If students have any programming experience at all, he should be able to pick up the general R syntax quite easily.

## Course Objectives:

To develop ability to use the computational languages necessary for engineering practice

To provide hands- on experience of the recent platform, technologies and design methodologies used in developing applications.

## Course Outcomes: Upon completion of the course student will able to

1. Recite R language fundamentals and basic syntax
2. Demonstrate how R is used to perform data analysis
3. Recite major R data structures
4. Illustrate visualizations using R
5. Implement various functions using R studio.
6. Design different Statistical models.

<b>UNIT - I</b>	<b>Understanding Big Data and R basics:</b>	<b>(6 Hours)</b>
	Evolution of R, Features of R, Local Environment Setup, R Command Prompt, R Script File, Comments, R –Data Types, R –Variables, Types of Operators, the alternatives to R.	
<b>UNIT - II</b>	<b>Data structures in R:</b>	<b>(6 Hours)</b>
	Vectors, Vectors and assignment, Vector arithmetic, Generating regular sequences, Character vectors, Index vectors, Lists: Constructing and modifying lists, Matrices ,Arrays, Factors: Ordered and unordered factors, Data Frames: Making data frames, Working with data frames	
<b>UNIT - III</b>	<b>R programming fundamentals:</b>	<b>(6 Hours)</b>
	Conditions and loops, R Programming, R -If Statement, R –If...Else Statement, The if...else if...else Statement, R –Switch Statement, R -Repeat Loop, R-While Loop, R –For Loop, Loop Control Statements, Functions in R, Built-in Function, User-defined Function, Calling a Function, Objects and Classes, Debugging.	
<b>UNIT - IV</b>	<b>Working with data in R:</b>	<b>(6 Hours)</b>
	Getting and Setting the Working Directory, Reading data from files (CSV, EXCEL), The read. table() function, The scan() function, Accessing built-in datasets, , Reading text files, Reading XML File, XML to Data Frame,R-JSON file, JSON to a Data Frame Writing and saving data objects to file in R.	
<b>UNIT - V</b>	<b>Strings and Dates in R:</b>	<b>(6 Hours)</b>
	String operations in R:String Manipulation, Concatenating Strings -paste()	

function, Extracting parts of a string, Regular Expressions, Dates in R, R – Pie Charts, 3D Pie Chart , R-bar chart, Group Bar Chart and Stacked Bar Chart, use of functions ggplot & ggplot2

**UNIT - VI Statistical models in R:**

**(6 Hours)**

Defining statistical models; formulae, Linear models, Generic functions for extracting model information, Analysis of variance and model comparison, ANOVA tables, Updating fitted models, Generalized linear models, Graphical procedures, OS facilities, Research and industry Applications of R .

**Term Work:**

1. Introduction to Big Data Analytics.
2. Assignment based on Looping.
3. String Handling.
4. Storing and Retrieving Data Using Vectors and Data frames
5. Class and object using R.
6. Create Relationship Model & Get The Coefficients
7. Case studies: Perform regression analysis on existing datasets.
8. Plot The Pie Chart With Title And Rainbow Colour Pallet.
9. Reading And Writing Excel CSV Text Files
10. Subject Teacher should take one Mini Project in the group of 2 students based on above syllabus.

**Text books:**

1. The R Book, by Michael J Crawley 2nd Edition, wiley
2. Hands-On Programming with R: Write Your Own Functions and Simulations by Garrett Grolemond
3. Beginning R: the Statistical Programming Language, wiley

**References:**

1. "Using R for Numerical Analysis in Science and Engineering", Chapman & Hall/CRC, 2014, Victor A,Bloomfield.

# Industrial Training

**TEACHING SCHEME:**

**EXAMINATION SCHEME:**

**CREDITS ALLOTTED:**

End Semester Examination: 50 Marks

Term Work & Oral: 03

**Course Pre-requisites:**

Professional Skills, Knowledge of core computer engineering subjects.

**Course Objectives:**

- To provide exposure for the students on practical engineering fields
- To have better understanding of engineering practice in general and a sense of frequent possible problems.
- To develop problem Identification abilities in real world
- To experience use of technology /tools for software development.
- To Identify their skills, values, beliefs, interests and personal abilities to develop the skills.
- To prepare and present a report.

**Course Outcomes: Upon completion of the course student will able to**

- I. Propose a solution to solve real world problems with the help of technology.
- II. Apply software engineering principles.

- III. Evaluate and compare the various methodologies to solve a real world problem.
- IV. Report hands on experience of using modern software development tools.
- V. Assess their skills, values, beliefs, interests and personal abilities and act in congruence with them.
- VI. Identify social and ethical responsibilities and develop skills to compete for lifelong learning.

As a part of the B.Tech Computer Engineering curriculum, Industrial Training is a Practical course, which the students B.Tech Computer Engineering should undergo in reputed Private / Public Sector / Government organization / companies as industrial training of 45 days weeks to be undergone by the student in the summer vacation after the semester VI. Examination. And Oral examination will be conducted at the end of the semester VII.

The Industrial Training Report:

An Industrial Training report should be prepared by each student.. The report is expected to demonstrate development of practical and professional skills in Engineering through technical experience and application of theoretical knowledge. Development of skills in dealing with people, and communication skills form part of the training experience. Students should seek advice from their employers to ensure that no confidential material is included into the report. The student should be able to present the report to prospective employers,

The following should be observed:

- i. Length of training
- ii. Preliminary information
- iii. Technical report/diary References should be made in the text to books, technical papers, standards etc., used during the training period and should be listed.
- iv. Finally, a conclusion should include comprehensive comments on the type and value of experience gained, and how this relates to your professional career.
- v. A copy of the report should be submitted to his/her employer, another copy to the Department (through the respective Adviser). Students should also retain a personal copy of the report.

# Seminar

## TEACHING SCHEME:

Practical: 2 Hours / Week

## EXAMINATION SCHEME:

End Semester Examination: 50 Marks

## CREDITS ALLOTTED

Term Work & Oral: 01

## Course Pre-requisites:

Basics of Software engineering, Knowledge of core computer engineering subjects.

## Course Objectives:

- To develop problem Identification abilities in real world.
- To study the use of technology for societal benefits.
- To acquire the knowledge of intellectual topics in computer engineering.
- To prepare and present a document .

## Course Outcomes: Upon completion of the course student will able to

- I. Describe the broader trends of technological growth in the computer, engineering fields.
- II. Interpret that technology has profound impact as a trigger for global change.
- III. Develop skills to explore intellectual topics in computer engineering.
- IV. Develop better skills to succeed in the career.



v. Understand the responsibility and the of ethics as an engineer

The student has to prepare for the seminar presentation and present it before the group of students It is recommended that a student should meet the guide regularly during the course of the seminar.

The following are the guidelines for the seminar:

- He /She can select a paper from his/her area of interest.
- Recent research papers from any reputed journals like Springer/ACM/IEEE can be selected.
- After selecting the paper, the student has to get approval from the concerned faculty In charge /Seminar guide.
- Students are required to acquire a thorough knowledge on the subject by referring back papers and reference books.
- The student has to prepare a MS power point Preparation of slides and present it in front of group of students from the same class in presence of seminar guide followed by question answer session
- He /She have to write a comprehensive report about the seminar at the end of the semester.

The term work can be assessed based on selection of topic, decorum, communication skill, preparation of presentations/slide and seminar report.

## Project Stage-I

### TEACHING SCHEME:

Practical: 8 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 50 Marks

### CREDITS ALLOTTED:

TermWork&Oral: 03

### Course Pre-requisites:

Basics of Software engineering, Software testing and knowledge of core computer engineering subjects.

### Course Objectives:

- To develop problem solving abilities using mathematics.
- To apply algorithmic strategies while solving problems.
- To develop time and space efficient algorithms.
- To develop software engineering documents and testing plans.
- To use algorithmic solutions using distributed, Embedded, concurrent and parallel environments.

### Course Outcomes: Upon completion of the course student will able to

- I. Review and understand how previous experiences had an impact on affective states and intellectual performance.

- II. Identify and define the problem.
- III. Decide critically to solve the problem.
- IV. Demonstrate the ability to synthesize complex information from a variety of sources in decision-making.
- V. Predict and develop a group process and desired outcomes.
  
- VI. Plan and perform collaboratively towards a common purpose.

1. The project will be undertaken preferably by a group of at least 3- 4 students who will jointly work and implement the project over the academic year. The work will involve the design of a system or subsystem in the area of Computer Engineering.

2. If the project is chosen a hardware project it will involve the designing a system or subsystem or upgrading an existing system. The design must be implemented into a working model with necessary software interfacing and a user manual.

3. If the project is chosen in the pure Software Application it must involve the detail Software Design Specifications, Data Structure Layout, File Design, Testing with complete documentation and user interface, with life cycle testing and as an executable package.

4. The group will select a project with the approval of the guide (Staff-members assigned) and submit the name of the project with a synopsis of 2 or 3 pages in the month of August in the academic year. A preliminary study report by the group must be submitted and certified at the end of seventh Semester.

5. It is expected that at least one research paper is published by each group with guide.

The project report stage-I will contain the details

Problem definition and requirement specification, acceptance test procedure (ATP).

- a) System definition, requirement analysis.
- b) System design with UML.
- c) Documentation and references.

Documentation will use UML approach with Presentation, Category, Use Case, Class Diagrams, etc.

# Machine Learning

## TEACHING SCHEME:

Theory: 3 Hours / Week

Practical: 2 Hours / Week

Tutorial: 1 Hour / Week

## EXAMINATION SCHEME:

End Semester Examination: 60

Internal Assessment: 40

Term Work & Oral: 50

## CREDITS ALLOTTED:

Theory: 04

TW & Oral: 01

## Course Pre-requisites:

Artificial intelligence, Discrete Mathematics, Database Management System, Engineering Mathematics, Programming Languages.

## Course Objectives:

To provide a strong formal foundation of Machine Learning concepts and techniques

## Course Outcomes: Upon completion of the course student will able to

5. Explain significance of Machine Learning
6. Distinguish between paradigms of Machine Learning.
7. Illustrate use of algorithms in Supervised Learning and Unsupervised Learning.
8. Build Learning Model.
9. Analyze performance of Supervised and Unsupervised Learning
10. Tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.

**UNIT - I      Introduction:      (6 Hours)**

Introduction to statistics, Introduction to Learning Systems, Structure of Learning System, Testing vs Training, learning vs Designing, Goal and Applications of Machine Learning, Examples of Machine Learning Problems, Need of Learning, Machine Intelligence

**UNIT - II      Machine Learning Techniques:      (6 Hours)**

Introduction to Machine Learning Techniques: Supervised Learning(SL) Vs Semi Supervised Learning(SSL) vs Unsupervised Learning(USL), Examples of SL, SS, and US Learning, how to choose Machine Learning Technique, Machine Learning Models, and Types, Examples: Linear based Models, Logic Based and Algebraic Models, Probabilistic Models

**UNIT - III      Classification:      (6 Hours)**

What is Classification?, Types: Naive Bayes Classifier, Decision Trees, Support Vector Machines, Rule based Classification, Backpropagation, Associative Classification, Classifier Accuracy Measures, Precision and Recall Measures.

**UNIT - IV      Regression:      (6 Hours)**

What is Regression? Types: Linear Regression, Logistic Regression, Classification vs Regression, Issues Regarding Classification, and Regression, Assessing performance of Regression, Predictor error measures, Applications of Supervised Learning.

**UNIT - V**    Unsupervised Learning: **(6 Hours)**  
Introduction to Clustering, Types: K Means Clustering Algorithm, Mixture Models, Hierarchical Clustering, Anomaly Detection, Neural Networks, Self-Organizing Map(SOM), Applications of Unsupervised Learning.

**UNIT - VI**    **Trends in Machine Learning:** **(6 Hours)**  
Ensemble methods for increasing accuracy: Bagging and Boosting, multitask learning, online learning and Sequence Prediction, Data Streams and Active Learning, Introduction to Deep Learning and Reinforcement Learning, Case Study: Latest Machine Learning Tools.

**Term Work:**

1. Distinguish between Supervised and Unsupervised Machine Learning.
2. Implement Linear and Nonlinear Learning models.
3. Implement Distance based Learning techniques.
4. Write study assignment to build tree based models.
5. Write study assignment to build rule based models.
6. WEKA: Tool for Machine Learning.
7. SCIKIT-LEARN: Tool for Machine Learning.
8. SHOGUN: Tool for Machine Learning.
9. ACCORD: Tool for Machine Learning.
10. Study assignment on Reinforcement Learning technique.

**Assignment:**

1. Distinguish between Learning and Designing with example.
2. Explain in detail Need of Machine Learning.
3. Explain in detail How to choose Machine Learning Algorithm.
4. Differentiate between different Machine Learning Models.
5. Explain in detail how Classification by Decision Tree Induction.
6. Explain in detail Support Vector Machine for Supervised Learning.
7. Distinguish between Classification and Regression with suitable example.
8. Demonstrate the use of Linear Regression for Supervised Machine Learning.
9. Implement K-Means Clustering Algorithm for Unsupervised Machine Learning.
10. Explain in detail Anomaly Detection.
11. What are the methods used to increase accuracy of machine learning algorithms? Explain.
12. Define Reinforcement Learning with example.

**Text books:**

1. Jiawei Han, Jian Pei, Micheline Kamber, "Data mining concepts and techniques", 3rd Edition.
2. K.P. Soman, R. Loganathan, V. Ajay, "Machine Learning with SVM and Other Kernel Methods"
3. Witten I.H. Author, "Data Mining Practical Machine Learning Tools and Techniques" 2<sup>nd</sup> Edition.
4. Peter Flach, Machine Learning: The Art and Science of Algorithms that Make Sense of Data",  
Cambridge University Press, Edition 2012.
5. Hastie, Tibshirani, Friedman, "Introduction to Statistical Machine Learning with Applications in R", Springer, 2<sup>nd</sup> Edition-2012.



**References:**

1. T. M. Mitchell, "Machine Learning", McGraw Hill.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer 1st Edition-2013.
3. Ethem Alpaydin, "Introduction to Machine Learning"

**Syllabus for Unit Test:**

Unit Test -1                      UNIT – I, UNIT –II , UNIT –III.

Unit Test -2                      UNIT – IV, UNIT – V, UNIT - VI

## Image Processing and Pattern Recognition

**TEACHING SCHEME:**

Theory: 3 Hours / Week

Practical: 2 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60

Internal Assessment: 40

Term Work & Practical: 50

**CREDITSALLOTTED:4**

Theory: 03

TW& Practical: 01

**Course Pre-requisites:**

Set theory, Linear algebra and statistics, Computer Graphics and visualization, Signals and system, Digital signal processing.

**Course Objectives:**

- 1 Students should be able to understand digital image processing and advanced concepts.

- 2 Students should be able to properly implement algorithms using modern computing tools such as MATLAB, and to interpret and present the results.
- 3 To study fundamentals of colour Image Processing

**Course Outcomes: Upon completion of the course student will able to**

- 1 To explain the digital image processing and digital image formation.
- 2 To illustrate different mathematical preliminaries to deal with digital image processing
- 3 To explain the concept of Image restoration and image segmentation.
- 4 To apply the concept of pattern recognition and its different phases
- 5 To apply knowledge/ skills for solving real world problems.

**UNIT – I Digital Image Fundamentals: (6 Hours)**

Introduction, Fundamental steps and Components of Digital Image Processing, Image Sampling and Quantization: Basic concepts in Sampling and Quantization, Representing Digital images, Spatial and intensity resolution, Relationship between Pixels, Histogram Processing: Definition, Histogram Equalization,

**UNIT – II Image Enhancement: (6 Hours)**

Fundamentals of Spatial Filtering- The Mechanics of Spatial Filtering, Generating Spatial, Filter Masks, Noise Model, Smoothing Spatial Filters: Linear filters – Mean filters Non-linear (Order Statistic filters): Median, Mode, Max, Min filters, Image Enhancement by Frequency Domain Methods: Basic steps for Filtering in Frequency Domain, Frequency Domain low pass (Smoothing), High pass (Sharpening)

**UNIT – III Image Compression and Segmentation: (6 Hours)**

Fundamentals: Coding Redundancy, Spatial and temporal (Interpixel) Redundancy, Some Basic Compression Methods: Lossless Compression methods-Huffman coding, LZW coding, Fundamentals : Point , Line and Edge Detection, Line Detection, Edge Models, Basic Edge detection, Canny edge detector Thresholding : Foundation, Basic Global Thresholding, Optimal global thresholding, Multiple Thresholds.Region based segmentation: region growing, region splitting and merging.

**UNIT – IV Morphological Image Processing and Color Image Processing: (6 Hours)**

Morphological Image Processing, Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms: Boundary Extraction, Hole (Region) Filling, thinning, Color Image Processing: Color Fundamentals and Color Models Basics of Full-Color Image Processing, Color Transformations.

**UNIT – V Basics of Pattern Recognition: (6 Hours)**

Introduction and examples, Clustering vs. Classification; Supervised vs. unsupervised, Decision Boundaries, Decision region / Metric spaces/ distances, Object detection.

**UNIT – VI Clustering and Classification: (6 Hours)**

Bayes decision rule, Error probability, Linear Discriminates Function (equal covariance matrices)and non- Linear Decision Boundaries (unequal covariance matrices). Clustering: Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Minimum within cluster distance criterion. K-means algorithm, K-medoids, DBSCAN-Density-based Spatial clustering of application

with Noise.

**Term Work:**

1. Display of Grayscale Images.
2. Write a MATLAB code that reads a gray scale image and generates the flipped image of original image.
3. To enhance contrast using Histogram Equalization
4. Write a program for image enhancement.
5. Write a program for image compression
6. Write a program for Edge detection
7. Write a program for image segmentation
8. Write a program for image morphology
9. Illustrate and discuss use of various method of pattern recognition.
10. Write a program for face detection in MATLAB.

**Assignment:**

1. Write and explain concepts of histogram processing.
2. Write and explain edge detection and Line detection.
3. Write in details about Filtering in Frequency Domain.
4. Write any two algorithms for segmentation.
5. Write in detail about colour image processing.
6. Write and explain concepts of object detection.

7. Write and explain K-means algorithm.
8. Write and explain DBSCAN.
9. Case study on radiographic images to reduce noise in image.
10. Case study on pattern recognition.

**Text books:**

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing", Pearson Education ,2008.
2. S.Jayaraman, S Esakkirajan,T Veerakumar "Digital Image Processing", McGrawHill Publication,2009.
3. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification", John Wiley.

**References:**

1. K. Fukunaga," Statistical pattern Recognition", Academic Press.
2. S.Theodoridis and K.Koutroumbas," Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Anil K Jain, "Fundamentals of Digital Image Processing", PHI
4. B Chanda & Dutta Majumdar, "Digital Image Processing and Analysis", PHI
5. Rafael C Gonzalez, Richard E Woods, Eddins, "Digital Image Processing using MATLAB",Pearson Education

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Elective-IV a):Mobile Computing**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 3 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 2 Hours / Week	Internal Assessment: 40 Marks	TW & Practical: 01
	Term Work & Practical: 50 Marks	

**Course Pre-requisites:**

Computer Network , Fundamentals of Data Communication.

**Course Objectives:**

1. Understand the basic concept of mobile computing
2. Be familiar with network protocol stack
3. Learn the basics of mobile telecommunication
4. Develop system to be used in Ad-Hoc networks
5. Gain knowledge about different mobile platforms and application development

**Course Outcomes: Upon completion of the course student will able to**

1. Explain the basic of mobile telecommunication system
2. Choose the required functionality at each layer
3. Application identity solution for each functionality at each layer
4. Use similar tool and design Ad-hoc networks
5. Develop mobile application

**UNIT - I Introduction: (6 Hours)**

Mobile computing: mobile computing compared with wireless networking, mobile computing applications, characteristics of mobile computing, structure of mobile computing application: MAC protocol, wireless MAC issues, fixed assignment schemes, Random assignment schemes, and reservation based schemes.

**UNIT - II Mobile Internet Protocol & Transport Layer: (6 Hours)**

Overview of mobile IP, features of mobile IP, key mechanism in mobile IP, route optimization. Overview of TCP/IP, Architecture of TCP/IP, Adaption of TCP window, Improvement in TCP performance.

**UNIT - III Mobile Telecommunication System: (6 Hours)**

Global system for mobile communication (GSM), General packet radio service(GPRS),universal mobile telecommunication system(UMTS) Mobile technology generation, comparison between GMS vs UMTS vs 3G vs 4G vs 5G

**UNIT - IV Mobile AD-HOC Network: (6 Hours)**

Ad -Hoc basic concept, characteristic, Application, Design issues, Routing, Essential of traditional routing protocol, popular routing

protocol, vehicular Ad-hoc networks (VANET), MANET VS VANET-security.

**UNIT - V      Mobile Operating System & Application:      (6 Hours)**

Mobile device operating systems, special constraints & requirements, commercial mobile operating system, software development kit, iOS, iOS architecture, Android, Android architecture, How to develop application via Android, compiling & executing programs in Android, blackberry, window phone.

**UNIT - VI      Mobile Payment System using Mcommerce:      (6 Hours)**

Mcommerce- structure, pros & cons, mobile payment system, security issues, application issues, GSM mobility management administration.

**Term Work:**

1. Explain features of mobile IP & mechanism in mobile IP.
2. Explain comparison between GSM vs UMTS vs GPRS.
3. Explain comparison between 3G vs 4G vs 5G.
4. Develop small application in Android.
5. Develop small application in iOS.
6. Simulate the working of Android networking/Communication entities using software tools.

**Assignment:**

1. Discuss characteristics and applications of mobile computing
2. Explain structure of mobile computing application.
3. Describe TCP/IP architecture in detail.
4. Explain GPRS system with diagram.
5. Prepare a case study on Mobile OS : Android
6. Discuss in detail the implementation of TCP/IP stack in Mobile networks
7. Prepare a case study on MANET & VANET
8. Prepare a case study on Mobile OS : IOS
9. Prepare a case study on GSM architecture.





## Elective – IV b): Design Patterns

### TEACHING SCHEME:

Theory: 03 Hours / Week

Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work & practical: 50 Marks

### CREDITS ALLOTTED:

Theory: 03

TW & Practical : 01

### Course Pre-requisites:

Aware about basic java programming concepts.

### Course Objectives:

1. To understand the concept of patterns and the catalog
2. To discuss the Presentation tier design patterns and their affect on: sessions, client access

### Course Outcomes: Upon completion of the course student will able to

1. To demonstrate a thorough understanding of patterns and their underlying principles
2. To know what design pattern to apply to a specific problem
3. To demonstrate what tradeoffs need to be made when implementing a design pattern
4. To use design patterns for developing software.
5. To understand the variety of implemented bad practices related to the Business
6. To learn how to use design patterns to keep code quality high without overdesign.

**UNIT - I Introduction To Design Patterns:**

**(6 Hours)**

Introduction to design patterns: Design Pattern Definition, Strategy, Observer, Factory, Singleton, Command, Adapter, Facade, Template Method, Iterator, Composite, State, Proxy Design Patterns in Small Talk MVC, Describing Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, use of Design Patterns.

**UNIT - II      Designing A Document Editor:      (6 Hours)**

Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

**UNIT - III      Design Patterns Catalog:      (6 Hours)**

Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton. Discussion of Creational Patterns.

**UNIT - IV      Structural Patterns:      (6 Hours)**

Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns

**UNIT - V      Behavioral Patterns:      (6 Hours)**

Behavioral Patterns- Chain of Responsibility Command, Interpreter, iterator, Mediator, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns, Expectations from Design Patterns.

**UNIT - VI      Case Studies:      (6 Hours)**

The World Wide Web - a case study in interoperability, Air Traffic

Control – a case study in designing for high availability, Celsius Tech – a case study in product line development.

**Term Work:**

1. Review the engineering design for the part of the product that you must implement. (Engineering Design)
2. Create a new project for this assignment and create a package within the project named scoring.
3. Implement creational pattern.
4. Implement the Score interface. (Design Specifications)
5. Implement the Abstract Score class. (Design Specifications)
6. Implement the Leaf Score class. (Design Specifications)
7. Implement the Composite Score class. (Design Specifications)
8. Solve any two Design Problems using Design Patterns.

**Assignment:**

1. A journal on PCs would like to investigate some properties of different PCs, e.g. the price, performance, etc. The results need to be sorted in a list. There are several sorting algorithms for sorting all the PCs depending on specific characteristics. These sorting algorithms behave differently with respect to the time and space performance. Therefore, it is required to select and switch to a different sorting algorithm at run-time.

a) Which design pattern can be applied to fulfill these requirements?

b) Draw a class diagram that incorporates this pattern.

2. In the future it is expected that class Computer Equipment will be extended with additional operations. The present structure of computer equipment is assumed not to change. It is also not desired to 'pollute' all the existing component classes with new operations.

a) Which design pattern would be suitable for this problem?

3. Study on Template Method in design pattern
4. Study on Proxy Design Patterns in Small Talk MVC.
5. Solve the Design problems using design patterns.
6. Study on Behavioral pattern.

7. Designing a Document Editor for any system
8. Comparison of design pattern catalogs
9. Study of various structural patterns.
10. Case study on Interpretability.

**Text books:**

1. Gamma, Helm, Johnson, "Design Patterns: Elements of Reusable Object Oriented Software," PEA.
2. Eric Freeman, "Head First Design Patterns", Oreilly.

**References:**

1. Cooper "Java Design Patterns", Pearson.
2. Horstmann, "Object Oriented Design and Patterns", Wiley.
3. Ali Bahrami, "Object Oriented Systems Development", MCG.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Elective-IV c):Network Management System**

**TEACHING SCHEME:**

Theory: 3 Hours / Week  
 Practical: 2 Hour / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks  
 Internal Assessment: 40 Marks  
 TW & Practical: 50 Marks

**CREDITS ALLOTTED:**

Theory: 03  
 TW & Practical: 01

**Course Pre-requisites:**

Computer Network, Discrete Mathematics.

**Course Objectives:**

1. To help students to understand the principles of network management.
2. To provide knowledge about the various network management strategies and network management protocols.

**Course Outcomes: Upon completion of the course student will able to**

1. To understand network management architectures and protocols.
2. To gain knowledge about basic components of network management.
3. To gain the information about management communication patterns
4. To understand the protocols associated with network management
5. To gain the knowledge about remote monitoring
6. To understand network management metrics

**UNIT - I Introduction to Network Management: ( 6 Hours)**

Importance of network management, The Players: Different Parties with an Interest in Network Management, Case studies of Networking and Management, Challenges of Information Technology Managers, Current Status and future of Network Management,

**The Network Operator's Arsenal:**

Device Managers and Craft Terminals, Network Analyzers, Element Managers, Management Platforms , Collectors and Probes

**UNIT - II The Basic Ingredients of Network Management: ( 6 Hours)**

The Network Devices and its types with Configuration, The Management System, The Management Network, The Management Support Organization: Network Operations Center (NOC).

**UNIT - III Management Communication Patterns: (6 Hours)**

Layers of Management Interactions, Manager Initiated Interactions: Request and Response, Configuration Operations, Agent Initiated Interactions: Events and Event-Based Management.

<b>UNIT - IV</b>	<p><b>Common Management Protocols:</b></p> <p>SNMP (Simple Network Management Protocols): Classic and Perennial Favorite , SNMP Operations , SNMP Messages and Message Structure , SNMPv2/ SNMPv2c , SNMPv3, The SNMP Communication Model, Functional model, SNMPv2 Protocol, Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management, Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.</p>	<b>(6 Hours)</b>
<b>UNIT - V</b>	<p><b>SNMP Management: RMON (Remote Monitoring):</b></p> <p>Remote Monitoring Basics, RMON SMI (Structure of Management Information) and Management Information Base (MIB), RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON.</p> <p><b>Telecommunications Management Network(TMN):</b></p> <p>Fundamentals of TMN, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.</p>	<b>( 6 Hours)</b>
<b>UNIT - VI</b>	<p><b>Management Metrics: Assessing Management Impact and Effectiveness:</b></p> <p>Network Management Business Impact, Factors that Determine Management Effectiveness, Assessing Network Management Effectiveness.</p> <p><b>Web-Based Management:</b></p> <p>NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management</p>	<b>( 6 Hours)</b>

**Term Work:**

1. Installation and study of Packet Analyzer tool Wireshark.
2. Installation and study of Honeypots tool.
3. Installation and study of Ethereal tool.
4. Installation and study of Wi-Fi manager.
5. Installation and study of open source Network Management platform (Network Management Information System).
6. Installation and study of Icinga 2 (Open source network monitoring tool).
7. Installation and study of Zabbix.
8. Configure SNMP Protocol on Cisco Packet Tracer.
9. Configure VLAN on Cisco Packet Tracer.
10. Installation and study of Packet Sniffer.

**Assignments:**

1. Explain the significance of network management system.
2. Describe the components of network management.
3. Justify the role of device Managers and craft terminals in The Network Operator's Arsenal
4. Explain the layers of management interactions.
5. Illustrate SNMP Messages and Message Structure
6. Explain SNMP communication model
7. Explain the improvement in SNMPv2 over the SNMPv1
8. Explain the RMON (Remote Monitoring) with SMI (Structure of Management Information) and Management Information Base (MIB)
9. Describe the TMN (Telecommunications Management Network) architecture.
10. Explain the NMS(network management system) with the context of Web Interface and Web-Based Management

**Text Books**

1. Mani Subramanian, "Network Management: Principles and Practice", sixth edition Pearson Education.
2. Alexander Clemm, "Network Management Fundamentals "
3. D.C. Verma, "Principles of Computer Systems and network Management"
4. Morris, Network management, Pearson Education.



5. Mark Burges, Principles of Network System Administration, Wiley Dreamtech.

**Reference Books**

1. William Stallings, “SNMP, SNMPv2, SNMPv3, and RMON 1 and 2” third edition, Addison-Wesley Professional
2. William Stallings, “Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud”, Addison-Wesley Professional

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Elective – IV d): Parallel and Distributed Computing**

**TEACHING SCHEME:**

Theory: 3 Hours / Week

Practical: 2 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: 60 Marks

Internal Assessment: 40 Marks

Term Work & Practical: 50 marks

**CREDITS ALLOTTED:**

Theory: 03

TW & Practical: 01

**Course Pre-requisites:**

C/C++/Java Programming Languages, Data Structures, Linux/Unix Operating System, Distributed Computing, Computer Organization.

**Course Objectives:**

To focus on the principles of parallel and distributed computing environment and the

implementation and performance issues associated with them.

**Course Outcomes: Upon completion of the course student will able to**

1. Ability to recite, explain and model the fundamental concepts and reasoning principles for parallel and distributed systems.
2. Ability to Identify and describe limitations and Challenges of Parallel and Distributed Systems.
3. Ability to adapt and apply the architectural models for various real time applications.
4. Ability to design, analyze algorithms for execution in parallel and distributed settings
5. Ability to report and account for models, limitations, and fundamental concepts in the area of message passing and shared memory concurrency, and apply this understanding to example systems and algorithms.
6. Ability to Outline and assess the significance of high performance computing and its impact in a Computer environment.

**UNIT - I Fundamental of Parallel & Distributed Computing:**

**(6Hours)**

**Introduction to Parallel Processing Paradigms,** Modeling and Characterizing Parallel Algorithms, Balanced Trees, Divide and Conquer, Partitioning, Combining, Language Categories and Parallel Programming Languages.

**Introduction to Distributed Computing:** Computation Model, Client-Server Systems, Peer to Peer Systems, Modularity, Message Passing, Messages on worldwide web.

**UNIT - II Promises and Challenges of Parallel and Distributed Systems:**

**(6Hours)**

Cost vs. Performance Evaluation, Software and General-Purpose PDC, Turing Machine as the Basis, and Consequences, Complexity Measures for Parallelism, Complexity Measures for Distributed Systems, Processing Technology, Networking Technology, Software Tools and Environments, Neural Networks and Complexity Issues, Tolerating Processor Failures in Synchronous Systems, Tolerating Processor Failures in Asynchronous Systems, Wait-Free Implementations of Shared Objects.

**UNIT - III Parallel and Distributed Architectures:**

**(6Hours)**

Computational Model, Engineering Model, RISC Architectures, Superscalar and VLIW Processors, SIMD-Processing: Concepts and Systems, MIMD Architectures: Shared and Distributed Memory Designs, Memory Hardware Technology, Memory System Architecture, User-Level Memory Models, and Memory Consistency Models.

**UNIT - IV Algorithms & Data Structure for Parallel Programming:**

**(6Hours)**

Arrays and Balanced Binary Trees, Linked Lists, Euler Tour vs. Parentheses String, Priority Queues (Heaps), Search Trees/Dictionaries, Impact of Data Distribution, CU/PE Overlap, Parallel Reduction Operations, Parallel Graph Algorithms, Parallel Computational Geometry.

**UNIT - V Communication and its Framework:**

**(6Hours)**

Message-Passing Model, Distributed Shared Memory Model, Message-Passing System: Desirable Features, Socket-Based Message Passing, p4, Parallel Virtual Machine, Message-Passing Interface(MPI), Separation of Data and Control Functions.

Directory-Based Cache Coherence, Shared Memory Consistency Models,

Distributed Memory Architectures, Basic Model: RMI, CORBA, DCOM, Comparison of the Three Paradigms.

**UNIT - VI Applications, Tools & Technologies:**

**(6Hours)**

HPC, Mixed-Mode Systems, Examples of Existing Mixed-Machine Heterogeneous Computing Systems, Overview of Clustering, Distinct Uses of Clusters, General-Purpose Parallel Computers, Optical Communication: Free-Space Interconnection, Considerations in Choosing the Interconnection Topology, Broadband Integrated Service Data Network (B-ISDN), Parallel and Distributed Computing Environment Over ATM, Parallelizing Compilers and Preprocessors, Performance Monitoring and benchmarking tools, Performance Visualization, Case Studies: Molecular Modeling, Genetic and Protein Sequence Data.

**Term Work:**

1. To implement a program that plays Conway's Game of Life. Conway's Game of Life is an example of discrete event simulation, where a world of entities live, die, or are born based on their surrounding neighbors. Each time step simulates another round of living or dying.
2. To implement parallel matrix multiply using Pthreads and evaluate the scalability of your implementation as you increase the problem size and the number of threads.
3. Client-server socket programs - To Design a multi-threaded server, using signals, and learning about the HTTP protocol.
4. To Study about CUDA. Implement a forest fire simulator using CUDA.
5. To Understand Locality, Load balancing, and Synchronization Effects using p-Threads.
6. To analyze the tradeoffs among different synchronization algorithms in terms of their latency, fairness, scalability, traffic, and storage requirements.
7. To understand the role of data communication using MPI as the message passing model. Setup the Environment and use the program of Gaussian Elimination.
8. To write a word count program on map-reduce framework.
9. To write a Jacobi Method to solve a system of linear equations using Map-reduce method.

**Assignment:**

1. To study about Hadoop Architecture.
2. To Study about Spark Architecture.
3. Prepare a case study on CUDA supporting Parallel programming and distributed application.
4. Case study on how to use Java-based TCP communication through a design of chat client and server program.
5. Case study on how to write a parallel-computing application using MPI Java
6. Case study on MPI
7. Note on comparing RMI and mobile agents in terms of programmability and performance.
8. Case study on design and implementation of a very simple distributed file system.
9. Prepare a presentation and case study on A Modern Multi-Core Processor: Forms of Parallelism + Understanding Latency and BW
10. Prepare a presentation and case study on Workload-Driven Performance

**Text Books:**

- 1) "Parallel and Distributed Computing: A Survey of Models, Paradigms and Approaches", A Wiley-Interscience publication, Volume 12 of Wiley Series on Parallel and Distributed Computing, Claudia Leopold, 0471358312, 9780471358312.

**References:**

1. "Tools and Environments for Parallel and Distributed Computing, Salim Hariri, Manish Parashar, Volume 34 of Wiley Series on Parallel and Distributed Computing", John Wiley & Sons, 0471474843, 9780471474845
2. "Parallel and Distributed Computing: Theory and Practice. Springer Science & Business Media", 3540580786, 9783540580782.
3. Péter Kacsuk, Dieter Kranzlmüller, Zsolt Németh, Jens Volkert, "Distributed and Parallel Systems: Cluster and Grid Computing, Volume 706 of The Springer International Series in Engineering and Computer Science", Springer Science & Business Media, 2012, 1461511674, 9781461511670
4. Jacek Błażewicz, Klaus Ecker, Brigitte Plateau, Denis Trystram, "Handbook on Parallel and Distributed Processing, International Handbooks on Information Systems", Springer Science & Business Media, 2013, 3662043033, 9783662043035

## Syllabus for Unit Test:

Unit Test -1                               UNIT – I, UNIT – II, UNIT - III

Unit Test -2                               UNIT – IV, UNIT – V, UNIT - VI

# Data Mining and Knowledge Discovery

## TEACHING SCHEME:

Theory: 3 Hours / Week  
Practical: 2 Hours / Week

## EXAMINATION SCHEME:

End Semester Examination: 60 Marks  
Internal Assessment: 40 Marks  
Term Work & Practical: 50 Marks

## CREDITS ALLOTTED:

Theory: 03  
TW &OR : 01

## Course Pre-requisites:

Knowledge of Statistics, Database Management System.

## Course Objectives:

1. Identify the scope and necessity of Data Mining & Warehousing for the society.
2. Describe the designing of Data Warehousing so that it can be able to solve the root problems.
3. Understand various tools of Data Mining and their techniques to solve the real time problems.
4. Develop ability to design various algorithms based on data mining tools.

## Course Outcomes: Upon completion of the course student will able to

1. Define, describe, and clearly state the objectives of Knowledge Discovery and Data Mining.
2. Describe data mining algorithms
3. Suggest appropriate solutions to data mining problems
4. Analyze data mining algorithms and techniques
5. Identify and or develop software to execute the specified algorithm(s)/data mining technique(s)
6. Identify and distinguish data mining applications from other IT applications

## UNIT - I      **Introduction to Knowledge Discovery and Data Mining:                               (6 Hours)**

Data mining fundamentals, Classification of Data mining systems, Integration of Data mining system with Data warehouse, Data Preprocessing, KDD Fundamentals, KDD Process, Data clearing, Data integration and transformation, Data Reduction, Data mining Statistics.

<b>UNIT - II</b>	<b>OLAP:</b> Characteristics of OLAP system, Multidimensional view and data cube, Data Cube implementations and operations, Difference between OLAP, OLTP and OLAP Server-ROLAP, MOLAP, HOLAP Queries.	<b>(6 Hours)</b>
<b>UNIT - III</b>	<b>Association Rule Mining:</b>  Introduction, The Task and Naive Algorithm, Apriori Algorithm, Improving the efficiency of Apriori algorithm, Direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent patterns without candidate generation (FP Growth).	<b>(6 Hours)</b>
<b>UNIT - IV</b>	<b>Classification:</b> Decision Tree, The Tree Induction Algorithm, Split algorithms based on information theory, Split Algorithm based on Gini Index, Decision tree Rule,	<b>(6 Hours)</b>
<b>UNIT - V</b>	<b>Knowledge discovery:</b> Introduction, KDD Process KDD process steps, Models, Integration of KDD with Database system, KDD system architecture, KDD Lifecycle,	<b>(6 Hours)</b>
<b>UNIT - VI</b>	<b>Clustering:</b> Cluster analysis, Categorization of major clustering methods such as Partitioning methods, Hierarchical methods, Density based methods, grid based methods, Model based clustering methods, clustering high dimensional data, Constraint based analysis, Data mining applications	<b>(6 Hours)</b>

**Term Work:**

1. Implementing Web document browsing a OLAP using existing ontologies.
2. Show the implementation of Naïve Bayes algorithm.
3. Demonstration of Association rule process on any dataset using apriori algorithm.
4. Case Study: How New York's Fire Department Uses Data Mining
5. Comparison of various data mining tool
6. Implementation/usage of WEKA for classification of social network dataset
7. Implementation/usage of k-nearest neighbor classifier
8. Find predominant themes in a collection of documents (clustering).
9. Clustering images based on feature localization.
10. Case Study on Data mining applications.

**Assignment:**

1. Explain Data mining Tasks, Issues, Evaluation and Terminologies.

2. Implementation of various KDD models.
3. Define hypercube? How do they apply in OLAP system?
4. State Codd's guidelines for OLAP system?
5. Case study on OLAP.
6. Apply Apriori algorithm to the dataset from Table 13.1 (textbook) and extract all frequent itemsets with support count  $\geq 3$ . For one longest itemset construct association rules using confidence threshold 50%. Show all your work (candidates, frequent itemsets, etc.).
7. List and explain Association rule mining algorithms in detail.
8. Implementation of Data Cube.
9. Compare various clustering algorithm.
10. Case Study :clustering algorithm

**Text books:**

1. Jiawei Han & Micheline Kamber, "Data Mining – Concepts and Techniques",Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.
2. ",Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining, Pearson education.

**References:**

1. Arun K Pujari, "Data Mining Techniques",2nd edition, Universities Press.
2. Sam Aanhory & Dennis ,"Data Warehousing in the Real World",Murray Pearson Edn Asia.
3. K.P.Soman,S.Diwakar,V.Ajay, "Insight into Data Mining",PHI,2008.
4. Paulraj Ponnaiah, "Data Warehousing Fundamentals ",Wiley student Edition.

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



## Project Stage-II

### TEACHING SCHEME:

Practical: 16 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: 150 Marks

### CREDITS ALLOTTED:

Term Work & Oral: 08

### Course Pre-requisites:

Basics of Software engineering, software testing and knowledge of core computer engineering subjects.

### Course Objectives:

- To develop problem solving abilities using mathematics.
- To apply algorithmic strategies while solving problems.
- To prepare software engineering documents and design test cases.
- To demonstrate use of algorithmic solutions in real time problem.
- To encourage and expose students for participation in National/ International paper presentation activities.
- Exposure to Learning and knowledge access techniques using Conferences, Journal papers and participation in research activities.

**Course Outcomes:** Upon completion of the course student will able to

- I. Understand how to solve the problem.
- II. Demonstrate the ability to synthesize complex information from a variety of sources in decision-making
- III. Plan and perform collaboratively towards a common purpose.
- IV. Demonstrate self-advocacy skills and self-reliant behavior.
- V. Demonstrate the ability to develop and maintain satisfying interpersonal relationships.
- VI. Evaluate and conclude the results with documentation.

1. The project will be undertaken preferably by a group of at least 3- 4 students who will jointly work and implement the project over the academic year. The work will involve the design of a system or subsystem in the area of Computer Engineering.

2. If the project is chosen a hardware project it will involve the designing a system –subsystem or upgrading an existing system. The design must be implemented into a working model with necessary software interfacing and a user manual.

3. If the project is chosen in the pure Software Application it must involve the detail Software Design Specifications, Data Structure Layout, File Design, Testing with complete documentation and user interface. With life cycle testing and as an executable package.

The group will submit at the end of Semester-VIII,

- i) The workable project.
- ii) The details of Research paper published in National/ International paper conferences/journals for the project work carried out.
- iii) Project Report in the form of bound journal complete in all aspects, 3 copies for the institute and 1 copy of each student in the group for certification.

The examiner in consultation with the guide will assess the term work.

Oral examination will be based on the project work completed by the candidate.

The project report will contain the following details:

1. Problem definition and requirement specification, acceptance tests procedure (ATP).
2. System definition, requirement analysis.
3. System design.
4. System implementation-code documentation –dataflow diagram / algorithm.
5. Test results and procedure, test report as per ATP.
6. Platform choice, use.
7. Appendix tools used, references.
8. Documentation will use UML approach with Presentation, Category, Use Case, Class Diagrams, etc.



**Bharati Vidyapeeth**

**(Deemed to be University)**

**Pune, India**

**Faculty of Engineering and Technology**

**Programme: B.Tech (Computer Science and Business Systems)**

**COURSE STRUCTURE AND SYLLABUS**

**(Choice Based Credit System)**

**B.Tech (Computer Science and Business Systems)**

**2018 Course**

**Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune**  
**B.Tech- Computer Science & Business Systems (Semester- I and II)**  
**Revised New Syllabus**

Semester I		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
1.1	Mathematics I	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.2	Statistics I	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.3	Principles of Electrical Engineering	3	0	2	5	60	20	10	10	-	50	150	3	1	4
1.4	Fundamentals of Computer Science	3	1	2	6	60	20	10	10	50	-	150	4	1	5
1.5	Fundamentals of Physics	3	0	2	5	60	20	10	10	-	50	150	3	1	4
1.6	Business Communication & Value Science - I	2	1	2	5	50	-	-	-	-	50	100	3	1	4
<b>Total</b>		<b>17</b>	<b>4</b>	<b>8</b>	<b>29</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>750</b>	<b>21</b>	<b>4</b>	<b>25</b>

Semester II		Teaching Scheme				Examination Scheme-Marks							Credit		
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
1.7	Mathematics II	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.8	Statistics II	3	1	0	4	60	20	10	10	-	-	100	4	0	4
1.9	Data Structures & Problem Solving	3	1	2	6	60	20	10	10	50	-	150	4	1	5
1.10	Fundamentals of Economics	3	0	0	3	60	20	10	10	-	-	100	3	0	3
1.11	Principles of Electronics	3	0	2	5	60	20	10	10		50	150	3	1	4
1.12	Business Communication & Value Science - II	2	1	2	5	50	-	-	-	-	50	100	3	1	4
1.13	Self Learning Module	0	0	2	2	-	-	-	-	-	50	50	0	1	1
<b>Total</b>		<b>17</b>	<b>4</b>	<b>8</b>	<b>29</b>	<b>350</b>	<b>100</b>	<b>50</b>		<b>50</b>	<b>150</b>	<b>750</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune**  
**B.Tech- Computer Science & Business Systems (Semester- III and IV)**  
**Revised New Syllabus**

Semester- III		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.1	Formal Language and Automata Theory	4	1	2	6	60	20	10	10	-	50	150	5	1	6
2.2	Computer Organization & Architecture	4	0	2	5	60	20	10	10	-	50	150	4	1	5
2.3	Object Oriented Programming	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.4	Computational Statistics	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.5	Software Engineering	4	1	2	6	60	20	10	10	50	-	150	5	1	6
2.6	Indian Constitution (Non Credit)												0	0	0
<b>Total</b>		<b>18</b>	<b>2</b>	<b>10</b>	<b>27</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100</b>	<b>750</b>	<b>20</b>	<b>5</b>	<b>25</b>
Semester- IV		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.8	Operating Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.9	Database Management Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.10	Software Design with UML	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.11	Introduction to Innovation, IP Management & Entrepreneurship	4	0	0	3	60	20	10	10	-	-	100	3	0	3
2.12	Business Communication & Value Science – III	2	0	4	6	50	0	0	0	-	50	100	2	2	4
2.13	Operations Research	2	0	2	4	60	20	10	10	-	50	150	2	1	3
2.14	Essence of Indian Traditional Knowledge(Non Credit)									-	-	0			
<b>Total</b>		<b>20</b>	<b>0</b>	<b>12</b>	<b>28</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100</b>	<b>800</b>	<b>19</b>	<b>6</b>	<b>25</b>

**BHARATI VIDYAPEETH (Deemed to be University)**  
**COLLEGE OF ENGINEERING, PUNE-43**  
**B. Tech. (Computer Science & Business Systems)**

**Vision of the Department**

“To syndicate industry and institute to impart high quality knowledge through scholarship, research and creative endeavor”

**Mission of the Department**

- To impart contemporary technology conforming to a dynamic curriculum.
- To engage in professional development and scholarly endeavor through knowledge of common business principles.
- To promote the awareness of business discipline and ethical responsibility through industry alliance

**Programme Educational Objectives**

1. Prevail technical competency to concord the industry engrossment.
2. Assimilate business management skills.
3. Instigate business level innovation with societal consideration.

**Programme Outcomes**

**The students of B.Tech (Computer Science & Business Systems) will be able to**

- a. Demonstrate logical and programming skills through comprehensive programming foundation.
- b. Apply knowledge of mathematics, computer engineering and basic science to comprehend and solve real world problems.
- c. Develop software applications and processes for complex problems to provide efficient solutions by assessing its environmental, social and ethical constraints.
- d. Investigate and solve complex computing problems with alternate solutions.
- e. Use functional skills of modern IT tools and techniques for engineering activities.
- f. Understand the social and cultural impact of computing on society.
- g. Provide optimized computational solutions that apprehend the societal and environmental aspects.
- h. exhibit the professional, ethical and legal responsibilities related to industry.
- i. Perform as an individual and efficient team player to accomplish a goal.
- j. Present professional concepts through effective communication skills and documentation.
- k. Demonstrate management skills for developing time-bound projects within the available budget and resources.
- l. Develop the ability of life long learning for new IT practices.

## Syllabus of Semester I

### Mathematics I

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: Nil</b>	<b>Term Work: Nil</b>	

#### Course Pre Requisites:

The students should have basic Knowledge of high school math, including trigonometry, geometry and calculus

#### Course Objective:

The course introduces fundamental concepts of Calculus and Discrete Mathematics.

#### Course Outcomes:

- 1) Evaluate double integral and triple integral to compute area, volume for two dimensional and three-dimensional solid structure.
- 2) Understand and apply basic concepts of Boolean algebra.
- 3) To recall the basic concepts of sets, functions and relations.
- 4) Develop fundamental understanding of Elementary Combinatory.
- 5) Understand various concepts of algebraic systems.
- 6) Student will be able to prove mathematical statements using induction method.

#### Topics to Be Covered:

##### UNIT – I

[6 Hours]

**Calculus:** Differential calculus and integral calculus, double and triple integral.

##### UNIT – II

[6 Hours]

Application of double and triple integral.

##### UNIT – III

[6 Hours]



**Boolean algebra:** Introduction of Boolean algebra, truth table.

**UNIT – IV**

**[6 Hours]**

Basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

**UNIT – V**

**[6 Hours]**

**Abstract algebra:** Set, relation, group, ring, field.

**UNIT – VI**

**[6 Hours]**

**Combinatorics:** Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, strong form of induction, pigeonhole principle.

**Home Assignments:**

Assignments & tutorials covering the following: Successive differentiation, multiple integral, truth table, Karnaugh map, principle of mathematical induction, strong form of induction and pigeonhole principle.

**Reference Books:**

1. I. N. Herstein, “Topics in Algebra”, John Wiley and Sons.
2. M. Morris Mano, “Digital Logic & Computer Design”, Pearson
3. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publication, Delhi.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Statistics I

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs/Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: Nil</b>	<b>Term Work: Nil</b>	

### Course Pre-Requisites:

The students should have basic Knowledge of high school math and calculus

### Course Objective:

The course introduces fundamental concepts of statistics and probability

### Course Outcomes:

Course outcomes of Statistics-I

- 1) Students will be able to use appropriate statistical terms to describe data.
- 2) Students will be able to use appropriate statistical methods to collect, organize, display and analyze relevant data
- 3) Students will be able to identify the types of sampling.
- 4) Students will be able to understand mathematical expectation and moments generating function.
- 5) Students will be able to apply concepts of various probability distributions to find probabilities.
- 6) Students will be able to apply concepts of Normal, Poisson, Binomial, uniform, exponential, t and F-distribution.

### Topics to Be Covered:

#### UNIT – I

[6 Hours]

**Introduction to Statistics:** Definition of Statistics. Basic objectives. Applications in various branches of science with examples

**Collection of Data:** Internal and external data, Primary and secondary Data. Population and sample, Representative sample.

## UNIT – II

[6 Hours]

**Descriptive Statistics:** Classification and tabulation of univariate data, graphical representation, Frequency curves. Descriptive measures - central tendency and dispersion. Bivariate data. Summarization, marginal and conditional frequency distribution. Scatter diagram. Linear regression and correlation. Least squares method. Rank correlation.

## UNIT III

[6 Hours]

**Sampling Techniques:** Random sampling. Sampling from finite and infinite populations. Estimates and standard error (sampling with replacement and sampling without replacement), Sampling distribution of sample mean, stratified random sampling

## UNIT – IV

[6 Hours]

Expected values & moments: mathematical expectation & its properties, Moments (including variance) & their properties, interpretation, Moment generating function

## UNIT – V

[6 Hours]

Probability Theory: concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem

## UNIT – VI

[6 Hours]

Probability distributions: discrete & continuous distributions, Binomial, Poisson & Geometric distributions, Uniform, Exponential, Normal, Chi-square, t, F distributions

### Home Assignments:

Problem sets to be shared by faculty covering the following topics:

Graphical representation of data, Histograms, Descriptive measures - central tendency and dispersion Estimating moments, Distribution parameters, Simulation

### Text Books:

1. Introduction of Probability Models, S.M. Ross, Academic Press, N.Y.
2. Fundamentals of Statistics (vol. I and vol. II) - A. Goon, M. Gupta and B. Dasgupta.

### Reference Books:

1. A first course in Probability, S.M. Ross.
2. Probability and Statistics for Engineers (4th Edition) - I.R. Miller, J.E. Freund and R. Johnson.
3. Statistical Concepts & Methods - G.K. Bhattacharyya and R.A. Johnson.
4. Introduction to the Theory of Statistics - A.M. Mood, F.A. Graybill & D.C. Boes.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Principles of Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	<b>Theory: 3 Credits</b>
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	<b>TW and Oral :1 Credit</b>

### Course Pre-requisites:

The Students should have knowledge of Mathematics, physics

### Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, Electrostatics electromagnetism, transformer, electrical wiring.

**Course Outcomes:** After learning this course the students will be able to

1. Apply knowledge of basic concepts of work, power, energy for electrical, mechanical and thermal systems
2. Calculate current in electrical network using Kirchoff's laws and network theorems.
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries
4. Define basic terms of single phase and three phase ac circuits and supply systems.
5. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer.
6. Describe types of wiring and earthing system.

### Topics to Be Covered:

#### UNIT – I

**[4 Hours]**

**Basic Concepts:** Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems

#### UNIT – II

**[8 Hours]**

**Network Theorems:** Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series-parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.

#### UNIT III

**[4 Hours]**

**Electrostatics:** Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.

#### UNIT – IV

[6 Hours]

**AC Fundamentals & AC Circuits:** AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph balanced AC Circuits.

#### UNIT – V

[8 Hours]

**Magnetic Circuits & Transformer:** Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, Ampere's law, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit

Faraday's law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling,

Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.

#### UNIT – VI

[6 Hours]

**Electrical Wiring and Illumination system:** Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Introduction to measuring devices/sensors and transducers related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems and their practical application. :

**Term Work:** The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem

6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$ ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations.
10. Study of a Residential (L.T.) Bill

**Text Books:**

1. B.L. Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi
2. V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi
3. I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd

**Reference Books:**

1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Fundamentals of Computer Science

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: 2Hrs./Week</b>	<b>Term work &amp; Practical: 50 Marks</b>	<b>TW and Practical :1 Credit</b>

### Course Pre-Requisites:

Knowledge of Class XII level computers will be helpful, but not mandatory.

### Course Objective:

The course introduces fundamental concepts of computer science

### Course Outcomes:

1. Understand the basics of computer science & the process of moving from a problem statement to a computational formulation of a method for solving the problem.
2. Apply the basic concepts of control structures.
3. Understand basic concepts of function.
4. Implement concept of arrays and pointers.
5. Develop an application using the concept of file handling.
6. Describe unix system interface and programming method.

### Topics to Be Covered:

#### UNIT – I

[6 Hours]

**General problem Solving concepts and Imperative languages:** Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

**Imperative languages:** Introduction to imperative language; syntax and constructs of a specific language (ANSI C) .**Types Operator and Expressions with discussion of variable naming and Hungarian Notation:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation



## UNIT – II

[6 Hours]

**Control Flow with discussion on structured and unstructured programming:** Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming

## UNIT – III

[6 Hours]

**Functions and Program Structure with discussion on standard library:** Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Preprocessor, Standard Library Functions and return types

## UNIT – IV

[6 Hours]

**Pointers and Arrays:** Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

## UNIT – V

[6 Hours]

**Structures:** Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields

**Input and Output:** Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions

## UNIT – VI

[6 Hours]

**Unix system Interface:** File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator

**Programming Method:** Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

### Home Assignments:

1. Algorithm and flowcharts of small problems like GCD
2. Structured code writing with:
  - i. Small but tricky codes
  - ii. Proper parameter passing
  - iii. Command line Arguments
  - iv. Variable parameter
  - v. Pointer to functions

- vi. User defined header
- vii. Make file utility
- viii. Multi file program and user defined libraries
- ix. Interesting substring matching / searching programs
- x. Parsing related assignments

**Text Books:**

- 1. B. W. Kernighan and D. M. Ritchi, “The C Programming Language”, Second Edition, PHI.
- 2. B. Gottfried, “Programming in C”, Second Edition, Schaum Outline Series.

**Reference Books:**

- 1. Herbert Schildt, “C: The Complete Reference”, Fourth Edition, McGraw Hill.
- 2. Yashavant Kanetkar, “Let Us C”, BPB Publications.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Fundamentals of Physics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs. /Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: Nil	Continuous Assessment: 40 marks	
Lab: 2 Hrs. / Week	Term Work and Oral : 50 marks	TW and Oral :1 Credit

### Course Pre-Requisites:

Knowledge of Class XII level Physics and Mathematics

### Course Objective:

The course introduces fundamental concepts of physics

### Course Outcomes:

1. To understand the Importance of applications of Applied Physics in daily life
2. To provide students with a basic understanding of the Physics that may be required by engineers in the course of their careers
3. To impart knowledge related to the importance of EM waves and magnetic materials
4. To enhance knowledge related to lasers and its different components to make it suitable for various purposes
5. To introduce most important concepts of superconductivity, crystallography and fiber optics to the students
6. To introduce the learners to the basics of Special theory of relativity, X- rays, Quantum Mechanics

### Topics to Be Covered:

#### UNIT – I

[6 Hours]

**Oscillations:** Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple springs mass system. Resonance-definition., damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators

#### UNIT – II

[6 Hours]

**Classical Optics:** Theory of interference fringes-types of interference-Fresnel’s prism-Newton’s rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel’s half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating. Temporal and Spatial Coherence, Polarization - Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster’s law, double refraction.

### UNIT – III

[6 Hours]

**Quantum Physics:** Introduction - Planck's quantum theory- Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one dimensional potential box, Heisenberg Picture.

### UNIT – IV

[6 Hours]

**X-ray & Crystallography:** Crystallography - Basic terms-types of crystal systems, Bravais lattices, miller indices, d spacing, Debye Scherrer powder method, laue method- Atomic packing factor for SC, BCC, FCC and HCP structures. Semiconductor Physics - conductor, semiconductor and Insulator; Basic concept of Band theory

### UNIT – V

[6 Hours]

**Modern Optics:** Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO<sub>2</sub> and Neodymium lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in engineering. Fiber optics and Applications, Types of optical fibers

### UNIT – VI

[6 Hours]

**Thermodynamics:** Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

#### Home Assignments:

Problems based on Newton rings, Michelson interference, young double slit

#### Laboratory

- 1) Magnetic field along the axis of current carrying coil – Stewart and Gee
- 2) Determination of Hall coefficient of semiconductor
- 3) Determination of Plank constant
- 4) Determination of wave length of light by Laser diffraction method
- 5) Determination of wave length of light by Newton's Ring method
- 6) Determination of laser and optical fiber parameters
- 7) Determination of Stefan's Constant.

#### Text Books:

1. Halliday, Resnic and Walker, Fundamentals of Physics, 9th Ed., John Wiley, 2011.
2. Beiser A, Concepts of Modern Physics, 5th Ed., McGraw Hill International, 2003.

3. Ajoy Ghatak, Optics, 5th Ed., Tata McGraw Hill, 2012
4. University Physics-Sears & Zemansky (Addison-Wesley)

**Reference Books:**

1. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt. Ltd.)
2. Basic Engineering Physics-I -Sujoy Bhattacharya, Saumen Paul (TMH)

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Business Communication & Value Science – I

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 2Hr./Week</b>	<b>Semester Examination: 50 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: 1 Hr. / Week</b>	<b>Continuous Assessment: No</b>	
<b>Lab: 2 Hrs. / Week</b>	<b>Term Work and Oral: 50 marks</b>	<b>TW and Oral :1 Credit</b>

### Course Pre-Requisites:

1. Basic communication in tenses (past, present, future).
2. Awareness of common words (adjectives used in daily verbal communication).
3. Basic idea of sentence formation and thereby paragraph building and writing.
4. Communication according to daily and varied contextual scenarios.
5. Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills.
6. Basic social etiquettes and knowledge of group work and communication that will enhance their professional growth.

### Course Objective:

The course aims to augment student's overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.

### Course Outcomes:

1. Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.
2. Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.
3. The ability to process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.
4. Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.
5. Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.

6. Understand the importance of team work, team motivation and effective team communication for further implementation in the corporate life. They should also be able to identify concretely between team and group dynamics.

**Topics to Be Covered:**

**UNIT – I [6 Hours]**

**Essential Grammar – I:** Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices.

**UNIT – II [6 Hours]**

**Vocabulary Enrichment:** Exposure to words from General Service List (GSL) by West, Academic word list (AWL) technical specific terms related to the field of technology, phrases, idioms, significant abbreviations formal business vocabulary

**Phonetic:** Pronunciation, Reduction of MTI in spoken English, Question formation with emphasis on common errors made during conversation

**UNIT – III [6 Hours]**

**Written Communication – I:** Letter Writing –Formal and Informal letter writing, Application letters, Report writing academic and business report, Job application letter

**UNIT – IV [6 Hours]**

**Communication Skills:** Importance of effective communication, types of communication- verbal and non - verbal, barriers of communication, effective communication, Listening Skills: Law of nature- Importance of listening skills, Difference between listening and hearing, Types of listening.

**UNIT – V [6 Hours]**

**Self - Awareness & Self Development:** Self - Assessment, Self - Appraisal, SWOT, Goal setting - Personal & career- Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self - appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Depression and Habit, relating SWOT analysis & goal setting, and prioritization

**Socio-Cultural and Cross-Cultural Sensitivities at the Workplace:** What is Inclusion? Women's contributions in Industry, work issues faced by women, what is sexual harassment, what is appropriate behavior for everyone at work

**UNIT – VI [6 Hours]**

**Interpersonal Skills – I:** Team work, Team effectiveness, Group discussion, Decision making - Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics. Multicultural team activity

**Time Management:** The Time management matrix, apply the Pareto Principle (80/20 Rule) to time management issues, to prioritize using decision matrices, to beat the most common time wasters, how to plan, how to handle interruptions, to maximize your personal effectiveness, how to say “no” to Time wasters

**Values of a good manager:** Understanding Corporate Values and behavior; Personal / Human Values; Pride and grace in Nationalist

**Text Books:**

1. Business Communication – Dr. Saroj Hire math
2. English vocabulary in use – Alan McCarthy and O’Dell

There will be handouts and reference links shared.

**Reference Books**

1. Strategic Writing by Charles Marsh
2. The Seven Basic Plots by Christopher Booker



**BHARATI VIDYAPEETH (Deemed to be University)**

**COLLEGE OF ENGINEERING, PUNE-43**

**B. Tech. (Computer Science & Business Systems)**

**Syllabus of Semester II**

**Mathematics II**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: Nil</b>	<b>Term Work: Nil</b>	

**Course Pre-Requisites:**

The students should have basic Knowledge of high school math, Boolean algebra and calculus.

**Course Objective:**

To develop ability to use the mathematical techniques, skills, and tools necessary for computer science.

**Course Outcomes:**

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

- 1) Apply knowledge of basics of Matrices, Determinants.
- 2) Solve the consistency of any type of systems
- 3) Describe Vector space, Orthogonality and Projection.
- 4) Apply methods Gram-Schmidt orthogonalization and QR decomposition.
- 5) Calculate Eigenvalues and Eigenvectors.
- 6) Describe Singular value decomposition and Principal component analysis.

**Topics to Be Covered:**

**UNIT – I**

**[6 Hours]**

Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.

## UNIT – II

[6 Hours]

Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

## UNIT – III

[6 Hours]

Vector space, Dimension, Basis, Orthogonality, Projection.

## UNIT – IV

[6 Hours]

Gram-Schmidt orthogonalization and QR decomposition.

## UNIT – V

[6 Hours]

Eigenvalues and Eigenvectors, Positive definite matrices, Linear transformations, Hermitian and Unitary matrices.

## UNIT – VI

[6 Hours]

Singular value decomposition and Principal component analysis, Introduction to their applications in Image Processing and Machine Learning.

### Home Assignments:

Assignments & tutorials covering the following: Vectors and linear combinations, Matrices, Determinants, Linear transformations, Complete solution to  $AX=b$ , Eigenvalues and Eigenvectors.

### Text Book:

1. B. S. Grewal, “Higher Engineering Mathematics”, Khanna Publication, Delhi.

### Reference Books:

1. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil.
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education.
3. Introduction to linear algebra, 5<sup>th</sup> Edition, Gilbert Strang.
4. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Digital Image Processing, R C Gonzalez and R E Woods.
6. <https://machinelearningmastery.com/introduction-matrices-machine-learning/>

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Statistics II

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr/Week	Continuous Assessment: 40 marks	
Lab: Nil	Term Work: Nil	

### Course Pre-requisites:

Basic of statistics and probability, Basic programming experience (in any language)

### Course Objective:

The course introduces fundamental concepts of linear statistical models, estimation methods, hypothesis testing and fundamental concepts of programming in R

### Course Outcomes:

The students completing this course will be able to

1. Understand the basic concepts of Statistical Inference,
2. Understand the basic concepts of Estimation methods,
3. Understand the basic concepts of Hypothesis Testing
4. Understand the basic concepts of linear statistical models.
5. Understand Introductory R language fundamentals, basic syntax and how to use R; what R is and how it's used to perform data analysis;
6. Understand major R data structures and create visualizations using R.

### UNIT – I [6 Hours]

**Linear Statistical Models:** Simple linear regression & correlation, multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

### UNIT – II [6 Hours]

**Estimation:** Point estimation, criteria for good estimates (unbiasedness, consistency), Methods of estimation including maximum likelihood estimation.

### UNIT – III [6 Hours]

**Sufficient Statistic:** concept & examples, complete sufficiency, their application in estimation

### UNIT – IV [6 Hours]

**Test of hypothesis:** concept & formulation, type I and type II errors, Neyman Pearson lemma, Procedures of testing

**UNIT – V****[6 Hours]**

**Non-parametric Inference:** Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region

**Basics of Time Series Analysis & Forecasting:** Stationary, ARIMA Models: Identification, Estimation and Forecasting.

**UNIT – VI****[6 Hours]**

**R statistical programming language:** Introduction to R, Functions, Control flow and Loops, Working with Vectors and Matrices, Reading in Data, Writing Data, Working with Data, Manipulating Data, Simulation, Linear model, Graphics in R

**Home Assignments:**

Problem sets to be shared by faculty covering the following topics:

Estimation Methods: Parametric & Non – Parametric, Hypothesis Testing

**Text Books:**

1. Probability and Statistics for Engineers (4th Edition) - I.R. Miller, J.E. Freund and R. Johnson.
2. Fundamentals of Statistics (vol. I and vol. II) - A. Goon, M. Gupta and B. Dasgupta.
3. Hands-on Programming with R - Garrett Grolemund
4. R for Everyone: Advanced Analytics and Graphics - Jared P. Lander

**Reference Books:**

1. Statistical Theory with Engineering Application - A. Hald.
2. Statistical Methods - G.W. Snedecor and W.G. Cochran.
3. Statistical Concepts & Methods - G.K. Bhattacharyya and R.A. Johnson.
4. Introduction to Linear Regression Analysis - D.C. Montgomery & E. Peck
5. Introduction to the Theory of Statistics - A.M. Mood, F.A. Graybill & D.C. Boes.
6. Practical Non-Parametric Statistics - W.J. Conover
7. Applied Regression Analysis - N. Draper & H. Smith

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Data Structures & Problem Solving

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3 Hrs. / Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1 Hr. / Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: 2 Hrs./ Week</b>	<b>Term Work and Practical: 50 Marks</b>	<b>TW and Practical :1 Credit</b>

### Course Pre Requisites:

Students should have knowledge of Fundamentals of data types and programming concepts

### Course Objective:

The course is aimed to provide an understanding of key concepts underlying the choice and implementation of data structures, algorithms and step by step approach in solving problems with the help of these fundamental data structures.

### Course Outcomes:

#### Students will be able to:

- 1) Understand the fundamentals and analysis of algorithms
- 2) Understand and implement Linear data structures
- 3) Understand and implement Non Linear data structure of Trees.
- 4) Understand and implement Non Linear data structure of Graphs.
- 5) Understand and implement the .
- 6) Understand the concepts of distributed system security.

### Topics to Be Covered:

#### UNIT – I

[6 Hours]

**Basic Terminologies & Introduction to Algorithm and Data Organization:** Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

#### UNIT – II

[6 Hours]

**Linear Data Structure:** Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures

### UNIT – III

[6 Hours]

**Non-linear Data Structure Trees** Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree), Various Representations, Operations : search and traversal algorithms and complexity analysis  
Applications of Trees.

### UNIT – IV

[6 Hours]

**Non-linear Data Structure Graphs:** Graphs : Directed and Undirected, Various Representations  
Operations: Search and traversal algorithms and complexity analysis  
Applications of Graphs.

### UNIT – V

[6 Hours]

**Searching and Sorting:** Sequential Search, Binary Search, Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing

### UNIT – VI

[6 Hours]

**File:** Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes

#### Home Assignments:

1. Towers of Hanoi using user defined stacks.
2. Reading, writing, and addition of polynomials.
3. Line editors with line count, word count showing on the screen.
4. Trees with all operations.
5. All graph algorithms.
6. Saving / retrieving non-linear data structure in/from a file

#### Text Books:

1. Fundamentals of Data Structures, E. Horowitz and S. Sahni, 1977
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman

#### Reference Books:

1. The Art of Computer Programming: Volume 1: Fundamental Algorithms, Donald E. Knuth
2. Introduction to Algorithms, Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
3. Open Data Structures: An Introduction (Open Paths to Enriched Learning) ), 31st ed. Edition , Pat Morin

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

### Fundamentals of Economics

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3 Hrs/Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: Nil</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: Nil</b>	<b>Term Work: Nil</b>	

#### Course Pre-requisites:

Knowledge of Class XII level Mathematics

#### Course Objective:

1. To impart knowledge, with respect to concepts, principles of Economics, which govern the functioning of a firm/organization
2. To explain the students about concept of production, cost, national income, an aggregate supply and aggregate demand consumption

#### Course Outcomes:

After completing this course, students should be able to:

1. Demonstrate an understanding of the methods and principles of microeconomic and macroeconomic theory, including tradeoffs, opportunity costs, and marginal decision making.
2. Explain how markets work and how market prices are determined using principles of supply and demand.
3. Assess the impact of market failure such as externalities, and public goods and evaluate possible public policy remedies.
4. Analyze financial markets and investments, including the stock market, and their relation to the economy.
5. Evaluate key economic indicators (including GDP, unemployment, inflation) and their use in evaluating macroeconomic conditions.
6. Understand major macroeconomic tools, including fiscal and monetary policies, and their use in managing the economy. Also apply ethical principles in a variety of economic contexts.

#### Topics to Be Covered:

### UNIT – I

**[6 Hours]**

#### Microeconomics

Principles of Demand and Supply – Supply Curves of Firms – Elasticity of Supply



Demand Curves of Households – Elasticity of Demand Equilibrium and Comparative Statics  
(Shift of a Curve and Movement along the Curve) Welfare Analysis – Consumers’ and  
Producers’ Surplus – Price Ceilings and Price Floors

**UNIT – II**

**[6 Hours]**

Consumer Behaviour – Axioms of Choice – Budget Constraints and Indifference Curves  
Consumer’s Equilibrium – Effects of a Price Change, Income and Substitution Effects –  
Derivation of a Demand Curve  
Applications – Tax and Subsidies – Intertemporal Consumption – Suppliers’ Income Effect

**UNIT – III**

**[6 Hours]**

Theory of Production – Production Function and Iso-quants – Cost Minimization  
Cost Curves – Total, Average and Marginal Costs – Long Run and Short Run Costs  
Equilibrium of a Firm Under Perfect Competition Monopoly and Monopolistic Competition

**UNIT – IV**

**[6 Hours]**

**Macroeconomics**

National Income and its Components – GNP, NNP, GDP, NDP  
Consumption Function  
Investment  
Simple Keynesian Model of Income Determination and the Keynesian Multiplier  
Government Sector – Taxes and Subsidies  
External Sector – Exports and Imports

**UNIT – V**

**[6 Hours]**

Money – Definitions  
Demand for Money – Transactionary and Speculative Demand  
Supply of Money – Bank’s Credit Creation Multiplier  
Integrating Money and Commodity Markets – IS, LM Model  
Business Cycles and Stabilization – Monetary and Fiscal Policy – Central Bank and the  
Government

**UNIT – VI**

**[6 Hours]**

The Classical Paradigm – Price and Wage Rigidities – Voluntary and Involuntary Unemployment.

**Home Assignments:**

In the discussion topics mentioned above, students should be asked to prepare in advance in groups  
and present in class

**Text Books:**

1. Microeconomics- Pindyck, Robert S., and Daniel L. Rubinfeld Microeconomics
2. Macroeconomics- Dornbusch, Fischer and Startz

**Reference Books:**

Other articles could be sent through email as and when a relevant topic is discussed.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Principles of Electronics

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 3Hrs/Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: Nil	Continuous Assessment: 40 marks	
Lab: 2 Hrs/ Week	Term Work and Oral: 50 marks	TW and Oral :1 Credit

**Course Pre Requisites:**

The students should have knowledge of Class XII level Electronics, Physics & Mathematics

**Course Objective:**

The course introduces fundamental concepts of electronics

**Course Outcomes:**

Students will be able to,

1. Identify semiconductor materials, draw band-diagrams, distinguish between intrinsic and extrinsic semiconductors.
2. Explain the phenomenon of rectification, draw the I-V characteristics and calculate ripple factor.
3. Explain the I-V characteristics of BJTs – both input and output; learn to bias transistors as an amplifier.
4. Describe FET and MOSFET and differentiate between BJT, FET and MOSFET.
5. Explain the fundamentals of feedback amplifiers and Operational Amplifier .
6. Demonstrate the knowledge of Boolean algebra including simplification techniques and operation of basic types of flip-flops.

## Topics to Be Covered:

### UNIT – I

[6 Hours]

**Semiconductors:** Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers.

### UNIT – II

[6 Hours]

**Diodes and Diode Circuits:** Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance. Linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.

### UNIT – III

[6 Hours]

**Bipolar Junction Transistors:** Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor

### UNIT – IV

[6 Hours]

**Field Effect Transistors:** Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles

### UNIT – V

[6 Hours]

**Feed Back Amplifier, and Operational Amplifiers:** Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator

**Digital Electronics Fundamentals:** Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters.

**List of Experiments:**

1. To plot V-I characteristics of PN junction diode.
2. To plot regulation characteristics of half wave rectifier
3. To plot regulation characteristics of Full wave rectifier
4. To plot input-output characteristics of CE configuration of BJT.
5. To study Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias circuits.
6. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
7. To study Colpitts Oscillator.
8. Study of OP-AMP circuits: Inverting and Non-inverting Amplifier.
9. Study of basic logic gates and De-Morgan's Theorem.
10. Study of half adder and full adder.

**List of Assignments: -**

1. Describe applications of diodes as Clippers and Clampers.
2. Describe application of Zener diode as Voltage regulator.
3. Study of characteristic curves for CB configuration of BJT using Virtual Lab.
4. Simulation of BJT amplifier using Virtual Lab.
5. Design and Implementation of Various Arithmetic Circuits using Virtual Lab.
6. To design, built and test any electronic circuit (Group activity)

**Text Books:**

1. Sedra & Smith: Microelectronics Engineering
2. Millman & Halkias: Integrated Electronics

**Reference Books:**

1. Electronic Devices and Circuit Theory by Robert Boylestad
2. Solid State Electronic Devices by Streetman, Banerjee
3. Malvino: Electronic Principle

4. Schilling & Belove: Electronics Circuits
5. Millman & Grabal: Microelectronics
6. Salivahanan: Electronics Devices & Circuits
7. Boylestad & Nashelsky: Electronic Devices & Circuit Theory

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

### **Business Communication & Value Science - II**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 2 Hrs/Week</b>	<b>Semester Examination: 50 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: 1 Hr/ Week</b>	<b>Continuous Assessment: Nil</b>	
<b>Lab: 2 Hrs/ Week</b>	<b>Term Work and Oral: 50 marks</b>	<b>TW and Oral :1 Credit</b>

#### **Course Pre-requisites:**

1. Basic knowledge of the parts of speech in English.
2. Vocabulary covered in the previous semester along with basic knowledge of verbs & adverbs.
3. Basic awareness of the need of speaking skills within social circle.
4. The elements of team dynamics done during the previous semester with proper application.
5. Basic awareness of the concepts of feedback, criticism.
6. The various common conflicts that may arise at varied situations.

#### **Course Objective:**

The course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The soft skills topics for this semester are intended to develop student's expertise on public speaking skills and to deal positively with criticism and so as to effectively present their personalities

#### **Course Outcomes:**

By the end of the course, students should be able to

1. Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators. They will be able to learn 20-25 common errors made in parts of speech and also use 10 modal verbs efficiently during professional communication.
2. Differentiate between vocabulary used as adjectives, verbs and adverbs and be able to use the 60-70 words for their daily conversation.

3. Overcome the fear of speaking and will be aware of the 3 types of public speaking necessary according to the contemporary requirements. They would be able to deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.
4. Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.
5. Analyze them relating to their hobbies and strengths and hence set realistic goals in terms of personal and professional growth. They will be able to identify at least 5-7 strengths and a couple of goals to be achieved that will enable their lives to be directed appropriately.
6. Apply 5-6 positive strategies to diversity and inclusion during team work.

**Topics to Be Covered:**

**UNIT – I**

**[6 Hours]**

**Essential Grammar – II:** Application of tenses, Auxiliaries- correct usage and importance in formal communication, Business Vocabulary - Vocabulary exercises through web-based applications

**UNIT – II**

**[6 Hours]**

**Written Communication II:** Email writing- Formal and Informal email writing structure, Inquiry letters, Instruction letters, complaint letters, Routine business letters, Sales Letters etc. Technical writing, Essay writing, Paragraph writing.

**UNIT – III**

**[6 Hours]**

**Vocabulary- II:** Vocabulary exercises through web-based applications, Usage and application through mock meetings

**Situational Conversation:** Application of grammar and correct spoken English according to context/ situation and application in business scenario.

**UNIT – IV**

**[6 Hours]**

**Fundamentals of Effective Communication:** Public Speaking: fundamentals of effective public speaking, types- Extempore speech, manuscript speech, and ways to enhance public speaking skills, storytelling, oral review

**Presentation Skills:** PowerPoint presentations, Effective ways to structure the presentation, importance of body language

**Leadership Skills, Leader’s Role, Responsibilities And Skill Required:** Understanding good Leadership behaviors, Learning the difference between Leadership and Management, Gaining insight into your Patterns, Beliefs and Rules, Defining Qualities and Strengths of leadership, Determining how well you perceive what's going on around you, interpersonal Skills and Communication Skills, Learning about Commitment and How to Move Things Forward, Making Key Decisions, Handling Your and Other People's Stress, Empowering, Motivating and Inspiring Others, Leading by example, effective feedback.

**Problem Solving Skill:** Problem solving skill, Confidence building

**UNIT – V**

**[6 Hours]**

**Corporate / Business Etiquettes:** Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behavior at the work place, Understand and Implement etiquettes in workplace, presenting oneself with finesse and making others comfortable in a business setting. Importance of first impression, Grooming, Wardrobe, Introduction to Ethics in engineering and ethical reasoning, rights and responsibilities

**UNIT – VI**

**[6 Hours]**

**Diversity and Inclusion Part II:** Socio-Cultural and Cross-Cultural Sensitivities at the Workplace: PwD and LGBT at the workplace, Learning disabilities at the workplace; Caste, class, regionalism, religion and poverty: the different identities of Indian employees and employers and how to include everyone; Global diversity identities of race, religion, nationhood; Appropriate Social Media Use

**Values Sciences Part II:** Values of a good manager: Ethics in Business; Embodying organizational pride with grace

**Text Books:**

1. Business Communication Today by Bovee, Thill, Raina
2. APAART: Speak Well 1 (English Language and Communication)
3. APAART: Speak Well 2 (Soft Skills)

**Reference Books:**

1. Strategic Communication by Charles Marsh
2. English vocabulary in use – Alan Mc’Carthy and O’dell
3. Business Communication – Dr. Saroj Hiremath

**Self Learning Module**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 0 Hrs/Week</b>	<b>Semester Examination: Nil</b>	
<b>Tutorials: 0 Hr. / Week</b>	<b>Continuous Assessment: Nil</b>	
<b>Lab: 2 Hrs/ Week</b>	<b>Term Work and Oral: 50 marks</b>	<b>TW and Oral :1 Credit</b>

Students will be undertaking self-learning courses in consultation with the faculty member as per their choices.



**Bharati Vidyapeeth**

**(Deemed to be University)**

**Pune, India**

**Faculty of Engineering and Technology**

**Programme: B.Tech (Computer Science and Business Systems)**

**COURSE STRUCTURE AND SYLLABUS**

**(Choice Based Credit System)**

**B.Tech (Computer Science and Business Systems)**

**2018 Course**



**Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune**  
**B.Tech- Computer Science & Business Systems (Semester- III and IV)**  
**Revised New Syllabus**

Semester- III		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.1	Formal Language and Automata Theory	4	1	2	6	60	20	10	10	-	50	150	5	1	6
2.2	Computer Organization & Architecture	4	0	2	5	60	20	10	10	-	50	150	4	1	5
2.3	Object Oriented Programming	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.4	Computational Statistics	3	0	2	5	60	20	10	10	50	-	150	3	1	4
2.5	Software Engineering	4	1	2	6	60	20	10	10	50	-	150	5	1	6
2.6	Indian Constitution (Non Credit)												0	0	0
<b>Total</b>		<b>18</b>	<b>2</b>	<b>10</b>	<b>27</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100</b>	<b>750</b>	<b>20</b>	<b>5</b>	<b>25</b>
Semester- IV		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
2.8	Operating Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.9	Database Management Systems	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.10	Software Design with UML	4	0	2	5	60	20	10	10	50	-	150	4	1	5
2.11	Introduction to Innovation, IP Management & Entrepreneurship	4	0	0	3	60	20	10	10	-	-	100	3	0	3
2.12	Business Communication & Value Science – III	2	0	4	6	50	0	0	0	-	50	100	2	2	4
2.13	Operations Research	2	0	2	4	60	20	10	10	-	50	150	2	1	3
2.14	Essence of Indian Traditional Knowledge(Non Credit)									-	-	0			
<b>Total</b>		<b>20</b>	<b>0</b>	<b>12</b>	<b>28</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100</b>	<b>800</b>	<b>19</b>	<b>6</b>	<b>25</b>

**BHARATI VIDYAPEETH (Deemed to be University)**  
**COLLEGE OF ENGINEERING, PUNE-43**  
**B. Tech. (Computer Science & Business Systems)**

**Vision of the Department**

“To syndicate industry and institute to impart high quality knowledge through scholarship, research and creative endeavor”

**Mission of the Department**

- To impart contemporary technology conforming to a dynamic curriculum.
- To engage in professional development and scholarly endeavor through knowledge of common business principles.
- To promote the awareness of business discipline and ethical responsibility through industry alliance

**Programme Educational Objectives**

1. Prevail technical competency to concord the industry engrossment.
2. Assimilate business management skills.
3. Instigate business level innovation with societal consideration.

**Programme Outcomes**

**The students of B.Tech (Computer Science & Business Systems) will be able to**

- a. Demonstrate logical and programming skills through comprehensive programming foundation.
- b. Apply knowledge of mathematics, computer engineering and basic science to comprehend and solve real world problems.
- c. Develop software applications and processes for complex problems to provide efficient solutions by assessing its environmental, social and ethical constraints.
- d. Investigate and solve complex computing problems with alternate solutions.
- e. Use functional skills of modern IT tools and techniques for engineering activities.
- f. Understand the social and cultural impact of computing on society.
- g. Provide optimized computational solutions that apprehend the societal and environmental aspects.
- h. exhibit the professional, ethical and legal responsibilities related to industry.
- i. Perform as an individual and efficient team player to accomplish a goal.
- j. Present professional concepts through effective communication skills and documentation.
- k. Demonstrate management skills for developing time-bound projects within the available budget and resources.
- l. Develop the ability of lifelong learning for new IT practices.

## FORMAL LANGUAGE & AUTOMATA THEORY

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	
<b>Lab: Nil</b>	<b>Term Work: Nil</b>	

### Course Pre Requisites:

The students should have basic Knowledge Set algebra, elementary formal logic, constructing proofs, recurrence relations, Discrete Structures and Data structures and problem solving.

### Course Objective:

1. To understand problem classification and problem solving by machines.
2. To understand the basics of automata theory and its operations.
3. To study computing machines by describing, classifying and comparing different types of computational models.
4. Encourage students to study theory of computability and complexity.
5. To understand the P and NP class problems and its classification.
6. To understand the fundamentals of problem decidability and reducibility.

### Course Outcomes:

- 1) To construct finite state machines to solve problems in computing.
- 2) To write mathematical expressions for the formal languages.
- 3) To understand context free and context sensitive languages.
- 4) To construct Turing Machine for formal languages.
- 5) To express the understanding of the decidability and undecidability problems.
- 6) To understand NP Hard and complete problems.

### Topics to Be Covered:

#### UNIT – I

[6 Hours]

**Introduction:** Alphabet, Strings and languages, Graphs, Directed Graphs, Trees.

#### UNIT – II

[6 Hours]

**Regular languages and finite automata:** Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, *Kleene's theorem*, pumping lemma for regular languages, *Myhill-Nerode theorem and its uses*, minimization of finite automata.

### UNIT – III

[6 Hours]

**Context-free languages and pushdown automata:** Productions and Derivation, Context-free grammars (CFG) and languages (CFL), Chomsky hierarchy of languages, Chomsky Normal Forms and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

**Context-sensitive languages:** Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

### UNIT – IV

[6 Hours]

**Turing machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

### UNIT – V

[6 Hours]

**Undecidability:** Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.

### UNIT – VI

[6 Hours]

**Basic Introduction to Complexity:** Introductory ideas on Time complexity of deterministic and nondeterministic Turing machines, P and NP, NP-completeness, Cook's Theorem, other NP-Complete problems.

#### Reference Books:

#### Text Books:

1. *Introduction to Automata Theory, Languages, and Computation* John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman.

#### Reference Books:

1. *Elements of the Theory of Computation*, Harry R. Lewis and Christos H. Papadimitriou.
2. *Automata and Computability*, Dexter C. Kozen.
3. *Introduction to the Theory of Computation*, Michael Sipser.
4. *Introduction to Languages and the Theory of Computation*, John Martin.
5. *Computers and Intractability: A Guide to the Theory of NP Completeness*, M. R. Garey and D. S. Johnson.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Syllabus of Semester III**  
**Computer Organization & Architecture**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	<b>Theory: 4 Credits</b>
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work and Oral: 50 Marks	<b>TW and Oral :1 Credit</b>

**Course Pre-Requisites:**

The students should have basic Knowledge Digital electronics and computer system

**Course Objective:**

To understand the design of the various functional units of computer system.

**Course Outcomes:**

After completion of this course students will be able to

- 1) Explain the architecture and functions of Central Processing Unit.
- 2) Solve fixed point and floating-point arithmetic problems using algorithms
- 3) List the design approaches and functional requirements for implementing control unit.
- 4) Analyze the characteristics of memory system.
- 5) Describe the I/O organization and interconnections.
- 6) Infer parallel processing and multiprocessor configuration.

**Topics to Be Covered:**

**UNIT – I**

**[8 Hours]**

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

**Functional blocks of a computer:** CPU, memory, input-output subsystems, control unit.

**Introduction to x86 architecture**

**Instruction set architecture of a CPU:** Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

## UNIT – II

[8 Hours]

**Data representation:** Signed number representation, fixed and floating point representations, character representation.

**Computer arithmetic:** Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

## UNIT III

[8 Hours]

**CPU control unit design:** Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

## UNIT – IV

[8 Hours]

Memory system design: Semiconductor memory technologies, memory organization.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

## UNIT – V

[4 Hours]

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB

## UNIT – VI

[4 Hours]

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

**Home Assignments:** Assignments covering the following topics should be given

1. Booth's algorithm for multiplication
2. Restoring and non-restoring division
3. Fixed point and floating point representation

4. Programmer's model of 80386
5. Hardwired and micro-programmed design approaches.
6. Characteristics of Memory system
7. Cache organization and address mapping
8. Virtual memory and replacement algorithms
9. Calculating throughput and speed in pipelining
10. Multiprocessor architecture

**Text Books:**

1. Computer System Architecture M. M. Mano., 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
3. Computer Organization and Embedded Systems, Carl Hamacher.

**Reference Books:**

1. Computer Architecture and Organization, John P. Hayes.
2. Computer Organization and Architecture: Designing for Performance, William Stallings

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



## B.Tech (Computer Science & Business Systems)

### Semester – III

#### OBJECT ORIENTED PROGRAMMING

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 3 Credits</b>
<b>Practical: 2 Hrs/Week</b>	<b>Continuous Assessment: 40 marks</b>	
	<b>Term Work and Practical: 50 marks</b>	<b>Term Work and Practical: 1 Credit</b>

#### Course Pre Requisites:

The students should have basic Knowledge of “C” programming language.

#### Course Objective:

The course introduces fundamental concepts of Object oriented programming.

#### Course Outcomes:

At the end of this course students will able to:

- 1) Understand basic concepts of Procedural programming and, the overview of C programming language
- 2) Understand some basic difference between C and C++.
- 3) Understand basic concepts of Object Oriented Programming, classes and objects in OOP.
- 4) Apply the concept of Access Specifier, friend function, constructor, destructor and Error Handling using C++ programs
- 5) Implement the concept of polymorphism, virtual functions and inheritance using C++
- 6) Develop OOP applications using Templates and file Handling.

#### Topics to Be Covered:

##### UNIT-I

[6 Hours]

**Procedural programming, An Overview of C:** Types Operator and Expressions, Scope and Lifetime, Constants, Pointers, Arrays, and References, Control Flow, Functions and Program Structure, Namespaces, error handling, Input and Output (C-way), Library Functions (string, math, stdlib), Command line arguments, Pre-processor directive

##### UNIT-II

[6 Hours]

**Some difference between C and C++:** Single line comments, Local variable declaration within function scope, function declaration, function overloading, stronger type checking, Reference variable, parameter passing – value vs reference, passing pointer by value or reference, #define

constant vs const, Operator new and delete, the typecasting operator, Inline Functions in contrast to macro, default arguments

**UNIT-III**

**[6 Hours]**

**The Fundamentals of Object Oriented Programming:** Necessity for OOP, Data Hiding, Data Abstraction, Encapsulation, Procedural Abstraction, Class and Object.

**UNIT-IV**

**[6 Hours]**

**More extensions to C in C++ to provide OOP Facilities:** Scope of Class and Scope Resolution Operator, Member Function of a Class, private, protected and public Access Specifier, this Keyword, Constructors and Destructors, friend class, error handling (exception)

**UNIT-V**

**[6 Hours]**

**Essentials of Object Oriented Programming:** overloading, Inheritance – Single and Multiple, Class Hierarchy, Pointers to Objects, Assignment of an Object to another Object, Polymorphism through dynamic binding, Virtual Functions, Overloading, overriding and hiding, Error Handling

**UNIT-VI**

**[6 Hours]**

**Generic Programming:** Template concept, class template, function template, template specialization

**Input and Output:** Streams, Files, Library functions, formatted output

**Object Oriented Design and Modelling:** UML concept, Use case for requirement capturing, Class diagram, Activity diagram and Sequence Diagram for design, Corresponding C++ code from design

**Text Books:**

1. The C++ Programming Language, Bjarne Stroustrup.
2. C++ and Object-Oriented Programming Paradigm, Debasish Jana

**Reference Books:**

1. Programming – Principles and Practice Using C++, Bjarne Stroustrup.
2. The Design and Evolution of C++, Bjarne Stroustrup.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## B.Tech in Computer Science & Business Systems

### Final Syllabus, Semester – III

#### Computational Statistics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	<b>Theory: 3 Credits</b>
Practical: 04 Hours / Week	Continuous Assessment: 40 Marks	<b>TW and Practical :1 Credit</b>
	Term Work and Practical: 50 Marks	

**Course Pre-requisites:** The Students should have knowledge of basics of statistics.

#### **Course Objectives:**

The aim of this course is to give graduate students a solid foundation of computational statistics, basics of analysis and Python programming. The course objective is to exercise students for data set handling, data wrangling, data visualization etc. using Python.

#### **Course Outcomes:**

- Understand basics of normal distribution and linear regression model.
- Apply knowledge of multivariate regression and discriminant analysis.
- Outline component analysis and factor analysis.
- Design various clusters
- Understand and demonstrate fundamentals of Python programming.
- Demonstrate visualization in Python

#### **Topics to Be Covered:**

##### **UNIT – I**

**[8 Hours]**

**Multivariate Normal Distribution:** Multivariate Normal Distribution Functions, Conditional Distribution and its relation to regression model, Estimation of parameters.

**Multiple Linear Regression Model:** Standard multiple regression models with emphasis on detection of collinearity, outliers, non-normality and autocorrelation, Validation of model assumptions.

##### **UNIT – II**

**[5 Hours]**

**Multivariate Regression:** Assumptions of Multivariate Regression Models, Parameter estimation, Multivariate Analysis of variance and covariance.

**Discriminant Analysis:** Statistical background, linear discriminant function analysis, Estimating linear discriminant functions and their properties.

##### **UNIT III**

**[7 Hours]**

**Principal Component Analysis:** Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

**Factor Analysis:** Factor analysis model, Extracting common factors, determining number of factors, Transformation of factor analysis solutions, Factor scores.

#### UNIT – IV

[5 Hours]

**Clustering and Segmentation Analysis:** Introduction, Types of clustering, Correlations and distances, clustering by partitioning methods, hierarchical clustering, overlapping clustering, K-Means Clustering-Profiling and Interpreting Clusters.

#### UNIT – V

[6 Hours]

**Python Concepts, Data Structures, Classes:** Interpreter, Program Execution, Statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files - Reading and Writing.

**Data Wrangling:** Combining and Merging Datasets, Reshaping and Pivoting, Data Transformation, String Manipulation, Regular Expressions

#### UNIT – VI

[6 Hours]

**Data Aggregation, Group Operations, Time series:** GroupBy Mechanics, Data Aggregation, Groupwise Operations and Transformations, Pivot Tables and Cross Tabulations, Time Series Basics, Data Ranges, Frequencies and Shifting

**Visualization in Python:** Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches.

#### Term Work

1. Introduction to python programming (String operation, Mathematical operation, loops, branching).
2. Implementation of classes and constructor in Python.
3. Implementation of basic data structures in Python.
4. File Handling in the Python.
5. Introduction to data set handling in Python.
6. Implement various pre-defined libraries in Python like Panda, NumPy, Cbor (Drawing of statistical graph).
7. Implementation Multivariate Normal Distribution.
8. Implementation Multiple Linear Regression Model
9. Implementation Multivariate Regression
10. Implementation Discriminant Analysis
11. Implementation clustering and segmentation
12. Implementation of data wrangling, data aggregation, group operations and time series operations.
13. Data Visualization in Python.

#### **Text Books:**

1. *An Introduction to Multivariate Statistical Analysis*, T.W. Anderson.
2. *Applied Multivariate Data Analysis, Vol I & II*, J.D. Jobson.
3. *Beginning Python: From Novice to Professional*, Magnus Lie Hetland. Edition, 2005.

#### **Reference Books:**

1. *The Foundations of Factor Analysis*, A.S. Mulaik.
2. *Introduction to Linear Regression Analysis*, D.C. Montgomery and E.A. Peck.
3. *Python for Data Analysis*, Wes Mc Kinney.
4. *Programming Python*, Mark Lutz.
5. *Python 3 for Absolute Beginners*, Tim Hall and J-P Stacey.

## SOFTWARE ENGINEERING

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 4Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 5 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 2Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

### Course Pre Requisites:

The students should have sound knowledge of data structures, programming experience and an extensive hands-on experience of using software.

### Course Objective:

The course introduces key aspects of software engineering processes for the development of a complex software system.

### Course Outcomes:

1. Learn importance of software engineering process and its principles
2. Understand the software development life cycle with appropriate models
3. Understand software quality concepts
4. Document user requirements using suitable techniques
5. Analyze the software design from and Object Oriented perspective.
6. Apply appropriate testing techniques on a software

### Topics to Be Covered:

#### UNIT – I [6 Hours]

**Introduction:** Programming in the small vs. programming in the large; software project failures and importance of software quality and timely availability; engineering approach to software development; role of software engineering towards successful execution of large software projects; emergence of software engineering as a discipline.

#### UNIT – II [6 Hours]

**Software Project Management:** Basic concepts of life cycle models – different models and milestones; software project planning –identification of activities and resources; concepts of feasibility study; techniques for estimation of schedule and effort; software cost estimation models and concepts of software engineering economics; techniques of software project control and reporting; introduction to measurement of software size; introduction to the concepts of risk and its mitigation; configuration management.

### **UNIT – III [6 Hours]**

**Software Quality and Reliability:** Internal and external qualities; process and product quality; principles to achieve software quality; introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126; introduction to Capability Maturity Models (CMM and CMMI); introduction to software reliability, reliability models and estimation.

### **UNIT – IV [6 Hours]**

**Software Requirements Analysis, Design and Construction:** Introduction to Software Requirements Specifications (SRS) and requirement elicitation techniques; techniques for requirement modeling – decision tables, event tables, state transition tables, Petri nets; requirements documentation through use cases; introduction to UML, introduction to software metrics and metrics based control methods; measures of code and design quality.

### **UNIT – V [6 Hours]**

**Object Oriented Analysis, Design and Construction:** Concepts -- the principles of abstraction, modularity, specification, encapsulation and information hiding; concepts of abstract data type; Class Responsibility Collaborator (CRC) model; quality of design; design measurements; concepts of design patterns; Refactoring; object oriented construction principles; object oriented metrics.

### **UNIT – VI [6 Hours]**

**Software Testing:** Introduction to faults and failures; basic testing concepts; concepts of verification and validation; black box and white box tests; white box test coverage – code coverage, condition coverage, branch coverage; basic concepts of black-box tests – equivalence classes, boundary value tests, usage of state tables; testing use cases; transaction based testing; testing for non-functional requirements – volume, performance and efficiency; concepts of inspection.

#### **Home Assignments:**

1. UML diagrams
2. Data Flow Diagrams
3. Testing
4. Software project covering various software development methodology techniques will be implemented.

#### **Text Books:**

1. *Software Engineering*, Ian Sommerville
2. *Object Oriented Software Engineering: A Use Case Driven Approach* --Ivar Jacobson

#### **Reference Books:**

3. *Fundamentals of Software Engineering*, Carlo Ghezzi, Jazayeri Mehdi, Mandrioli Dino

4. *Software Requirements and Specification: A Lexicon of Practice, Principles and Prejudices*, Michael Jackson
5. *The Unified Development Process*, Ivar Jacobson, Grady Booch, James Rumbaugh
6. *Design Patterns: Elements of Object-Oriented Reusable Software*, Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides
7. *Software Metrics: A Rigorous and Practical Approach*, Norman E Fenton, Shari Lawrence Pfleeger

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## OPERATING SYSTEM

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 4Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 0Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 2Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

### **Course Pre Requisites:**

Prerequisites for this course include thorough knowledge in some high-level programming language of C or C++ and UNIX and Linux as programs are to be implemented by writing C code during the course and will cover the details of C and its close relationship to UNIX and Linux in the case study in 6<sup>th</sup> unit.

### **Course Objective:**

1. To learn the basic concepts of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the methods of process scheduling.
4. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the management aspects of memory management and virtual memory
6. To learn programmatically file management techniques

### **Course Outcomes:**

1. To learn the evolution of operating system.
2. To Understand the concept of process and process state transition and thread and concept of multithreading.
3. Understand the importance of scheduling and types of scheduling algorithms.
4. To understand the inter process communication strategies, concept of deadlock and criteria of deadlock occurrence along with its avoidance
5. To understand the memory management techniques, paging and segmentation.
6. To understand the file management and disk management techniques



## **Topics to Be Covered:**

### **UNIT – I [6 Hours]**

**Introduction:** Concept of Operating Systems (OS), Generations of OS, Types of OS, OS Services, Interrupt handling and System Calls, Basic architectural concepts of an OS, Concept of Virtual Machine, Resource Manager view, process view and hierarchical view of an OS.

### **UNIT – II [6 Hours]**

**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

**Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

### **UNIT – III [6 Hours]**

**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.

**Scheduling algorithms:** Pre-emptive and non-pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

### **UNIT – IV [6 Hours]**

**Inter-process Communication:** Concurrent processes, precedence graphs, Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Semaphores, Strict Alternation, Peterson's Solution, The Producer / Consumer Problem, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Barber's shop problem.

**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**Concurrent Programming:** Critical region, conditional critical region, monitors, concurrent languages, communicating sequential process (CSP); Deadlocks - prevention, avoidance, detection and recovery.

### **UNIT – V [6 Hours]**

**Memory Management:** Basic concept, Logical and Physical address maps, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction.

**Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page allocation, Partitioning, Paging, Page fault, Working Set, Segmentation, Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

### UNIT – VI [6 Hours]

**I/O Hardware:** I/O devices, Device controllers, Direct Memory Access, Principles of I/O.

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

**Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.

**Case study:** UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, UNIX system calls.

#### Home Assignments:

1. To implement scheduling algorithms
2. To implement resource allocation graph
3. To implement Banker's Algorithm
4. To implement the shell programming in UNIX OS

#### Text Books:

1. Operating System Concepts Essentials. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne.

#### Reference Books:

1. *Operating Systems: Internals and Design Principles*. William Stallings.
2. *Operating System: A Design-oriented Approach*. Charles Patrick Crowley.
3. *Operating Systems: A Modern Perspective*. Gary J. Nutt.
4. *Design of the Unix Operating Systems*. Maurice J. Bach.
5. *Understanding the Linux Kernel*, Daniel Pierre Bovet, Marco Cesati.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Database Management Systems

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 4 Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: NIL</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical : 1 credit</b>
<b>Lab: 2 Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

### Course Objectives:

- 1) Identify various techniques to communicate with database.
- 2) Relate relevant data for effective processing of data.
- 3) Construct a database to maintain data adroitly.
- 4) Study various queries and tools to deal with the data.
- 5) Understand the relation between data set and respective means to access it.
- 6) Understand influence of data in the effective development of software.

### Course Prerequisites:

**Students should have knowledge of**

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

### Course Outcomes:

1. Model an application's data requirements using conceptual modeling tools
2. Demonstrate concepts of relational algebra and queries
3. Demonstrate concepts of relational database design
4. Interpret the query processing and optimization activities in database
5. Interpret the transaction activities in database
6. Recognize the emerging database applications and security concerns

### Topics to Be Covered:

#### UNIT – I [6 Hours]

**Introduction:** Introduction to Database. Hierarchical, Network and Relational Models.

**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

**Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

## UNIT – II[6 Hours]

**Relational query languages:** Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL,ORACLE, DB2, SQL server.

## UNIT – III [6 Hours]

**Relational database design:** Domain and data dependency, Armstrong's axioms, Functional Dependencies, Normal forms, Dependency preservation, Lossless design.

## UNIT – IV [6 Hours]

**Query processing and optimization:** Evaluation of relational algebra expressions, Queryequivalence, Join strategies, Query optimization algorithms.

**Storage strategies:** Indices, B-trees, Hashing.

## UNIT – V [6 Hours]

**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

## UNIT – VI [6 Hours]

**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

**Advanced topics:** Object oriented and object relational databases, Logical databases, Webdatabases, Distributed databases, Data warehousing and data mining.

### Assignments:

Assignments & tutorials covering the relational database design and operations in SQL and PL/SQL

### Text Books:

1. Database System Concepts. Abraham Silberschatz, Henry F. Korth and S. Sudarshan.

### Reference Books:

1. *Principles of Database and Knowledge – Base Systems*, Vol 1 by J. D. Ullman.
2. *Fundamentals of Database Systems*. R. Elmasri and S. Navathe.
3. *Foundations of Databases*. Serge Abiteboul, Richard Hull, VictorVianu.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Software Design with UML

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 4Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Lab: 2Hrs./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
	<b>Term Work and Practical: 50</b>	

### Course Pre Requisites:

The students should have sound knowledge software engineering and programming experience using data structures.

### Course Objective:

To model software solutions, application structures, system behavior and business processes using .

### Course Outcomes:

7. Apply Unified Modeling Language (UML) for representation of an object-oriented system using different modeling views
8. Analyze requirements to represent logical design that is recognized by various object relationships.
9. Identify interaction among structural elements to translate analysis model into design model.
10. Model dependencies among packages and package element ownership
11. Model dynamic behavior of the system and message flow from one object to other.
12. Envision the topology of the physical components of a system where the software components are utilized

### Topics to Be Covered:

#### UNIT – I [6 Hours]

**Introduction to on Object Oriented Technologies and the UML Method:** Software development process: The Waterfall Model vs. The Spiral Model; The Software Crisis, description of the real world using the Objects Model; Classes, inheritance and multiple configurations; Quality software characteristics; Description of the Object Oriented Analysis process vs. the Structure Analysis Model. **UML Language:** Standards; Elements of the language; General description of various models; The process of Object Oriented software development; Description of Design Patterns; Technological Description of Distributed Systems.

## UNIT – II [6 Hours]

**Requirements Analysis Using Case Modeling AND The Logical View Design:** Analysis of system requirements; Actor definitions; Writing a case goal; Use Case Diagrams; Use Case Relationships. **The Static Structure Diagrams:** The Class Diagram Model; Attributes descriptions; Operations descriptions; Connections descriptions in the Static Model; Association, Generalization, Aggregation, Dependency, Interfacing, Multiplicity.

## UNIT – III [6 Hours]

**Transfer from Analysis to Design in the Characterization Stage: Interaction Diagrams:** Description of goal; Defining UML Method, Operation, Object Interface, Class; Sequence Diagram; Finding objects from Flow of Events; Describing the process of finding objects using a Sequence Diagram; Describing the process of finding objects using a Collaboration Diagram

## UNIT – IV [6 Hours]

**Package Diagram Model:** Description of the model; White box, black box; Connections between packages; Interfaces. ; Create Package Diagram; Drill Down.

## UNIT – V [6 Hours]

**Dynamic Model: State Diagram / Activity Diagram:** Description of the State Diagram; Events Handling; Description of the Activity Diagram; Exercise in State Machines.

## UNIT – VI [6 Hours]

**Component Diagram Model:** Physical Aspect; Logical Aspect; Connections and Dependencies; User face; Initial DB design in a UML environment. **Deployment Model:** Processors; Connections; Components; Tasks; Threads; Signals and Events.

### Home Assignments:

5. Study of UML notations
6. Class diagram
7. Interaction diagrams
8. Activity diagram
9. State diagram
10. Software project covering various software development methodology techniques will be implemented.

### Text Books:

1. Object-Oriented Software Engineering: using UML, Patterns, and Java. Bernd Bruegge and Allen H. Dutoit.

### Reference Books:

1. Design Patterns: Elements of Reusable Object-Oriented Software. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Introduction to Innovation, IP Management & Entrepreneurship**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 5 Credits</b>
<b>Tutorials: 0Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 0Hrs./Week</b>	<b>Term Work and Practical: 00</b>	

### **Course Pre Requisites:**

Good knowledge of Fundamentals of Management (Covered in Year 2, Semester 1)

### **Course Objective:**

The major emphasis of the course will be on creating a learning system through which management students can enhance their innovation and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

### **Course Outcomes:**

As a part of this course, students will:

- Learn to be familiar with creative and innovative thinking styles.
- Learn opportunity reorganization and entrepreneurship skills.
- Learn to investigate, understand and internalize the process of founding a startup.
- Understand financial aspects of Entrepreneurship.
- Learn to manage various types of IPR to protect competitive advantage.
- Understand the types of IP.

### **Topics to Be Covered:**

#### **UNIT – I [6 Hours]**

#### **Innovation: What and Why?**

Innovation as a core business process, Sources of innovation, Knowledge push vs. need pull innovations.

Class Discussion- Is innovation manageable or just a random gambling activity?

## **UNIT – II [6 Hours]**

### **Building an Innovative Organization**

Creating new products and services, Exploiting open innovation and collaboration, Use of innovation for starting a new venture

*Class Discussion- Innovation: Co-operating across networks vs. 'go-it-alone' approach*

## **UNIT – III [6 Hours]**

### **Entrepreneurship:**

- Opportunity recognition and entry strategies
- Entrepreneurship as a Style of Management
- Maintaining Competitive Advantage- Use of IPR to protect Innovation

## **UNIT – IV [6 Hours]**

### **Entrepreneurship- Financial Planning:**

- Financial Projections and Valuation
- Stages of financing
- Debt, Venture Capital and other forms of Financing

## **UNIT – V [6 Hours]**

### **Intellectual Property Rights (IPR)**

- Introduction and the economics behind development of IPR: Business Perspective
- IPR in India – Genesis and Development
- International Context
- Concept of IP Management, Use in marketing

## **UNIT – VI [6 Hours]**

### **Types of Intellectual Property**

- Patent- Procedure, Licensing and Assignment, Infringement and Penalty
- Trademark- Use in marketing, example of trademarks- Domain name
- Geographical Indications- What is GI, Why protect them?



- Copyright- What is copyright
- Industrial Designs- What is design? How to protect?

Class Discussion- Major Court battles regarding violation of patents between corporate companies.

**Home Assignments:**

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

Topic 1- Is innovation manageable or just a random gambling activity?

Topic 2- Innovation: Co-operating across networks vs. ‘go-it-alone’ approach.

Topic 3- Major Court battles regarding violation of patents between corporate companies.

**Text Books:**

1. Joe Tidd, John Bessant. *Managing Innovation: Integrating Technological, Market and Organizational Change*
2. Case Study Materials: To be distributed for class discussion

<b>Syllabus for Unit Test:</b>	<b>Unit</b>
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **Business Communication and Value Science-III**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 2Hrs./Week</b>	<b>Semester Examination: 50 marks</b>	<b>Theory: Credits 02</b>
<b>Tutorials: 0 Hr./Week</b>	<b>Continuous Assessment: No</b>	<b>Term Work Credit: 02</b>
<b>Lab: 4 Hrs./Week</b>	<b>Term Work and Oral: 50</b>	

### **Course Pre Requisites:**

Good knowledge of Business Communication and Value Science (Covered Semester 1 and 2) Basic Knowledge of English (verbal and written) Completion of all units from Semesters 1 and 2

### **Course Objective:**

Develop technical writing skills; introduce students to Self-analysis techniques like SWOT & TOWS and develop the sense of Pluralism & cultural spaces, Cross-cultural communication, Science of Nation building.

### **Course Outcomes:**

**Upon completion of the course, students shall have ability to**

Apply & analyze the basic principles of SWOT & life positions.

Understand, analyze & leverage the power of motivation in real life.

Identify & respect pluralism in cultural spaces.

Understand and apply the concepts of Global, glocal and translocational

Analyze cross cultural communication

Apply the science of Nation building, the diverse culture of India

Identify the common mistakes made in cross-cultural communication, tools of technical writing, recognize the roles and relations of different genders.

Understand Artificial intelligence & recognize its impact in daily life

**Topics to Be Covered:**

**UNIT – I**

**[6 Hours]**

**SWOT and Life Positions:**

Summarize the basic principles of SWOT and Life Positions; apply SWOT in real life scenarios. TOWS analysis, research on TOWS and find out how you can turn your threat into opportunity

**UNIT – II**

**[6 Hours]**

**SWOT and TOWS:**

Research through SWOT and TOWS on what are the strengths they have identified to survive in the VUCA World, Motivation: its role and application in real life.

**UNIT – III**

**[6 Hours]**

**Pluralism in cultural spaces:**

Identify pluralism in cultural spaces, Respect pluralism in cultural spaces, Differentiate between the different cultures of India,

**UNIT – IV**

**[6 Hours]**

**Cross cultural communication**

Define the terms global, glocal and translocational, Differentiate between global, glocal and translocational culture, implications of cross-cultural communication, common mistakes made in cross-cultural communication, roles and relations of different genders

**UNIT – V**

**[6 Hours]**

**Nation Building:**

Role of science in nation building, tools and best practices of technical writing, technical writing in real-life scenarios

**UNIT – VI**

**[6 Hours]**

**Roles of technical writing in science and technology:**

AI (artificial intelligence), the importance of AI, Designing College in the year 2090 with help of technical writing and technology, role of technical writing in science and technology, IOT

**Text Books:**

1. Swot Analysis: A Guide to Swot for Business Studies Students by [Alan Sarsby](#)
2. The SWOT Analysis: Using Your Strength to Overcome Weaknesses, Using Opportunities to Overcome Threats by [Lawrence G. Fine](#)
3. Cross-Cultural and Intercultural Communication by [William B. Gudykunst](#)

## Operations Research

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 2Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 2 Credits</b>
<b>Tutorials: 0Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 2Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

### Course Pre Requisites:

Good knowledge of mathematics (Covered in Year 1,2)

### Course Objective:

### Course Outcomes:

As a part of this course, students will:

- Understand OR problem and associated models.
- Understand Linear Algebra.
- Use transportation and assignment problems.
- Use PERT for modeling.
- Use Inventory Control System.
- Apply queuing theory and modulation techniques.

### Topics to Be Covered:

#### UNIT – I [6 Hours]

#### Introduction to OR:

Origin of OR and its definition. Concept of optimizing performance measure, Types of OR problems, Deterministic vs. Stochastic optimization, Phases of OR problem approach – problem formulation, building mathematical model, deriving solutions, validating model, controlling and implementing solution.

#### UNIT – II [6 Hours]

#### Linear Programming:

Linear programming – Examples from industrial cases, formulation & definitions, Matrix form. Implicit assumptions of LPP.

Some basic concepts and results of linear algebra – Vectors, Matrices, Linear Independence / Dependence of vectors, Rank, Basis, System of linear eqns., Hyperplane, Convex set, Convex polyhedron, Extreme points, Basic feasible solutions.

Geometric method: 2-variable case, Special cases – infeasibility, unboundedness, redundancy & degeneracy, Sensitivity analysis.

Simplex Algorithm – slack, surplus & artificial variables, computational details, big-M method, identification and resolution of special cases through simplex iterations.

Duality – formulation, results, fundamental theorem of duality, dual-simplex and primal-dual algorithms.

### **UNIT – III [6 Hours]**

#### **Transportation and Assignment problems:**

TP - Examples, Definitions – decision variables, supply & demand constraints, formulation, Balanced & unbalanced situations, Solution methods – NWCR, minimum cost and VAM, test for optimality (MODI method), degeneracy and its resolution.

AP - Examples, Definitions – decision variables, constraints, formulation, Balanced & unbalanced situations, Solution method – Hungarian, test for optimality (MODI method), degeneracy & its resolution.

### **UNIT – IV [6 Hours]**

#### **PERT – CPM:**

Project definition, Project scheduling techniques – Gantt chart, PERT & CPM, Determination of critical paths, Estimation of Project time and its variance in PERT using statistical principles, Concept of project crashing/time-cost trade-off.

### **UNIT – V [6 Hours]**

#### **Inventory Control:**

Functions of inventory and its disadvantages, ABC analysis, Concept of inventory costs, Basics of inventory policy (order, lead time, types), Fixed order-quantity models – EOQ, POQ & Quantity discount models. EOQ models for discrete units, sensitivity analysis and Robustness, Special cases of EOQ models for safety stock with known / unknown stock out situations, models under prescribed policy, Probabilistic situations.

### **UNIT – VI [6 Hours]**

#### **Queuing Theory:**

Definitions – queue (waiting line), waiting costs, characteristics (arrival, queue, service discipline) of queuing system, queue types (channel vs. phase).

Kendall's notation, Little's law, steady state behavior, Poisson's Process & queue, Models with examples - M/M/1 and its performance measures; M/M/m and its performance measures; brief description about some special models.

#### **Simulation Methodology:**

Definition and steps of simulation, random number, random number generator, Discrete Event System Simulation – clock, event list, Application in Scheduling, Queuing systems and Inventory systems.

**Text Books:**

3. *Operations Research: An Introduction.* H.A. Taha.

**Reference Books:**

1. *Linear Programming.* K.G. Murthy.
2. *Linear Programming.* G. Hadley.
3. *Principles of OR with Application to Managerial Decisions.* H.M. Wagner.
4. *Introduction to Operations Research.* F.S. Hiller and G.J. Lieberman.
5. *Elements of Queuing Theory.* Thomas L. Saaty.
6. *Operations Research and Management Science, Handbook:* Edited By A. Ravi Ravindran.
7. *Management Guide to PERT/CPM.* Wiest & Levy.
8. *Modern Inventory Management.* J.W. Prichard and R.H. Eagle.

<b>Syllabus for Unit Test:</b>	<b>Unit</b>
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Essence of Indian Traditional Knowledge

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 2Hrs./Week	Semester Examination: 50 marks	Theory: Non-Credits

**Course Objective:** Give exposure to the repositories of our indigenous knowledge and wisdom which have evolved over centuries, and they still continue to serve social and cultural functions.

**Course Outcomes: Student will be able to**

1. Understand basic principles, thought process, reasoning and inference of Indian Traditional Knowledge Systems.
2. Recognize wisdom of Sanskrit literature and its importance in modern society with rapid technological advancements.
3. Be familiar with scientific worldview and basic principles of Yoga and holistic health care system
4. Understand that sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.

**Topics to Be Covered:**

### UNIT – I [6 Hours]

**Basic Structure of Indian Knowledge System:** The historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), Traditional Knowledge (TK) Vs western knowledge traditional knowledge vis-à-vis formal knowledge. Significance of TK Protection, value of TK in global economy, Role of Government to harness TK. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act).

### UNIT – II [6 Hours]

**Modern Science and Indian Knowledge System;** Mathematics in India, Early Historical Period, The Classical Period, The Classical Period, post-Āryabhaṭa, Features of Indian Mathematics. Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Indian Philosophy Sāṃkhya, Yoga, Vaiśeṣika, Nyāya, Mīmāṃsā, Vedānta, Sāṃkhya.

### UNIT – III [6 Hours]

Yoga and Holistic Health care: Ayurveda for Life, Health and Well-being ,Definition of Ayurveda, The Principles of Ayurvedic Healing, Treating diseases to restore health, Astanga Ayurveda.

**Reference Books:**

1. V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014.

2. Swami Jitatmanand, Holistic Science and Vedant, Bharatiya Vidya Bhavan.
3. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
4. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016

**E-Resources:**

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/121106003/>



**Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune**  
**B.Tech- Computer Science & Business Systems (Semester- V and VI)**  
**Revised New Syllabus Structure**

Semester- V		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
						Unit Test	Attendance	Assignments							
3.1	Design And Analysis of Algorithms	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.2	Compiler Design	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.3	Fundamentals of Management	4	0	0	4	60	20	10	10	--	--	100	4	0	4
3.4	Business Strategy	3	0	0	3	60	20	10	10	--	--	100	3	0	3
3.5	Design Thinking	3	0	2	5	60	20	10	10	--	50	150	3	1	4
3.6	Elective I	3	1	2	6	60	20	10	10	--	50	150	4	1	5
3.7	Mini Project	0	0	2	2	50	--	--	--	--	50	50	0	1	1
<b>Total</b>		<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>410</b>	<b>120</b>	<b>60</b>	<b>60</b>	<b>100</b>	<b>150</b>	<b>850</b>	<b>20</b>	<b>5</b>	<b>25</b>
<b>Elective I</b>		Conversational Systems													
		Cloud, Microservices & Application													
		Machine Learning													

Semester- VI		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
						Unit Test	Attendance	Assignments							
3.8	Computer Networks	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.9	Information Security	3	0	2	5	60	20	10	10	--	50	150	3	1	4
3.10	Artificial Intelligence	3	0	2	5	60	20	10	10	50	--	150	3	1	4
3.11	Financial & Cost Accounting	4	0	0	4	60	20	10	10	--	--	100	4	0	4
3.12	Business Communication & Value Science – IV	3	0	2	5	50	0	0	0	-	50	100	3	1	4
3.13	Elective II	3	1	2	6	60	20	10	10	--	50	150	4	1	5
<b>Total</b>		<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>350</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>800</b>	<b>20</b>	<b>5</b>	<b>25</b>

<b>Elective II</b>	Robotics and Embedded Systems
	Modern Web Applications
	Data Mining and Analytics

## DESIGN AND ANALYSIS OF ALGORITHMS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3 Hrs./Week	Semester Examination: 60 marks	Theory: 3 Credits
Tutorials: NA	Continuous Assessment: 40 marks	Term Work and Practical Credit: 1
Lab: 2 Hrs./Week	Term Work and Practical: 50	

**Course Pre Requisites:** Students should be well versed with algorithms and operations on basic data structures stacks, queues, linked lists, trees, graphs. Students should have knowledge of searching sorting algorithms.

**Course Objective:** Understand and compare important algorithmic design paradigms and methods of analysis. To choose and extend efficient algorithms required for designs.

### Course Outcomes:

After successful completion of this course students will be able to :

1. Interpret the performance of algorithms using analysis techniques.
2. Examine the fundamental algorithmic strategies.
3. Compare the fundamental algorithmic strategies.
4. Implement Graphs and trees algorithms.
5. Interpret the tractable or intractable problem.
6. Summarize the advance types of algorithms.

### Topics to Be Covered:

#### UNIT – I [6 Hours]

**Introduction:** Characteristics of Algorithm. Analysis of Algorithm: Asymptotic analysis of Complexity Bounds – Best, Average and Worst-Case behavior; Performance Measurements of Algorithm, Time and Space Trade-Offs, Analysis of Recursive Algorithms through Recurrence Relations: Substitution Method, Recursion Tree Method and Masters' Theorem.

#### UNIT – II [6 Hours]

**Fundamental Algorithmic Strategies:** Brute-Force technique, Heuristics, Greedy algorithms, , Illustrations of these techniques for Problem-Solving

#### UNIT – III [6 Hours]

**Fundamental Algorithmic Strategies (contd.) :** Dynamic Programming, Branch and Bound algorithms, Backtracking methodologies; Illustrations of these techniques for Problem-Solving

### UNIT – IV [6 Hours]

**Graph and Tree Algorithms:** Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

### UNIT – V [6 Hours]

**Tractable and Intractable Problems:** Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook’s theorem, Standard NP-complete problems and Reduction techniques.

### UNIT – VI [6 Hours]

**Advanced Topics:** Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE, Introduction to Quantum Algorithms.

#### Home Assignments:

Implementation of Different Algorithms based on various algorithmic strategies studied above using C

#### Text Books:

1. *Fundamental of Computer Algorithms*, E. Horowitz and S. Sahni, Orient Black Swan
2. *Introduction to Algorithms*, T. H. Cormen, C. E. Leiserson and R. L. Rivest, PHI Learning Pvt. Ltd. (Originally MIT Press)

#### Reference Books:

1. *The Design and Analysis of Computer Algorithms*, A. Aho, J. Hopcroft and J. Ullman, Pearson Education India
2. *Computer Algorithms: Introduction to Design and Analysis*, S. Baase, Pearson Education India
3. *The Art of Computer Programming, Vol. 1, Vol. 2 and Vol. 3*, .D. E. Knuth, Addison Wesley

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Compiler Design

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral credit: 1
Lab: 2Hrs./Week	Term Work and Oral: 50	

### Course Pre Requisites:

1. The students should have learnt Theory of Computation.
2. Basic of the structure of any Programming Language and Grammars.
3. Know the basics of Computer organization and Assembly Language Programming.

### Course Objective:

1. To study the Compiler Design Tools.
2. To understand the Compiler for various Programming Languages.

### Course Outcomes:

1. Understands compiler and various phases in compilation.
2. Understand Parser and its various techniques.
3. Understands Syntax Directed Translation, Symbol Tables and their applications.
4. Learn the techniques of Code Optimization.
5. Learn the techniques of Code improvement.
6. Understands compilation of Object Oriented features.

### Topics to Be Covered:

#### UNIT – I [6 Hours]

**Introduction:** Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, relating regular expressions and finite automata, scanner generator (lex, flex).

#### UNIT – II [6 Hours]

**Syntax Analysis (Top down Parser):** Context-free languages and grammars, push-down automata, Elimination of Left recursion, Elimination of Left factoring, Top down parsing, FIRST and FOLLOW, Non-Recursive Predictive Parsing, LL(1) grammars .

### UNIT – III [6 Hours]

**Syntax Analysis (Bottom Up Parser):** Operator grammars, Bottom-up parsing, Shift Reduce Parser, LR(O), SLR(1), LR(1), CLR,LALR(1) grammars, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

### UNIT – IV [6 Hours]

**Semantic Analysis:** Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

**Symbol Table:** Basic structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, scope.

### . UNIT – V [6 Hours]

**Intermediate Code Generation:** Translation of different language features, different types of intermediate forms

**Code Improvement (optimization):** Control-flow, data-flow dependence etc.; local optimization, global optimization, loop optimization, peep-hole optimization etc.

### UNIT – VI [6 Hours]

**Architecture dependent code improvement:** Instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation.

**Advanced topics:** Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

### Home Assignments:

Assignments using Lex and Yacc

### Text Books:

1. Compilers: Principles, Techniques and Tools, V. Aho, R. Sethi and J. Ullman.
2. Lex & Yacc, Levine R. John, Tony Mason and Doug Brown

### Reference Books:

The Design and Evolution of C++, Bjarne Stroustrup.

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## FUNDAMENTALS OF MANAGEMENT

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hrs/Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: NIL	Continuous Assessment: 40 marks	Term Work and Practical Credit: NIL
Lab: NIL	Term Work and Practical: Nil	

**Course Pre Requisites:** Preliminary awareness about the functioning of any organization

**Course Objective:**

1. To impart knowledge about various management and organization principles which governs the functioning of a firm/organization
2. To explain about concepts of leadership, organizational design, organization behavior and managerial ethics.

**Course Outcomes:** After completion of course, students should be able to

1. Understand the evolution of management
2. Explain intricacies of different functions of management.
3. Categorize behavior of individuals in an organization
4. Distinguish between approaches to organizational design.
5. Analyze importance and types of work ethics
6. Identify importance and traits of leadership

**Topics to Be Covered:**

**UNIT – I [6 Hours]**

**Management Theories:** Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo etc.

**UNIT – II [6 Hours]**

**Functions of Management-** Planning, Organizing, Staffing, Directing, Controlling

**UNIT – III [6 Hours]**

**Organization Behavior:** Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity

**UNIT – IV [6 Hours]**

**Organizational Design:** Classical, Neoclassical and Contingency approaches to organizational design; Organizational theory and design, Organizational structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure)

**UNIT – V [6 Hours]**

**Managerial Ethics:** Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision – making frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility

**UNIT – VI [6 Hours]**

**Leadership:** Concept, Nature, Importance, Attributes of a leader, developing leaders across the organization, Leadership Grid.

**Home Assignments:** The topic for class discussion will be mentioned beforehand and students should be ready to discuss these topics (in groups) in class. Students are required to meet in groups before coming to class and prepare on the topic. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate social responsibility (CSR) and HRM implications: What does it mean to be socially responsible within an increasingly financially driven market economy?
2. Topic: Leaders are Born, Not Made! The debate

**Text Books:** Richard L. Daft, *Understanding the Theory and Design of Organizations*

**Reference Books:**

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, *Organizational Behavior*
2. Other relevant articles or books could be sent later to the students.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **BUSINESS STRATEGY**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3 Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: NIL</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: NIL</b>
<b>Lab: NIL</b>	<b>Term Work and Practical: NIL</b>	

**Course Pre Requisites:** Introductory awareness of Business terminologies and functions

**Course Objective:** Familiarize the fundamental principles and practices of business development

**Course Outcomes:**

This course will help students,

1. To summarize the important concepts of strategic management
2. To identify the process and capabilities for internal environment of a firm.
3. To understand the strategies applicable for external environments of firm
4. To examine corporate strategies
5. To compare the various business growth strategies
6. To understand the process of strategy implementation

**Topics to Be Covered:**

### **UNIT – I [6 Hours]**

**Introduction to Strategic Management**

- Importance of Strategic Management
- Vision and Objectives
- Schools of thought in Strategic Management
- Strategy Content, Process, and Practice
- Fit Concept and Configuration Perspective in Strategic Management

### **UNIT – II [6 Hours]**

**Internal Environment of Firm- Recognizing a Firm's Intellectual Assets**

- Core Competence as the Root of Competitive Advantage
- Sources of Sustained Competitive Advantage
- Business Processes and Capabilities-based Approach to Strategy

### **UNIT – III [6 Hours]**



## **External Environments of Firm- Competitive Strategy**

- Five Forces of Industry Attractiveness that Shape Strategy
- The concept of Strategic Groups, and Industry Life Cycle
- Generic Strategies
- Generic Strategies and the Value Chain
- 

### **UNIT – IV [6 Hours]**

## **Corporate Strategy**

- The Motive for Diversification
- Related and Unrelated Diversification
- Business Portfolio Analysis

### **UNIT – V [6 Hours]**

## **Growth Strategies**

- Expansion, Integration and Diversification
- Strategic Alliances, Joint Ventures, and Mergers & Acquisitions

### **UNIT – VI [6 Hours]**

## **Strategy Implementation: Structure and Systems**

- The 7S Framework
- Strategic Control and Corporate Governance

## **Home Assignments:**

- Latest business events would be discussed in class and students should be ready to discuss these events (in groups). The topic will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare on the topic.
- There will be periodic homework assignments relating to the course concepts or mini-cases. Specific instructions will be given separately.

## **Text Books:**

1. Robert M. Grant (2012). *Contemporary Strategic Management*, Blackwell, 7th Edition.

## **Reference Books:**

1. M.E. Porter, *Competitive Strategy*, 1980. M.E. Porter,
2. *Competitive Advantage*, 1985 Richard Rumelt (2011).  
*Good Strategy Bad Strategy: The Difference and Why It Matters.*

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## **DESIGN THINKING**

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: NA</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work credit: 1</b>
<b>Lab: 2 Hrs./Week</b>	<b>Term Work and Oral: 50</b>	

**Course Pre Requisites:** Students should be well versed Completion of all units from Semesters 1, 2, 3 and 4

### **Course Objective:**

1. Recognize the importance of DT
2. Explain the phases in the DT process
3. List the steps required to complete each phase in DT process
4. Apply each phase in the DT process
5. Use doodling and storytelling in presenting ideas and prototypes
6. Create value proposition statements as part of their presentations
7. Recognize how DT can help in functional work
8. Recognize how Agile and DT complement each other to deliver customer satisfaction

### **Course Outcomes:**

After successful completion of this course students will be able to:

1. Implement the Phases in the DT process
2. Identify the steps required to conduct an immersion activity
3. Design personas to create problem statements in the define phase of DT
4. Apply the steps in the ideate phase of DT
5. Design a prototype to create a value proposition statement
6. Test a prototype created through a DT process

## **Topics to Be Covered:**

### **UNIT – I [6 Hours]**

**Introduction:** Recognize the importance of Design Thinking why is Design Thinking important for business?, Why is Design Thinking important for you? , Identify the steps in the DT process What is DT? Empathize (search for rich stories and find some love), Define (user need and insights – their POV), Ideate (ideas, ideas, ideas), Prototype (build to learn), Test (show, don't tell)

### **UNIT – II [6 Hours]**

**Empathy Phase:** Recognize the steps in the empathize phase of DT, What is empathy? Ask What? How? Why?, Different types to developing Empathy towards People Identify the steps required to conduct an immersion activity, How to empathize?, Intro to Immersion Activity, Conduct an immersion activity and fill up the DT question template, Immersion activity

### **UNIT – III [6 Hours]**

**Define Phase:** Creating personas: Recognize the steps to create personas in the define phase of DT, What is a persona and how do I create one? Four Different Perspectives on Personas 1)Goal-directed Personas 2)Role-Based Personas 3) Engaging Personas 4) Fictional Personas, 10 steps to Creating Your Engaging Personas and Scenarios Recognize the steps to create problem statements in the define phase of DT, Problem statements, Defining problem statements, Define the problem statements in the define phase of DT

### **UNIT – IV [6 Hours]**

**Ideate Phase:** How to Ideate?, Recognize the steps in the ideate phase of DT, Apply the steps in the ideate phase of DT, Ideation games: Game 1: Six Thinking Hats, Game 2: Million-dollar idea, Ideate to find solutions, Characteristics Required for Successful Ideation, Recognize how doodling can help to express ideas, Recognize the importance storytelling in presenting ideas and prototypes, What is Storytelling in DT?

### **UNIT – V [6 Hours]**

**prototype phase:** Recognize the importance of the prototype phase in DT, Prototype your idea, Create a prototype: Types of Prototyping 1)Low-Fidelity Prototyping 2) High-Fidelity Prototyping , Guidelines for Prototyping, Recognize the importance of service value proposition, Create a value proposition statement

### **UNIT – VI [6 Hours]**

**Testing Phase:** Testing in Design Thinking, Test the Prototype, Role of DT in your work, discuss How DT can help me to become a better coder?, Agile and DT complement each other to deliver customer satisfaction, Share your Satori.

### Home Assignments:

Implementation of Different Design Thinking Phase based on various activities.

### Text Books:

There are no prescribed texts for Semester 5 – there will be handouts and reference links shared.

### Reference Books:

Hooked by Nir Eyal

The Art of Creative Thinking by Rod Judkins

Start Up nation by Dan Senior and Saul singer

Start with Why by Simon Sinek

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

### Practical

#### Summative Assessment based on End Semester Project

<b>Bloom's Level</b>	<b>Topics</b>	<b>Contents</b>		<b>Marks</b>
Understand	Understand, Analyze, Apply	<b>Option 1:</b> Each group needs to present a Prototype of how they can apply DT in their functional work or coding. Examples will be provided to explain what exactly they need to do.  <b>Option 2:</b> Each group will apply DT to create a prototype to improve any existing product or service.  For both options, groups need to complete all phases of the Stanford DT model and include the outputs of each phase in their presentation.		50
Apply	Conduct and apply DT in the project.		<b>12 Hours</b>	
Analyze				

### Elective -I Machine Learning

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 3Hrs./Week	Semester Examination: 60 marks	Theory: 4 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Oral Credit: 1
Lab: 2 Hrs./Week	Term Work and Oral: 50	

#### Course Pre-Requisites:

- 1) Basic concepts of statistics.
- 2) Knowledge of fundamentals of AI.

#### Course Objective:

- 1) To simulate decision making and thinking in machine.
- 2) To understand standard Machine Learning practices.
- 3) To apply algorithms for precise result.

#### Course Outcomes: Students will be able to

1. Learn relationship between human and machine.
2. Implement basic classification algorithms
3. Implement enhanced classification algorithms
4. Implement HMM in detail
5. Apply concepts of regression for various application
6. Apply expectation maximization techniques for optimization.

#### Topics to Be Covered:

##### UNIT – I

[6 Hours]

Introduction to Machine Learning (ML); Relationship between ML and human learning; A quick survey of major models of how machines learn; Example applications of ML

##### UNIT – II

[6 Hours]

Classification: Supervised Learning; The problem of classification; Feature engineering; Training and testing classifier models; Cross-validation; Model evaluation (precision, recall, F1-measure, accuracy, area under curve); Statistical decision theory including discriminant functions and decision surfaces.

### UNIT – III

[6 Hours]

Naive Bayes classification; Bayesian networks; Decision Tree and Random Forests; k-Nearest neighbor classification; Support Vector Machines; Artificial neural networks including backpropagation; Applications of classifications; Ensembles of classifiers including bagging and boosting.

### UNIT – IV

[6 Hours]

Hidden Markov Models (HMM) with forward-backward and Viterbi algorithms; Sequence classification using HMM; Conditional random fields; Applications of sequence classification such as part-of-speech tagging.

### UNIT – V

[6 Hours]

Regression: Multi-variable regression; Model evaluation; Least squares regression; Regularization; LASSO; Applications of regression Association rule mining algorithms including apriori.

### UNIT – VI

[6 Hours]

Expectation-Maximization (EM) algorithm for unsupervised learning Clustering: average linkage; Ward's algorithm; Minimum spanning tree clustering; K-nearest neighbors clustering; BIRCH; CURE; DBSCAN Anomaly and outlier detection methods.

#### Home Assignments:

- (1) Introduction to WEKA and R
- (2) Classification of some public domain datasets in UCI ML repository

#### Mini projects in the Lab:

- (1) Implementation of one clustering algorithm
- (3) Implementation of one association rule mining algorithm
- (4) Implementation of one anomaly detection algorithms
- (5) Implementation of EM algorithm for some specific problem

#### Text Books:

[1] R.O. Duda, P.E. Hart, D.G. Stork, **Pattern Classification**, 2/e, Wiley, 2001.

#### Reference Books:

- [1] C. Bishop, **Pattern Recognition and Machine Learning**, Springer, 2007.
- [2] E. Alpaydin, **Introduction to Machine Learning**, 3/e, Prentice-Hall, 2014.
- [3] A. Rostamizadeh, A. Talwalkar, M. Mohri, **Foundations of Machine Learning**, MIT Press.
- [4] A. Webb, **Statistical Pattern Recognition**, 3/e, Wiley, 2011.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



## Computer Network

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3 Hrs/Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 3 Credits</b>
<b>Tutorials: NIL</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 2 Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

**Course Pre Requisites:** The prerequisite for this class is successful completion of Object Oriented Design, Data Structures, Data Communications.

### **Course Objective:**

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. Understand the client/server model and key application layer protocols.
3. Learn sockets programming and how to implement client/server programs.
4. Understand the concepts of reliable data transfer and how TCP implements these concepts.
5. Know the principles of congestion control and trade-offs in fairness and efficiency.
6. Learn the principles of routing and the semantics and syntax of IP.

### **Course Outcomes:**

1. Have a good understanding of the OSI Reference
2. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
3. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
4. Have an understanding of the issues surrounding Mobile and Wireless Networks.
5. Have a working knowledge of datagram and internet socket programming
6. Have a basic knowledge of the use of cryptography and network security

## Topics to Be Covered:

### UNIT – I [6 Hours]

**Introduction:** Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures.**Data communication Components:** Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media.**LAN:** Wired LAN, Wireless LAN, Virtual LAN

### UNIT – II[6 Hours]

**Data Link Layer and Medium Access Sub Layer:** Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA\

### UNIT – III [6 Hours]

**Network Layer:** Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

### UNIT – IV [6 Hours]

**Application Layer:** DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls.

### UNIT – V [6 Hours]

**Techniques for Bandwidth utilization:** Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

### UNIT – VI [6 Hours]

**Network Security:** Electronic mail, directory services and network management, Basic concepts of Cryptography.

## Home Assignments:

1. Socket Programming using C/C++
2. Network System Administration: Understanding switches and routers

## Text Books:

1. *Computer Networks*, A. Tannenbaum.
2. *Data and Computer Communication*, William Stallings

## Reference Books:

3. *Network Security*, Kaufman, R. Perlman and M. Speciner.
4. *UNIX Network Programming*, Vol. 1,2 & 3, W. Richard Stevens

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Subject Name : Information Security

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
<b>Lectures: 4Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 5 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: 1</b>
<b>Lab: 2Hrs./Week</b>	<b>Term Work and Practical: 50</b>	

<b>Course Prerequisites:</b>		
<b>Students should have primary knowledge of</b>		
<ol style="list-style-type: none"> <li>1 Fundamentals of Digital Communication and Computer Networks.</li> <li>2. Operating Systems</li> </ol>		
<b>Course Objectives:</b>		
<ul style="list-style-type: none"> <li>• Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management.</li> <li>• Discuss and provide hands on approaches to better understand and to devise strategies related to security policy.</li> <li>• Understand different security issues related to computer network, operating systems and database systems.</li> </ul>		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
<b>1) Understand security parameters and cryptosystems.</b>		
<b>2) Understand security and access control models.</b>		
<b>3) Understand aspect of information security management including planning, process, policy, procedure and monitoring.</b>		
<b>4) Understand various issues related to threats like Threat Analysis, Threat Modeling, threat awareness and threat modeling</b>		
<b>5) Understand security issues related to networks, operating systems and database.</b>		
<b>6) Learn information audit and business continuity planning concepts.</b>		
<b>UNIT-I</b>	<b>Overview of Security Parameters and Cryptosystems</b>	<b>(6 Hours)</b>
	Confidentiality, integrity and availability; Security violation and threats; Security policy and procedure; Assumptions and Trust; Security Assurance, Implementation and Operational Issues; Security Life Cycle. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Different Ciphers used for Information Security, Secure Cryptosystem.	

<b>UNIT-II</b>	<b>Access Control Models</b>	<b>( 6 Hours)</b>
	Discretionary, mandatory, roll-based and task-based models, unified models, access control algebra, temporal and spatio-temporal models, Authorization and Authentication - types, policies and techniques, Trusted Computing and multilevel security - Security models, Trusted Systems.	
<b>UNIT-III</b>	<b>Security Policies</b>	<b>(6 Hours)</b>
	Confidentiality policies, integrity policies, hybrid policies, non-interference and policy composition, international standards, Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Policies and Procedures, Role of Information Security Department	
<b>UNIT-IV</b>	<b>Security Threats</b>	<b>( 6 Hours)</b>
	Sources of security threats- Motives - Target Assets and Vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning,	
<b>UNIT-V</b>	<b>Logic-based System</b>	<b>(6 Hours)</b>
	Malicious logic, vulnerability analysis, auditing, intrusion detection. Applications: Network security, user security, program security. Database Security Architecture, Operating Systems Security, Enterprise Security, Data privacy, introduction to digital forensics, Incidence Response and Forensics, enterprise security specification, Software security issues, Email and Internet use policies, Third Party Development - Intellectual Property Issues.	
<b>UNIT-VI</b>	<b>Auditing and Business Continuity Planning</b>	<b>( 6 Hours)</b>
	Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware, Security testing tool BackTrack, Audit Tools: NESSUS and	

	NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues, Database auditing	
<b>Assignment List:</b>		
1.	Assignments on different ciphers.	
2.	Assignments on RSA, DSA, DES, AES, Blowfish, TripleDES.	
3.	Assignment based on the presentation on following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools Asymmetric Cryptosystems	
4.	Case study on secure configuration of Email Server	
5.	Case study on Incidence Response and Forensics analysis	
6.	Assignment on Computer Forensic Tools	
<b>Text Books:</b>		
1)	Neal Koblitz, “A Course in Number Theory and Cryptography”, 2 <sup>nd</sup> Edition, Springer, 2002.	
2)	Johannes A. Buchman, “Introduction to Cryptography”, 2 <sup>nd</sup> Edition, Springer, 2004.	
3)	Serge Vaudenay, “Classical Introduction to Cryptography – Applications for Communication Security”, Springer, 2006.	
4)	Victor Shoup, “A Computational Introduction to Number Theory and Algebra”, Cambridge University Press, 2005.	
5)	William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.	
6)	Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning, 2004.	
<b>Reference Books:</b>		
1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009	
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective Information Security Management (Paperback) Auerbach,1 <sup>st</sup> edition, 2001	
3)	Neal Koblitz, “A Course in Number Theory and Cryptography”, 2 <sup>nd</sup> Edition, Springer, 2002.	
4)	Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

## Artificial Intelligence

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4Hrs./Week	Semester Examination: 60 marks	Theory: 5 Credits
Tutorials: 1Hr./Week	Continuous Assessment: 40 marks	Term Work and Practical credit: 1
Lab: 2Hrs./Week	Term Work and Practical: 50	

**Course Pre Requisites:** Discrete mathematics, Data structures,

**Course Objective:**

To provide the insight to the students the about basic knowledge representation, problem solving, and learning methods of artificial intelligence.

**Course Outcomes:**

**After completion of the course the students will able to,**

1. Describe the concept of Artificial Intelligence, Intelligent agents and Learning agents
2. Identify issues in problem solving and apply the appropriate search methods.
3. Use the appropriate search method and identify the constraints
4. Describe and select the different knowledge representation methods
5. Identify the components of planning for a particular System
6. Use appropriate domain knowledge and develop an Expert system

### UNIT – I [6 Hours]

**Introduction, Overview of Artificial intelligence:** Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

### UNIT – II[6 Hours]

**Problem Solving, Problems, Problem Space & search:** Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

**Search techniques:** Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A\* search, AO\* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search

### UNIT – III [6 Hours]

**Constraint satisfaction problems:** Local search for constraints Satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

### UNIT – IV

**Knowledge & reasoning:** Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

### UNIT – V [6 Hours]

**Probabilistic reasoning:** Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

### UNIT – VI [6 Hours]

**Expert Systems:** Representing and using domain knowledge, expert system shells, and knowledge acquisition.

#### Home Assignments:

Assignments should include problems related to the topics covered in lectures, like heuristics, optimal search, and graph heuristics. Constraint satisfaction problems, k-nearest neighbors, decision trees, etc. can be included in home assignments.

#### Text Books:

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach
2. Artificial Intelligence, Russel, Pearson

#### Reference Books:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
3. Logic & Prolog Programming, Saroj Kaushik, New Age International
4. Expert Systems, Giarranto, VIKAS

Syllabus for Unit Test:	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI





## FINANCIAL AND COST ACCOUNTING

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 4 Hrs/Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: NIL</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Practical credit: -- NIL</b>
<b>Lab: NIL</b>	<b>Term Work and Practical: -- NIL</b>	

**Course Pre Requisites:** familiarity with common concepts and terminologies in economics and accounts.

### **Course Objective:**

1. To impart knowledge about different ways of accounting process
2. Understanding and interpreting financial statements.

### **Course Outcomes:**

After successful completion of this course students will be able to

1. Understand the important concepts of accounting and their importance in management
2. Interpret the accounting process
3. Analyze financial statements
4. Review the cash flow and fund flow techniques
5. Interpret the costing systems
6. Infer the accounts and reports

### **Topics to Be Covered:**

#### **UNIT – I [6 Hours]**

**Accounting Concept:** Introduction, Techniques and Conventions, Financial Statements- Understanding & Interpreting Financial Statements

#### **UNIT – II [6 Hours]**

### **Accounting Process:**

- Book Keeping and Record Maintenance
- Fundamental Principles and Double Entry
- Journal, Ledger, Trial Balance, Balance Sheet, Final Accounts
- Cash Book and Subsidiary Books

- Rectification of Errors

### **UNIT – III [6 Hours]**

**Financial Statements:** Form and Contents of Financial Statements, Analyzing and Interpreting Financial Statements, Accounting Standards.

*Class Discussion: Corporate Accounting Fraud- A Case Study of Satyam*

### **.UNIT – IV [6 Hours]**

**Cash Flow and Fund Flow Techniques:** Introduction, How to prepare, Difference between them

### **UNIT – V [6 Hours]**

**Costing Systems:**

- Elements of Cost
- Cost Behavior, Cost Allocation, OH Allocation
- Unit Costing, Process Costing, Job Costing
- Absorption Costing, Marginal Costing, Cost Volume Profit Analysis
- Budgets
- ABC Analysis

*Class Discussion: Application of costing concepts in the Service Sector*

### **UNIT – VI [6 Hours]**

**Company Accounts and Annual Reports:**

- Audit Reports and Statutory Requirements
- Directors Report
- Notes to Accounts
- Pitfalls

**Home Assignments:** Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Corporate Accounting Fraud: A Case Study of Satyam
2. Topic: Application of costing concepts in the Service Sector

**Text Books:**

1. Robert N Anthony, David Hawkins, Kenneth Marchant, *Accounting: Texts and Cases*, McGraw-Hill
2. Case Study Materials: To be distributed for class discussion

**Reference Books:**

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**B. Tech (Computer Science and Business Systems) Sem-VI**  
**BUSINESS COMMUNICATION & VALUE SCIENCE – IV**

<b>Designation of Course</b>	<b>BUSINESS COMMUNICATION &amp; VALUE SCIENCE – IV</b>		
<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>		<b>Credits Allotted</b>
Theory:- 03 Hours/ Week	End Semester Examination	50 Marks	Theory: 03 Tutorial: 00 Practical: 01
Practical : 02 Hours/ Week	Term Work & Oral	50 Marks	
	Total	100 Marks	
	Continuous Assessment	Yes	04

<b>Course Prerequisites:-</b>	Basic Knowledge of English (verbal and written)  Completion of all units from Semesters 1, 2, 3, 4 and 5
<b>Course Objective</b>	Recognize the importance of diversity in workplace, Recognize the best practices of communicative writing, Understand the importance of emotional intelligence in personal and professional lives, Apply emotional intelligence in real life scenarios, Use the best practices of public speaking in real life scenarios, Understand the importance of corporate social responsibility (CSR), Understand the importance of corporate etiquettes, Practice corporate etiquettes in real life scenarios
<b>Course Outcomes:-</b>	<p><b>Upon completion of the course, students shall have ability to</b></p> <ol style="list-style-type: none"> <li>01. Understand the importance of diversity in workplace</li> <li>02. Recognize the best practices of communicative writing</li> <li>03. Apply knowledge of multiple intelligences and learning styles in interpersonal interactions</li> <li>04. Recognize the attributes needed to function and grow in a corporate environment</li> <li>05. Identify the best practices to manage stress</li> <li>06. Understand the importance of corporate social responsibility (CSR)</li> </ol>

## Course Contents

<b>Unit 1</b>	<b>Diversity and Inclusion at workplace</b>	<b>(6 Hrs.)</b>
<p>Recapitulation activity of Satori, Introduce the concept of Diversity in corporate environments through an activity. Understand the importance of diversity and inclusion at workplace, Diversity and inclusion matter at workplace.</p>		
<b>Unit 2</b>	<b>Communicative Writing:</b>	<b>(6 Hrs.)</b>
<p>Aspects of communicative writing, Application of communicative writing in real life scenarios , Use of charts and graphs in communicative writing, The best practices of communicative writing</p>		
<b>Unit 3</b>	<b>Emotional Intelligence</b>	<b>(6 Hrs.)</b>
<p>what is emotional intelligence?, Emotional intelligence in personal and professional lives its importance need and application, public speaking at workplace, Importance , need and ways, The best practices of public speaking, Apply public speaking in real life scenarios</p>		
<b>Unit 4</b>	<b>Corporate Social Responsibility (CSR)</b>	<b>(6 Hrs.)</b>
<p>Corporate social responsibility (CSR) its importance and need, Stalwarts in CSR, the attributes needed to function and grow in a corporate environment, the best practices to share and receive feedback for CSR</p>		
<b>Unit 5</b>	<b>Intelligences and learning styles in interpersonal interactions:</b>	<b>(6 Hrs.)</b>
<p>Application of emotional intelligence in real life scenarios, intelligences and learning styles in interpersonal interactions, the impact of conflicts, Basic guidelines required to manage conflicts</p>		
<b>Unit 6</b>	<b>Corporate etiquette, Stress &amp; Time Management:</b>	<b>(6 Hrs.)</b>
<p>The key features of corporate etiquette, Application of the business idioms and corporate terms, the impact of stress in life and work, the best practices to manage stress, the importance of time management, the best time management practices</p>		
<b>Project: (Summative Assessment based on End Semester Project)</b>	<p>Each group to create a POC (Proof of Concept) for their start-up applying their learning's from the CSBS course (core subjects + BCVS).</p> <p>The evaluation for this POC will be done as part of the Sem end assessment by the TCS team. During the assessment, students need to share the journey of creating their start-up: from inception to POC.</p>	

## Reference Books:

01	Emotional Intelligence: Why it Can Matter More Than IQ by Daniel Goleman
02	Putting Emotional Intelligence To Work by Ryback David
03	How to Develop Self Confidence and Improve Public Speaking - Time - Tested Methods of Persuasion by Dale Carnegie
04	TED Talks: The official TED guide to public speaking: Tips and tricks for giving unforgettable speeches and presentations
05	Diversity, Inclusion and Engagement 3rd Edition by <u>Mervyn Hyde</u> <u>Lorelei Carpenter</u> , <u>Shelley Dole</u>
<b>Web References:</b>	
<a href="https://www.tata.com/about-us/tata-group-our-heritage">https://www.tata.com/about-us/tata-group-our-heritage</a>	
<a href="https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms">https://economictimes.indiatimes.com/tata-success-story-is-based-on-humanity-philanthropy-and-ethics/articleshow/41766592.cms</a>	
<b>Online Resources:</b>	
<a href="https://youtu.be/reu8rzD6ZAE">https://youtu.be/reu8rzD6ZAE</a>	
<a href="https://youtu.be/Wx9v_J34Fyo">https://youtu.be/Wx9v_J34Fyo</a>	
<a href="https://youtu.be/F2hc2FLOdhI">https://youtu.be/F2hc2FLOdhI</a>	
<a href="https://youtu.be/wHGqp8lz36c">https://youtu.be/wHGqp8lz36c</a>	
<a href="https://youtu.be/hxS5He3KVEM">https://youtu.be/hxS5He3KVEM</a>	
<a href="https://youtu.be/nMPqsjuXDmE">https://youtu.be/nMPqsjuXDmE</a>	

## ELECTIVE II : Robotics and Embedded Systems

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
<b>Lectures: 3 Hrs./Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Oral Credit: 1</b>
<b>Lab: 2Hrs./Week</b>	<b>Term Work and Oral: 50</b>	

<b>Course Prerequisites:</b>		
<b>Students should have primary knowledge of</b>		
<ol style="list-style-type: none"> <li>1 Good programming skills in C/C++. Basic knowledge of linear algebra. (for Robotics)</li> <li>2. Basic knowledge of operating system</li> <li>3. Basic knowledge of microprocessors and microcontrollers</li> </ol>		
<b>Course Objectives:</b>		
During the course the students will: - <ol style="list-style-type: none"> <li>1) Learn the concepts of embedded system, its components and its application areas.</li> <li>2) Learn the concepts of robotics and robot design components.</li> </ol>		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
<ul style="list-style-type: none"> <li>• Acquire knowledge about microcontrollers embedded processors and their applications.</li> <li>• Understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.</li> <li>• Understand the role of embedded systems in industry.</li> <li>• Understand the concepts of real time operating system.</li> <li>• Understand various applications of embedded system and various electronics parts used in embedded system design.</li> <li>• Understand different concepts in robotics, various parts used in robotics.</li> </ul>		
<b>UNIT-I</b>	<b>Introduction to Embedded System</b>	<b>(6 Hours)</b>



	Embedded system Vs General computing systems, History of Embedded systems, Purpose of Embedded systems, Microprocessor and Microcontroller, Hardware architecture of the real time systems.	
<b>UNIT-II</b>	<b>Devices and Communication Buses</b>	<b>(6 Hours)</b>
	I/O types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Intrnet embedded system network protocols, USB, Bluetooth.	
<b>UNIT-III</b>	<b>Program Modeling</b>	<b>(6 Hours)</b>
	Program Modeling Concepts; Fundamental issues in Hardware software co-design, Unified Modeling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.	
<b>UNIT-IV</b>	<b>Real Time Operating Systems</b>	<b>(6 Hours)</b>
	Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. Real time scheduling: Clock Driven, Weighted Round Robin, Priority Driven Approach, RM,EDF algorithms	
<b>UNIT-V</b>	<b>Examples of Embedded System</b>	<b>(6 Hours)</b>
	Mobile phones, RFID, WISENET, Robotics, Biomedical Applications, Brain machine interface etc. Popular microcontrollers used in embedded systems, sensors, actuators, Design of microcontroller systems using ADC/DAC, LED/LCD, PWM, Keyboard, Stepper motor etc.	
<b>UNIT-VI</b>	<b>Robotics</b>	<b>(6 Hours)</b>
	<b>Robotics:</b> Introduction, Elements of robots -- joints, links, actuators, and sensors <b>Kinematics:</b> Kinematics of serial robots, Kinematics of parallel robots, Motion planning and control <b>Advanced Topics on Robotics:</b> Sensing distance and direction, Line Following Algorithms, Feedback Systems, Other topics on advance robotic techniques	

<b>List of Practical Assignments</b>		
<b>1.</b>	Arithmetic Operations using 8051	
<b>2</b>	Interfacing ADC and DAC	
<b>3</b>	Interfacing LED and PWM	
<b>4</b>	Interfacing real time clock and serial port	
<b>5</b>	Interfacing keyboard and LCD	
<b>6</b>	Flashing of LEDES	
<b>7</b>	Interfacing stepper motor and temperature sensor.	
<b>8</b>	Study of robotic arm and its configuration	
<b>9</b>	Study the robotic end effectors	
<b>List of Assignments/Tutorials</b>		
	1) Assignment on State machine programming model of Fibonacci sequence generator. 2) Assignment on actuator behavior. 3) Assignment on Real time scheduling algorithms. 4) Assignment on CAN protocol. 5) Assignment on microcontrollers used in embedded systems. 6) Assignment on Program Modeling concepts.	
<b>Text Books:</b>		
<b>1)</b>	Introduction to Embedded Systems : Shibu K. V. (TMH)	
<b>2)</b>	Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)	
<b>3)</b>	Embedded Systems : Rajkamal (TMH)	
<b>4)</b>	Embedded Systems : L. B. Das (Pearson)	
<b>5)</b>	The 8051 Microcontroller and embedded systems by Muhammad Ali Mazidi, PHI.	
<b>6)</b>	Robotics: Fundamental Concepts and Analysis, Oxford University Press	
<b>Reference Books:</b>		
<b>1)</b>	Embedded System design : S. Heath (Elsevier)	
<b>2)</b>	Embedded microcontroller and processor design: G. Osborn (Pearson)	
<b>3)</b>	Embedded systems design by Steve Heath, Newnes	
<b>Syllabus for Unit Test:</b>		

<b>Unit Test -1</b>	<b>Unit I,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

## ELECTIVE II : DATA MINING AND ANALYTICS

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
<b>Lectures: 3 Hrs/Week</b>	<b>Semester Examination: 60 marks</b>	<b>Theory: 4 Credits</b>
<b>Tutorials: 1 Hr./Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Term Work and Oral Credit: 1</b>
<b>Lab: 2 Hrs/Week</b>	<b>Term Work and Oral: 50</b>	

**Course Pre Requisites:** Student should possess a strong mathematical background in Probability and Statistics. Also should have programming proficiency with algorithmic approach.

**Course Objective:** is to make statistical foundation, followed by various machine learning and data mining algorithms. This course will also give coverage to practical systems and software used in data analytics.

### **Course Outcomes:**

1. Understand basic concepts and techniques of Data Mining
2. Evaluate different models used for OLAP and data preprocessing.
3. Classify and differentiate between situations for applying data-mining techniques such as frequent pattern mining, association, correlation, classification, prediction, cluster, and outlier analysis.
4. Apply knowledge for understanding data and select suitable linear, nonlinear data model and time series analysis model.
5. Develop skills of using data mining software for solving practical problems.
6. Understand and apply several statistical analysis techniques: regression, ANOVA, data reduction

### **Topics to Be Covered:**

#### **UNIT – I [6 Hours]**

**Introduction to Data Mining:** What is data mining? Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications

## UNIT – II[6 Hours]

**Data preprocessing:** Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization

**Data mining knowledge representation:** Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques

**Attribute-oriented analysis:** Attribute generalization, Attribute relevance, Class comparison, Statistical measures

## UNIT – III [6 Hours]

**Data mining algorithms - Association rules:** Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis

**Data mining algorithms - Classification:** Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules

**Data mining algorithms – Prediction:** The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor), linear models

## UNIT – IV [6 Hours]

**Descriptive analytics:** Data Modeling, Trend Analysis, Simple Linear Regression Analysis

**Forecasting models:** Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models

## UNIT – V [6 Hours]

**Generalized Linear model:** link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma.

**Non Linear Regression (NLS):** Linearization transforms, their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods

## UNIT – VI [6 Hours]

**Time Series Analysis:** Auto - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing

**Linear time series models:** Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARMA Processes, Forecasting using ARIMA models

**Prescriptive Analytics:** Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis, Decision trees.

**Home Assignments:**

Course faculty must design one home assignment on every unit.

**Text Books:**

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, 3rd ed, 2010.
2. Lior Rokach and Oded Maimon, “Data Mining and Knowledge Discovery Handbook”, Springer, 2nd edition, 2010
3. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.

**Reference Books:**

1. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition.
- Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune**  
**B.Tech- Computer Science & Business Systems (Semester- VII and VIII)**  
**Revised New Syllabus Structure**

Semester- VII		Teaching Scheme				Examination Scheme-Marks						Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total
							Unit Test	Attendance	Assignments						
4.1	Usability Design of Software Applications	3	0	2	5	60	20	10	10	50	-	150	3	1	4
4.2	IT Workshop	3	0	2	5	60	20	10	10	50	-	150	3	1	4
4.3	Financial Management	3	0	0	3	60	20	10	10	-	-	100	3	0	3
4.4	Human Resource Management	3	0	0	3	60	20	10	10	-	-	100	3	0	3
4.5	Elective III	3	0	2	5	60	20	10	10	-	50	150	3	1	4
4.6	Elective IV	3	0	2	5	60	20	10	10	-	50	150	3	1	4
4.7	Project Evaluation I	0	0	2	2	-	-	-	-	-	50	50	0	1	1
4.8	Internship	0	0	0	0	-	-	-	-	-	50	50	0	2	2
<b>Total</b>		<b>18</b>	<b>0</b>	<b>10</b>	<b>28</b>	<b>360</b>	<b>120</b>	<b>60</b>	<b>60</b>	<b>100</b>	<b>200</b>	<b>900</b>	<b>18</b>	<b>7</b>	<b>25</b>
<b>Elective III</b>		DS	Cognitive Science & Analytics												
		DTS	Introduction to IoT												
		DS	Cryptology												
<b>Elective IV</b>		CS	Quantum Computation & Quantum Information												
		DS	Advanced Social, Text and Media Analytics												
		DTS	Mobile Computing												

Semester-VIII		Teaching Scheme				Examination Scheme-Marks							Credit			
ID	Course	Lecture	Tutorial	Practical	Contact Hours per week	End Semester Examination	Continuous Assessment			TW & Practical	TW & Oral	Total	Theory	Term Work	Total	
							Unit Test	Attendance	Assignments							
4.9	Services Science & Service Operational Management	4	0	2	6	60	20	10	10	50	–	150	4	1	5	
4.10	IT Project Management	3	0	2	5	60	20	10	10	–	50	150	3	1	4	
4.11	Marketing Research & Marketing Management	3	0	0	3	60	20	10	10	–	–	100	3	0	3	
4.12	Elective V	3	0	2	5	60	20	10	10	–	50	150	3	1	4	
4.13	Elective VI	3	0	2	5	60	20	10	10	–	50	150	3	1	4	
4.14	Project Evaluation II	0	0	6	6	–	–	–	–	–	150	150	0	3	3	
4.15	Seminar	0	0	2	2	–	–	–	–	–	50	50	0	2	2	
<b>Total</b>		<b>16</b>	<b>0</b>	<b>16</b>	<b>30</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>350</b>	<b>900</b>	<b>16</b>	<b>9</b>	<b>25</b>	
<b>Elective V</b>		SH	Behavioral Economics													
		MS	Computational Finance & Modeling													
<b>Elective VI</b>		SH	Psychology													
		DTS	Enterprise Systems													
		MS	Advance Finance													
		DTS	Image Processing and Pattern Recognition													



## Usability Design of Software Applications

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	3Hours/Week	<b>End Semester Examination:</b> 60Marks		<b>Theory</b>	<b>Credits</b> 3
<b>Practical:</b>	2 Hours/Week	<b>Continuous Assessment:</b> 40 Marks			
<b>Tutorials:</b>	NIL	<b>TW &amp; Practical:</b> 50 Marks		<b>TW &amp; Practical:</b>	1
		<b>TW &amp; Oral:</b> NA		<b>TW &amp; Oral:</b>	NA
		<b>Term Work:</b>	NA	<b>Term Work</b>	NA
<b>Total</b> 150Marks <b>Total</b> 4					

### Course Overview

This course teaches concepts of User Centered Design.

### Prerequisite:

Basic understanding of web and mobile app development

### Course Outcomes: On completion of the course, students will have the ability to:

1. To sensitise the students to the fundamentals of User Centred Design and User Experience their relevance and contribution to businesses
2. Familiarise them to the facets of User Experience (UX) Design, particularly as applied to the digital artefacts
3. Appreciation of user research, solution conceptualisation and validation as interwoven activities in the design and development lifecycle
4. Acquire the ability to constructively engage with the Design professionals they would work with in the future

### Unit I 06 Hours

Introduction to User Centred Design.

### Unit II 06 Hours

Aspects of User Centred Design  
Product Appreciation Assignment – Evaluating the product from user centred design aspects such as functionality, ease of use, ergonomics, and aesthetics.

### Unit III 06 Hours

Heuristic Evaluation: Heuristic Principles, Examples  
Heuristic Evaluation: Group Assignment initiation (Website and App)  
Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.

### Unit IV 06 Hours

Group Project identification, UX Research  
Understanding users, their goals, context of use, and environment of use.  
Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX

### Unit V 06 Hours

Scenarios and Persona Technique , Presentation of Personas for the group project, Design Thinking Technique, Discovery and brainstorming, Concept Development, Task flow detailing for the Project

## **Unit VI**

**06 Hours**

### **Prototyping Techniques**

Paper, Electronic, Prototyping Tools, Project Prototyping Iteration 1, Project Prototyping Iteration 2

### **Textbooks**

1. Interaction Design: Beyond Human-Computer Interaction, 4<sup>th</sup> Edition, Jenny Preece, Helen Sharp and Yvonne Rogers
2. About Face, 4th Edition, Alan Cooper and Robert Reimann
3. Understanding Design Thinking, Lean, and Agile - Jonny Schneider.

### **Reference Books**

1. Observing the User Experience, Second Edition: A Practitioner's Guide to User Research. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed
2. The Elements of User Experience: User-Centered Design for the Web and Beyond 2nd Edition, Jesse James Garrett

### **List of Assignments**

**2 -3 Assignment to be framed on each Unit.**

### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## IT Workshop

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	3 Hours/Week	<b>End Semester Examination:</b> 60Marks		<b>Theory</b>	<b>Credits</b> 3
<b>Practical:</b>	2Hours/Week	<b>Continuous Assessment:</b> 40 Marks			
<b>Tutorials:</b>	NIL	<b>TW &amp; Practical:</b> 50 Marks		<b>TW &amp; Practical:</b>	1
		<b>TW &amp; Oral:</b> NA		<b>TW &amp; Oral:</b>	NA
		<b>Term Work</b>	NA	<b>Term Work</b>	NA

Total150Total4

### Course Overview

#### Prerequisite:

Need to know basics of image representation.

#### Course Outcomes: On completion of the course, students will have the ability to:

1. Understand Matlab
2. Learn Matlab Workspace
3. Learn Mathematical functions of Matlab
4. Learn Plotting
5. Understand Matlab Programming
6. Learn Debugging

#### Unit I

06 Hours

##### Introduction to MATLAB

History, basic features, strengths and weaknesses, good programming practices and plan your code.

#### Unit II

06 Hours

##### Working with variables, workspace and miscellaneous commands

Creating MATLAB variables, overwriting variable, error messages, making corrections, controlling the hierarchy of operations or precedence, controlling the appearance of floating point number, managing the workspace, keeping track of your work session, entering multiple statements per line, miscellaneous commands.

#### Unit III

06 Hours

##### Matrix, array and basic mathematical functions

Matrix generation, entering a vector, entering a matrix, matrix indexing, colon operator, linear spacing, creating a sub-matrix, dimension, matrix operations and functions matrix generators, special matrices, array and array operations, solving linear equations, other mathematical functions.

#### Unit IV

06 Hours

##### Basic plotting

Overview, creating simple plots, adding titles, axis labels, and annotations,

multiple data sets in one plot, specifying line styles and colours

#### Unit V

06 Hours

##### **Introduction to programming**

Introduction, M-File Scripts, script side-effects, M-File functions, anatomy of a M-File function, input and output arguments, input to a script file, output commands

##### **Control flow and operators**

``if ... end" structure, relational and logical operators, ``for...end" loop, ``while ... end" loop, other flow structures, operator precedence, saving output to a file

#### Unit VI

06 Hours

##### **Debugging M-files**

Debugging process, preparing for debugging, setting breakpoints, running with breakpoints, examining values, correcting and ending debugging, correcting an M-file

#### **Textbooks**

1. *Digital Image Processing using MATLAB*. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Pearson Education, Inc., 2004.
2. *MATLAB: A Practical Introduction to Programming and Problem Solving*. Stormy Attaway, Butterworth-Heinemann.

#### **Reference Books**

1. <https://www.mathworks.com/content/dam/mathworks/mathworks-dot-com/moler/exm/book.pdf>
2. [https://www.mathworks.com/help/releases/R2014b/pdf\\_doc/matlab/getstart.pdf](https://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf)

#### **List of Assignments**

2-3 Assignment for each unit to be framed by the Course Instructor and Implementation of various Image Processing Algorithms

#### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

<b>FINANCIAL MANAGEMENT</b>				
<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	

<b>Lecture:</b>	3 Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b>	<b>Credits</b> 3
<b>Practical:</b>	-	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b>	-	<b>TW &amp; Practical:</b> NA	<b>TW &amp; Practical:</b>	NA
		<b>TW &amp; Oral:</b> NA	<b>TW &amp; Oral:</b>	NA
		<b>Term Work</b> NA	<b>Term Work</b>	NA
<b>Total</b>	<b>100 Marks</b>	<b>Total</b> 3		

### Course Overview

This course intends to introduce students to understand the financial aspects of IT projects. They shall understand the management of funds for a project and risks and returns involved therein.

### Prerequisite:

Students should be familiar with the basic concepts of economics and project life cycle.

### Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the fundamental concepts of financial management time value of money
2. Categorise valuation of securities, risks and returns
3. Summarise leverage for deciding financial angle of IT projects
4. Understand capital cost and budgeting
5. Understand working Capital and cash management
6. Analyse accounts receivable management

### Unit I

06 Hours

**Introduction :** Introduction to Financial Management - Goals of the firm - Financial Environments.

**Time Value of Money :** Simple and Compound Interest Rates, Amortization, Computing more than once a year, Annuity Factor.

### Unit II

06 Hours

**Valuation of Securities :** Bond Valuation, Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM.

**Risk & Return:** Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)

### Unit III

06 Hours

**Operating & Financial Leverage:** Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study

### Unit IV

06 Hours

**Cost of Capital :** Concept, Computation of Specific Cost of Capital for Equity - Preference - Debt, Weighted Average Cost of Capital - Factors affecting Cost of Capital 4L

**Capital Budgeting** : The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

**Unit V**

**06 Hours**

**Working Capital Management:** Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term- Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.

**Cash Management:** Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, Factoring

**Unit VI**

**06 Hours**

**Accounts Receivable Management:** Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period. 4L

**Textbooks**

1. Chandra, Prasanna - Financial Management - Theory & Practice, Tata McGraw Hill.

**Reference Books**

1. Srivastava, Misra: Financial Management, OUP
2. Van Horne and Wachowicz : Fundamentals of Financial Management, Prentice Hall/ Pearson Education

**List of Assignments**

Case studies based on Time Value of Money, Valuation of Securities, Risk & Return, Cost of Capital, Capital Budgeting, Working Capital Management, Cash Management, Accounts Receivable Management

**Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Human Resource Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	03Hours/Week	<b>End Semester Examination:</b>	60Marks	<b>Theory</b>	<b>Credits</b> 03
<b>Practical:</b>	NA	<b>Continuous Assessment:</b>	40 Marks		
<b>Tutorials:</b>	NA	<b>TW &amp; Practical:</b>	Marks	<b>TW &amp; Practical:</b>	NA
		<b>TW &amp; Oral:</b>	NA	<b>TW &amp; Oral:</b>	NA
		<b>Term Work</b>	NA	<b>Term Work</b>	
<b>Total :</b>	100 Marks	<b>Total</b>	3		

### Course Overview

Students must be aware of the basic principles of Human Resource Management because success in today's complex business environment depends on effective management of its human resources. This introductory course on Human Resource Management will familiarize the students with the basic concepts, roles, functional areas and activities of HR and help students understand organization's employees, their interest, motivation and satisfaction, and their belief of fair treatment- all of which actually impact the firm's current performance and sustainability in the long run.

**Prerequisite: NIL**

**Course Outcomes: On completion of the course, students will have the ability to:**

1. Effectively manage and plan key **human resource** functions within organizations.
2. Examine current issues, trends, practices, and processes in **HRM**.
3. Contribute to employee performance **management** and organizational effectiveness.
4. Problem-solve **human resource** challenges.
5. Develop employability skills for the Canadian workplace.

**Unit I** **06 Hours**  
**Human Resource Management:** Concept and Challenges, HR Philosophy, Policies, Procedures and Practices.

**Unit II** **06 Hours**  
**Human Resource System Design:** HR Profession, and HR Department, Line Management Responsibility in HRM, Measuring HR, Human resources accounting and audit; Human resource information system

**Unit III** **06 Hours**  
**Functional Areas of HRM:** recruitment and staffing, benefits, compensation, employee relations, HR compliance, organizational design, training and development, human resource information systems (H.R.I.S.) and payroll.

**Unit IV** **06 Hours**  
**Human Resource Planning:** Demand Forecasting, Action Plans– Retention, Training, Redeployment & Staffing, Succession Planning

**Unit V** **06 Hours**

**Strategic Management of Human Resources:** SHRM, relationship between HR strategy and overall corporate strategy, HR as a Factor of Competitive Advantage, Managing Diversity in the Workplace

## **Unit VI**

**06 Hours**

**Human Resource Management in Service Sector-** Special considerations for Service Sector including

- Managing the Customer – Employee Interaction
- Employee Empowerment and Customer Satisfaction
- Service Failure and Customer Recovery – the Role of Communication and Training
- Similarities and Differences in Nature of Work for the Frontline Workers and the Backend
- Support Services - Impact on HR Practices Stressing Mainly on Performance
- Flexible Working Practices – Implications for HR

### **Textbooks**

1 Gary Dessler, *Human Resource Management*

### **Reference Books**

1. Dave Ulrich, *Human Resource Management*, Mc Graw Hill Publication

### **List of Activities**

Further, the topic for class discussion will be mentioned beforehand. Students are required to meet in groups before coming to class and prepare for the topic to be discussed. Instructor may ask the student groups to present their analysis and findings to the class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Understanding the issues and challenges involved in managing a diverse workforce
2. Topic: Is The Only Purpose of a Corporation to Maximize Profit?
3. Topic: Similarities and Differences in Manufacturing and Service Sector - Impact on HR Practices

### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI



## Elective III a) Cognitive Science & Analytics

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<u>Credits</u>
<b>Lecture:</b>	Hours/Week	<b>End Semester Examination:</b> 60Marks	Theory	3
<b>Practical:</b>	3 Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b>	Hours/Week	<b>TW &amp; Practical:</b> NA	<b>TW &amp; Practical:</b>	
		<b>TW &amp; Oral:</b> 50 Marks	<b>TW &amp; Oral:</b>	1
		<b>Term Work</b> NA	<b>Term Work</b>	
<b>Total : 100 Marks</b>	<b>Total</b>	<b>4</b>		

### Course Overview

The course teaches cognitive Sciences.

### Prerequisite:

Knowledge of Neural Networks and Artificial Intelligence.

### Course Outcomes: On completion of the course, students will have the ability to:

1. Know Introduction to Cognitive Science, Psychology, Nervous system and brain
2. Understand Brain and sensory motor information, Representation of sensory information
3. Analyse From Sensation to Cognition; Roots of Cognitive Science
4. Develop Language and Embodiment
5. Implement Affordances in biological and artificial systems, Cognitive Development
6. Make Attention, Learning, Memory, Reasoning, Social Cognition.

### Unit I

**06 Hours**

Introduction to the study of cognitive sciences. What is language? Affordances, Categories and concepts; Concept learning, Introduction to the study of cognitive sciences. Neural Network Models ,Linguistic knowledge: Syntax, semantics, (and pragmatics), Direct perception, Machine learning. History of cognitive science, Processing of sensory information in the brain, Ecological Psychology, Constructing memories, Methodological concerns in philosophy, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory

### Unit II

**06 Hours**

Cognitive Science and its methodology concerns in philosophy, Written materials needed to get a CogNeuro research study with human subjects off the ground: Runsheets, SOPs, questionnaires, informed consent forms, Perform stemming operation in python using NLTK, Writing and running Robot programs – Activity of PICK and Place of an object, Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

### Unit III

**06 Hours**

Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory, Structure and constituents of the brain, fMRI, MEG, Language disorders,

Development, Brief history of neuroscience, PET, EEG, Lateralization, Child and robotic development, Sensory memory; Short term memory, Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, Long term memory, Rationality.

#### **Unit IV**

**06 Hours**

Experimental approach to studying the working human brain and body. How to use Brain Voyager Brain Tutor. How to use the BESA dipole simulator? Introduction to EEG recordings. Theory, physiology, practical aspects of recording and analyzing scalp recorded brain potentials. Perform lemmatization in python using NLTK. Make simulation model using Rockwell ARENA 11.0 to show the functions / predictions for a manufacturing work cell. Evaluating ML algorithm with balanced and unbalanced datasets Comparison of Machine Learning algorithms.

#### **Unit V**

**06 Hours**

Mathematical models, Information fusion, The great past tense debate, Human visual attention, Bounded rationality; Prospect theory ; Heuristics and biases, Looking at brain signals, From sensation to cognition, The great past tense debate, Computational models of attention, Reasoning in computers. Looking at brain signals, Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition.

#### **Unit VI**

**06 Hours**

Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional, Context and social judgment; Schemas; Social signals, Experimental approach to processing sensory information in the brain using python. EEG analysis: How to get from the raw recording to specific brain waves. An example analysis. Perform parts of speech tagging in python using NLTK, Simulation modeling of four machine system using Rockwell ARENA 11.0., Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

#### **Textbooks**

1. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 3rd ed, 2010.

#### **Reference Books**

1. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010
2. Box, G.E.P and Jenkins G.M. (1970) Time Series Analysis, Forecasting and Control, Holden-Day.
3. Draper, N. R. and Smith, H. (1998). Applied Regression Analysis (John Wiley) Third Edition. Hosmer, D. W. and Lemeshow, S. (1989). Applied Logistic Regression (Wiley).

#### **List of Assignments**

#### **Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

## ELECTIVE-III b)Introduction to IoT

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	03 Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b>	<b>Credits</b> 03
<b>Practical:</b>	02 Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b>	NIL	<b>TW &amp; Practical:</b> -- Marks	<b>TW &amp; Practical:</b>	NA
		<b>TW &amp; Oral:</b> 50 Marks	<b>TW &amp; Oral:</b>	01
		<b>Term Work</b> -- Marks	<b>Term Work</b>	
		<b>TotalMarks:</b> 150	<b>Work</b>	
			<b>TotalCredits:</b> 04	

### Course Overview

This course covers the development of Internet of Things (IoT) products and services—including devices for sensing, actuation, processing, and communication—to help the learners to develop skills and experiences which they can employ in designing novel systems.

### Prerequisite:

1. Basic principles of Electronics
2. Basic Programming Skills

### Course Outcomes: On completion of the course, students will have the ability to:

1. Understand basic principles and concepts of Internet-of-Things use cases, applications, architecture and technologies
2. Get an overview of an end-to-end IoT system encompassing the edge, cloud and application tier
3. Architect a complete IoT application on their own
4. Build upon the foundations created in the pre-requisite courses
5. Think innovatively to come up with a hardware solution to a given problem
6. Understand various industrial IoT applications as well as IIoT

### Unit I Introduction to IoT and Use cases

Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, **06 Hours**  
Fundamental building blocks, Use Cases of IoT in various industry domains,

### Unit II Architecture

IoT reference architectures, Industrial Internet Reference Architecture, Edge **06 Hours**  
Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing

### Unit III Sensors and Industrial Systems

Introduction to sensors and transducers, integrating sensors to sensor processing **06 Hours**  
boards, introduction to industrial data acquisition systems, industrial control systems and their functions

#### **Unit IV Networking for IoT**

Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial Communication), Industrial network protocols (Modbus, CANbus), **06 Hours**

#### **Unit V Communication for IoT**

Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers) **06 Hours**

#### **Unit VI IoT Data Processing and Storage**

Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection, **06 Hours**

#### **Textbooks**

1. The Internet of Things, Samuel Greengard, MIT Press Essential Knowledge Series
- 2 Getting started with Internet of Things, Cuno Pfister
- 3 Precision: Principles, Practices and Solutions for the Internet of Things, Timothy Chou
- 4 Learning Internet of Things, Peter Waher
- 5 Analytics for the Internet of Things (IoT), Andrew Minter

#### **Reference Books**

1. Industrial Internet Reference Architecture - <http://www.iiconsortium.org/IIRA.htm>
2. World Economic Forum Report on Industrial Internet of Things - <https://www.weforum.org/reports/industrial-internet-things>
3. 50 Sensor Applications for a Smarter World - [http://www.libelium.com/resources/top\\_50\\_iot\\_sensor\\_applications\\_ranking/](http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/)
4. Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
5. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis
6. Getting Started with Arduino, M. Banzai, O'Reilly Media
7. GSMA IoT Security Guidelines & Assessment - <https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/>

#### **List of Assignments**

1. Setting up the Arduino Development Environment, connecting analog sensors to an Arduino Boarding and reading analog sensor data.
2. Digital Input and Output reading using and Arduino board and Arduino Development Environment.
3. Integrate an Arduino Board to a Raspberry Pi computer and send sensor data from Arduino to the R Pi

4. Setup Python on the R Pi and run sample R Pi programs on the R Pi. Read the data from Arduino using Python language
5. Connect a R Pi Camera module to the Raspberry Pi and using Python programming capture still images and video
6. Set up TCP/IP socket server on a PC. Send a message from the R Pi to the PC using socket communication
7. Set up a MQTT broker on the PC. Send data from R Pi to PC using MQTT protocol. Receive data from PC to R Pi using MQTT protocol
8. Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message , toggle the LED lights on the Arduino
9. Connect LED lights to an Arduino. Connect the Arduino to the R Pi. Send Message from PC to R Pi via MQTT protocol. On receipt of the message , toggle the LED lights on the Arduino
10. Set up an account in a cloud service (such as Google / AWS or Azure). Set up a simple Http server using a language of your choice. Push the image captured from the R Pi camera to this web service. On receiving the image, store the image in a database or file
11. Develop a mobile application to view the images captured by the R Pi camera

**Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Elective III c) Cryptology

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
<b>Lecture:</b> 3Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b> 3
<b>Practical:</b> 2 Hours/Week	<b>Continuous Assessment:</b> 40 Marks	
<b>Tutorials:</b> Hours/Week	<b>TW &amp; Practical:</b> Marks	<b>TW &amp; Practical:</b> NA
	<b>TW &amp; Oral:</b> 50 Marks	<b>TW &amp; Oral:</b> 1
	<b>Term Work</b> NA	<b>Term Work</b>
	<b>TotalMarks:</b> 150	<b>TotalCredits:</b> 04

### Course Overview

To highlight the features of different technologies involved in Cryptology.

### Prerequisite:

- Basic knowledge in Discrete Mathematics, logarithms and set theory.
- Basic knowledge in networking concepts of presentation layer and application layer.

### Course Outcomes: On completion of the course, students will have the ability to:

1. An overview of basic cryptographic concepts and methods
2. A good knowledge of some commonly used cryptographic primitives and protocols
3. A sound understanding of theory and implementation, as well as limitations and vulnerabilities
4. An appreciation of the engineering difficulties involved in employing cryptographic tools to build secure systems

### Unit I 06 Hours

**Introduction to Cryptography:** Elementary number theory, Pseudo-random bit generation, Elementary Cryptosystems.

### Unit II 06 Hours

**Basic security services:** confidentiality, integrity, availability, non-repudiation, privacy

### Unit III 06 Hours

**Symmetric key cryptosystems:**Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication

### Unit IV 06 Hours

**Public Key Cryptosystems:**RSA, ECC; Digital signatures

### Unit V 06 Hours

**Security Applications (Selected Topics):**Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis

## Unit VI

06 Hours

**Introductory topics in Post-Quantum Cryptography:** Refer to <https://csrc.nist.gov/projects/post-quantum-cryptography>. May discuss any two ciphers from this list.

### Textbooks

1. *Cryptography, Theory and Practice*. D. R. Stinson, CRC Press.
2. *Handbook of Applied Cryptography*. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone, CRC Press

### Reference Books

1. *A course in number theory and cryptography*. N. Koblitz:, GTM, Springer.
2. *Cryptography and Network Security*. W. Stallings, Prentice Hall.
3. *Security Engineering*, R. Anderson, Wiley
4. *RC4 Stream Cipher and Its Variants*. G. Paul and S. Maitra: CRC Press, Taylor & Francis Group, A Chapman & Hall Book, 2012
5. *Design & Cryptanalysis of ZUC - A Stream Cipher in Mobile Telephony*. C. S. Mukherjee, D. Roy, S. Maitra, Springer 2020
6. *Contact Tracing in Post-Covid World - A Cryptologic Approach*. P. Chakraborty, S. Maitra, M. Nandi, S. Talnikar, Springer 2020
8. Presskil Lecture notes: Available online:  
<http://www.theory.caltech.edu/~preskill/ph229/>

### Syllabus for Unit Tests:

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI



## Elective IV a) Quantum Computation & Quantum Information

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<u>Credits</u>
Lecture: 3 Hours/Week	<b>End Semester Examination:</b> 60 Marks	Theory	3
Practical: 3 Hours/Week	<b>Continuous Assessment:</b> 40 Marks	TW & Practical:	--
Tutorials: --Hours/Week	<b>TW &amp; Practical:</b> -- Marks	<b>TW &amp; Oral:</b>	--
	<b>TW &amp; Oral:</b> 50 Marks	<b>Term Work</b>	1
	<b>Term Work</b> NA		
<b>Total</b> 150	<b>Total</b> 4		

### Course Overview

This is an introductory course on quantum computing from perspective of computer science. This course will introduce the students to the postulates of quantum computing, formalisms like density matrices, effects of measurement. It will cover the quantum Turing machine and quantum circuit models of computation, and discuss Shor's factoring and Grover's search algorithms in this model.

**Prerequisite:** Linear Algebra, Probability, Analysis and Design of Algorithms

**Course Outcomes:** On completion of the course, students will have the ability to:

1. To understand principles of quantum computing
2. To understand different quantum models of computation
3. To implement important quantum algorithms
4. To understand random number generation exploiting quantum physics
5. To learn quantum key distribution protocols
6. To apply quantum computing to different computational areas like cryptography

**Unit I** **06 hours**

**Quantum Mechanics:** Hilbert space, Unitary and stochastic dynamics, Probabilities and measurements, Entanglement, Density operators and correlations.

**Unit II** **06 Hours**

**Introduction to Quantum Information:** States, Operators, Measurements, Quantum Entanglement: Quantum Teleportation, Super-dense coding, CHSH Game, Quantum gates and circuits

**Unit III** **06 Hours**

**Quantum Algorithms:** Deutsch-Jozsa, Simon, Grover, Shor, Implication of Grover's and Simon's algorithms towards classical symmetric key cryptosystems, Implication of Shor's algorithm towards factorization and Discrete Logarithm based classical public key cryptosystems

**Unit IV** **06 Hours**

**Quantum True Random Number Generators (QTRNG):** Detailed design and issues of quantumness, Commercial products and applications

**Unit V** **06 Hours**  
**Quantum key distribution (QKD):**BB84, Ekert, Semi-Quantum QKD protocols and their variations, Issues of Device Independence, Commercial products

**Unit VI** **06 Hours**  
Refer to <https://csrc.nist.gov/projects/post-quantum-cryptography>. May discuss any two ciphers from this list. Quantum key distribution, entropic uncertainty relations

**Note: If any student also opts for Cryptology course, in that case the ciphers discussed in this course must differ from the ciphers that will be discussed in Cryptology course.**

**Textbooks**

1. Quantum Computation and Quantum Information. M. A. Nielsen and I. L. Chuang, Cambridge University Press
2. Presskil Lecture notes: Available online: <http://www.theory.caltech.edu/~preskill/ph229/>

**Reference Books**

1. An Introduction to Quantum Computing. P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, New York
2. Quantum Computer Science. N. David Mermin:, Cambridge University Press
3. Quantum Cryptography. D. Unruh:, Available online: [https://courses.cs.ut.ee/all/MTAT.07.024/2017\\_fall/uploads/](https://courses.cs.ut.ee/all/MTAT.07.024/2017_fall/uploads/)
4. NIST Post Quantum Cryptography, Available online: <https://csrc.nist.gov/projects/post-quantum-cryptography/round-2-submissions>
5. Quantum Algorithms for Cryptographically Significant Boolean Functions - An IBMQ Experience. SAPV Tharmashastha, D. Bera, A. Maitra and S. Maitra, Springer 2020.
6. Quantum Algorithm Zoo. <https://quantumalgorithmzoo.org/>
7. Handbook of Applied Cryptography. A. J. Menezes, P. C. van Oorschot, and S. A. Vanstone. CRC Press

**List of Assignments-**

**Will be provided by Course Coordinator. 1 or 2 assignments on each unit.**

**Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Elective IV b) Advanced Social, Text and Media Analytics

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	<b>Credits</b>
<b>Lecture:</b> 3Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b>	3
<b>Practical:</b> 2Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b> 0Hours/Week	<b>TW &amp;Practical:</b> NA	<b>TW &amp; Practical:</b>	
	<b>TW &amp;Oral:</b> 50Marks	<b>TW &amp; Oral:</b>	
	<b>Term Work</b> NA	<b>Term Work</b>	1
	<b>TotalMarks:</b> 150	<b>TotalCredits:</b> 04	

**Course Overview** Students will be able to hone their skills even further by embracing the newer techniques in our data-driven world. Understanding how Web & Data Analytics, Artificial Intelligence & Machine Learning can be applied to Social Media and Digital Marketing will be the prime objective of this content rich program.

**Prerequisite:** Machine Learning ,Database and Data mining

**Course Outcomes: On completion of the course, students will have the ability to:**

1. To be able to use various tools for Text Mining and carry out Pattern Discovery, Predictive Modeling.
2. Explore the use of social network analysis to understand the growing connectivity and complexity in the world around us on different scales ranging from small groups to the World Wide Web.
3. Perform social network analysis to identify important social actors, subgroups (i.e., clusters), and network properties in social media sites such as Twitter, Facebook, and YouTube.
4. Summarize knowledge on extraction and analyzing of social web
5. Describe Association rule mining algorithms
6. Recognize the evolution of social networks

**Unit I** **06 Hours**

**Text Mining:** Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications

**Unit II** **06 Hours**

**Methods & Approaches:** Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction

**Unit III** **06 Hours**

**Text Extraction:**Text Extraction: Introduction, Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords, Benchmark evaluation: precision and recall, efficiency, stoplist

generation, Evaluation on new articles.

#### **Unit IV**

**06 Hours**

**Web Analytics:** Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models

#### **Unit V**

**06 Hours**

**Social Media Analytics:** Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization; Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis

#### **Unit VI**

**06 Hours**

##### **Extracting And Analyzing Web Social Networks:**

Extracting Evolution of Web Community from a Series of Web Archive, Temporal Analysis on Semantic Graphusing Three-Way Tensor, Decomposition, Analysis of Communities and Their Evolutions in DynamicNetworks.

#### **Textbooks**

- 1 Peter Mika, "Social networks and the Semantic Web", Springer, 2007. 2.
2. GuandongXu, Yanchun Zhang, and Lin Li, "Web Mining and Social Networking Techniques and Applications", Springer

#### **Reference Books**

- 1Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
- 2.Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
- 3.Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
- 4.Charu C. Aggarwal, "Social Network Data Analytics", Springer, 2011.

#### **List of Assignments**

- 1.Review two case studies of applying social media analytics using both textand network analysis available.
- 2.Students will select two companies/organizations/groups to conduct acomparative analysis of social networks by examining social mediaactivity.
- 3.Identify 2 relevant social media platforms used by both entities and use Netlytic to collect publicly available social media data (e.g., Twitter messages, Facebook page posts, etc.).
- 4.Conduct text and network analysis of each platforms used by theorganizations. Students will end up with a set of interactive visualizationsto investigate the similarities and differences between the contentdiscussed and social networks developed among each organization.

#### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Elective IV c) Mobile Computing

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	03 Hours/Week	<b>End Semester Examination:</b> 60Marks		<b>Theory</b>	<b>Credits</b> 03
<b>Practical:</b>	02 Hours/Week	<b>Continuous Assessment:</b> 40 Marks			
<b>Tutorials:</b>	00 Hours/Week	<b>TW &amp; Practical:</b> 00 Marks		<b>TW &amp;</b>	00
				<b>Practical:</b>	
<b>Total</b>	05 Hours/Week	<b>TW &amp; Oral:</b>	50 Marks	<b>TW &amp; Oral:</b>	01
		<b>Term Work</b>	00 Marks	<b>Term Work</b>	00
<b>Total</b>	150	<b>Total</b>		<b>04</b>	

### Course Overview

Course covers Mobile structure, communication technologies.

**Prerequisite: Basic understanding of networking is required**

**Course Outcomes: On completion of the course, students will have the ability to:**

1. Study Mobile Infrastructure
2. Understand Location Management of Mobile.
3. Understand the Multiple Access Control
4. Use wireless Network
5. Understand Cognitive radio network
6. Use 5G technology.

### Unit I

**06 Hours**

**Introduction:** Overview of wireless and mobile infrastructure; Preliminary concepts on cellular architecture; Design objectives and performance issues; Radio resource management and interface; Propagation and path loss models; Channel interference and frequency reuse; Cell splitting; Channel assignment strategies; Overview of generations:- 1G to 5G.

### Unit II

**06 Hours**

**Location and handoff management:** Introduction to location management (HLR and VLR); Mobility models characterizing individual node movement (Random walk, Fluid flow, Markovian, Activity based); Mobility models characterizing the movement of groups of nodes (Reference point based group mobility model, Community based group mobility model); Static (Always vs. Never update, Reporting Cells, Location Areas) and Dynamic location management schemes (Time, Movement, Distance, Profile Based); Terminal Paging (Simultaneous paging, Sequential paging); Location management and Mobile IP; Overview of handoff process; Factors affecting handoffs and performance evaluation metrics; Handoff strategies; Different types of handoffs (soft, hard, horizontal, vertical).

**Unit III** **06 Hours**

**Wireless transmission fundamentals:** Introduction to narrow and wideband systems; Spread spectrum; Frequency hopping; Introduction to MIMO; MIMO Channel Capacity and diversity gain; Introduction to OFDM; MIMO-OFDM system; Multiple access control (FDMA, TDMA, CDMA, SDMA); Wireless local area network; Wireless personal area network (Bluetooth and zigbee).

**Unit IV** **06 Hours**

**Mobile Ad-hoc networks:** Characteristics and applications; Coverage and connectivity problems; Routing in MANETs.

**Wireless sensor networks:** Concepts, basic architecture, design objectives and applications; Sensing and communication range; Coverage and connectivity; Sensor placement; Data relaying and aggregation; Energy consumption; Clustering of sensors; Energy efficient Routing (LEACH).

**Unit V** **06 Hours**

**Cognitive radio networks:** Fixed and dynamic spectrum access; Direct and indirect spectrum sensing; Spectrum sharing; Interoperability and co-existence issues; Applications of cognitive radio networks.

**Unit VI** **06 Hours**

**D2D communications in 5G cellular networks:** Introduction to D2D communications; High level requirements for 5G architecture; Introduction to the radio resource management, power control and mode selection problems; Millimetre wave communication in 5G.

**Textbooks**

1. Mobile Communications. Jochen Schiller, Pearson Education.
2. *Wireless Communications*. Andrea Goldsmith, Cambridge University Press.
3. *Wireless Communications: Principles and Practice*. Theodore Rappaport, Pearson Education.
4. *Wireless Communications*. Ezio Biglieri, MIMO, Cambridge University Press.
5. *Handbook of Wireless Networking and Mobile Computing*. Ivan Stojmenovic, Wiley.

**Reference Books**

- 1 *Dynamic Location Management in Heterogeneous Cellular Networks*. James Cowling,

2 *Wireless Device-to- Device Communications and Networks*.Lingyang Song, Dusit Niyato, Zhu Han, and Ekram Hossain, Cambridge University Press.

### **List of Assignments**

- 1 Understand the cell splitting in crowded region.
- 2 Study the evolution from 1G to 5G
- 3 Use handoff approach for switching of network
- 4 Explain various mobility models in detail.
- 5 Use frequency hopping approaches in detail.
- 6 Exemplify the compatibility issues.
- 7 Explain energy efficient routing.
- 8 Explain dynamic spectrum access in detail
- 9 List out issues in D2D communication.
- 10 Analyse the changes required in architecture for 5G

### **Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

## Semester VIII

### Services Science & Service Operational Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
				Credits
<b>Lecture:</b>	04 Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b>	4
<b>Practical:</b>	02 Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b>	NA	<b>TW &amp;Practical:</b> 50Marks	<b>TW &amp;</b>	01
		<b>TW &amp;Oral:</b> NA	<b>Practical:</b>	
<b>Total</b>	<b>06 Hours/Week</b>	<b>Total : 150 Marks</b>	<b>TW &amp; Oral:</b>	NA
			<b>Total</b>	5

#### Course Overview

Introduction to service, its nature, operations, development, design, quality relationships and Innovation.

#### Prerequisite:

Fundamentals of Management, Operations Research

#### Course Outcomes: On completion of the course, students will have the ability to:

5. Understand concepts about Services and distinguish it from Goods.
6. Able to identify characteristics and nature of Services.
7. Comprehend ways to design Services and evaluate those using Service qualities.
8. Understand how various methods can be used to operate and manage Service businesses.
9. Understand how innovation can be approached from Services point of view.
10. Understand the need of Services Innovation.

#### Unit I

**06 Hours**

**Introduction:** Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector.

**Nature of Services and Service Encounters:** Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters.

#### Unit II

**06 Hours**

**Service-Dominant Logic:** From Goods-Dominant logic to Service-Dominant logic, Value Co-creation. **Service Strategy and Competitiveness:** Development of Strategic Service Vision (SSV), Data Envelopment Analysis.

**New Service Development:** NSD cycle, Service Blueprinting, Elements of service delivery system.

**Service Design:** Customer Journey and Service Design, Design Thinking methods to aid Service Design.

#### Unit III

**06 Hours**

**Locating facilities and designing their layout:** models of facility locations (Huff's retail model), Role of service-scape in layout design.

**Service Quality:** SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools.

**Service Guarantee & Service Recovery:** How to provide Service guarantee?



How to recover from Service failure?

#### Unit IV

06 Hours

**Forecasting Demand for Services:** A review of different types of forecasting methods for demand forecasting.

**Managing Capacity and Demand:** Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

**Managing Facilitating Goods:** Review of inventory models, Role of inventory in services.

#### Unit V

06 Hours

**Managing service supply relationship:** Understanding the supply chain/hub of service, Strategies for managing suppliers of service.

**Vehicle Routing Problem:** Managing after sales service, Understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes.

#### Unit VI

06 Hours

**Service Innovation:** Services Productivity, Need for Services Innovation.

#### Student Project:

Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.

Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

#### Textbooks

1. Fitzsimmons & Fitzsimmons, *Service Management: Operations, Strategy, Information Technology*, McGraw Hill publications (7th edition).

#### Reference Books

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing: Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) *Service Design for Business: A Practical Guide to Optimizing the Customer Experience*, Pan Macmillan India.
4. Chesbrough, H. (2010). *Open services innovation: Rethinking your business to grow and compete in a new era*. John Wiley & Sons.

#### List of Assignments

1. Manufacturing game (in-class activity)
2. Online activities (industrial service spotting blog, commenting)
3. Article reviews (in-class activity, in groups of 4 students)
4. Learning cases (visiting lectures, case examples)
5. Course essay (group activity in groups of 2 students)

#### Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## IT Project Management

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 3 Hours/Week	<b>End Semester Examination:</b> 60 Marks	Theory 3
Practical: 2 Hours/Week	<b>Continuous Assessment:</b> 40 Marks	
Total 5 Hours/Week	<b>TW &amp; Oral:</b> 50 Marks	<b>TW&amp; Oral</b> 1
	<b>Total: 150 Marks</b>	<b>Total: 4</b>

### Course Overview

Course provides an in depth understanding of project management principles and industry perspective software project management practices

Prerequisite:

Knowledge of Software Engineering Principles.

**Course Outcomes: On completion of the course, students will have the ability to:**

1. Learn the techniques to effectively plan
2. Perform the Project Scheduling, tracking, Quality management and Project Cost estimation using different techniques
3. Develop strategies to calculate risk factors involved in IT projects.
4. decide an effective project management strategy by assessing the project's business background and scope
5. understand responsibility as a professional practitioner of project management
6. Use project management and monitoring tools.

**Unit I** **06 Hours**

**Project Overview and Feasibility Studies:** Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal.

**Unit II** **06 Hours**

**Project Scheduling:** Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

**Unit III** **06 Hours**

**Cost Control and Scheduling:** Project Cost Control (PERT/Cost), Resource Scheduling & Resource Levelling

**Unit IV** **06 Hours**

**Project Management Features:** Risk Analysis, Project Control, Project Audit and Project Termination.

**Agile Project Management:** Introduction, Agile Principles, Agile methodologies:  
**Agile Methodologies:** XP, FDD, DSDM, Crystal.

**Unit V** **06 Hours**

**Scrum:** Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum. Relationship between Agile Scrum and Lean.

## Unit VI

06 Hours

**DevOps:** Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

### Textbooks

1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum
2. Notes to be distributed by the course instructor on various topics

### Reference Books

3. Roman Pichler, *Agile Product Management with Scrum*
4. Ken Schwaber, *Agile Project Management with Scrum (Microsoft Professional)*

### List of Assignments

Case studies will be distributed to students beforehand and students should prepare and try to solve these cases before coming to class. Students will be asked submit and present their understanding of the cases and solutions before the class.

**Note:** Workshops will be conducted as a part of this course which is mandatory for students to attend. The primary objective of the workshops is to teach the students the agile project management including Scrum and DevOps through group activities.

### Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Marketing Research & Marketing Management

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	3 Hours/Week	<b>End Semester Examination:</b>	60Marks	<b>Theory</b>	<b>Credits</b> 3
<b>Practical:</b>	NA	<b>Continuous Assessment:</b>	40 Marks		
<b>Tutorials:</b>	NA	<b>TW &amp; Practical:</b>	NA	<b>TW &amp; Practical:</b>	NA
		<b>TW &amp; Oral:</b>	NA	<b>TW &amp; Oral:</b>	NA
		<b>Term Work:</b>	NA	<b>Term Work</b>	NA
<b>Total</b>	<b>3 Hours/Week</b>	<b>Total:</b>	<b>100 Marks</b>	<b>Total</b>	<b>3</b>

### Course Overview:

Course includes concepts of Marketing, Product Management, Business Marketing and marketing management.

### Prerequisite:

Students should have basic knowledge about marketing skills.

### Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the basic marketing concepts.
2. Comprehend the concept of Product Life cycle and Product development.
3. Understand the basics of Pricing, Promotion and Distribution Strategy.
4. Comprehend the dynamics of marketing and analyze how its various components interact with each other in the real world.
5. Leverage marketing concepts for effective Internet Marketing.
6. Understand basic concepts and application of statistical tools in Marketing research.

### Unit I

**06 Hours**

**Marketing Concepts and Applications:** Introduction to Marketing & Core Concepts, Marketing of Services, Importance of marketing in service sector.

**Marketing Planning & Environment:** Elements of Marketing Mix, Analyzing needs & trends in Environment - Macro, Economic, Political, Technical & Social.

**Understanding the consumer:** Determinants of consumer behaviour, Factors influencing consumer behaviour.

**Market Segmentation:** Meaning & Concept, Basis of segmentation, selection of segments, Market Segmentation strategies, Target Marketing, Product Positioning.

### Unit II

**06 Hours**

**Product Management:** Product Life cycle concept, New Product development & strategy, Stages in New Product development, Product decision and strategies, Branding & packaging

### Unit III

**06 Hours**

**Pricing, Promotion and Distribution Strategy:** Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising.

#### **Unit IV**

**06 Hours**

**Marketing Research:** Introduction, Type of Market Research, Scope, Objectives & Limitations, Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, Media Research, Qualitative Research

**Data Analysis:** Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting and Positioning, Factor Analysis.

#### **Unit V**

**06 Hours**

**Internet Marketing:** Introduction to Internet Marketing. Mapping fundamental concepts of Marketing (7Ps, STP); Strategy and Planning for Internet Marketing.

#### **Unit VI**

**06 Hours**

**Business to Business Marketing:** Fundamental of business markets. Organizational buying process. Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationship, networks and customer relationship management. Business to Business marketing strategy.

#### **Textbooks**

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Research – Rajendra Nargundkar
4. Marketing Management – V.S. Ramaswamy and S. Namakumari
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindler

#### **Reference Books**

1. Marketing Management – Rajan Saxena
2. Marketing Management – S.A. Sherlekar
3. Service Marketing – S.M. Zha
4. Journals – The IUP Journal of Marketing Management, Harvard Business Review
5. Research for Marketing Decisions by Paul Green, Donald, Tull
6. Business Statistics, A First Course, David M Levine et al, Pearson Publication

#### **List of Assignments**

1. Case study on various marketing management, Product Management, Data Analysis, Internet Marketing
2. Field visit & live project covering steps involved in formulating Market Research Project
3. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

#### **Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

## Elective V a) Behavioral Economics

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	<b>3 Hours/Week</b>	<b>End Semester Examination:60 Marks</b>	<b>Theory</b>	<b>Credits 3</b>
<b>Practical:</b>	<b>2 Hours/Week</b>	<b>Continuous Assessment: 40 Marks</b>		
<b>Tutorials:</b>	<b>NA</b>	<b>TW &amp; Practical:50 Marks</b>	<b>TW &amp; Practical:</b>	<b>1</b>
		<b>TW &amp; Oral:NA</b>	<b>TW &amp; Oral:</b>	<b>NA</b>
		<b>Term Work :NA</b>	<b>Term Work</b>	<b>NA</b>
<b>Total</b>	<b>5 Hours/Week</b>	<b>Total:150 Marks</b>	<b>Total</b>	<b>4</b>

**Course Overview:** : To impart knowledge on current ideas and concepts regarding decision making in Economics, particularly from a behavioral science perspective, which can affect choices and behavior of firms, households and other economics entities

**Prerequisite:** Knowledge of Mathematics

**Course Outcomes:** On completion of the course, students will have the ability to:

1. various concepts in understand and apply traditional and modern Microeconomics, focusing on decision making, and
2. develop a holistic understanding of these concepts and their interconnections

**Unit I** **06 Hours**

**Introduction** The neoclassical/standard model and behavioral economics in contrast; historical background; behavioral economics and other social sciences; theory and evidence in the social sciences and in behavioral economics; losses, money illusion, charitable donation.

**Unit II** **06 Hours**

**Basics of choice theory** Revisiting the neoclassical model; utility in economics and psychology; models of rationality; connections with evolutionary biology and cognitive neuroscience; policy analysis – consumption and addiction, environmental protection, retail therapy; applications – pricing, valuation, public goods, choice anomalies

**Unit III** **06 Hours**

**Beliefs, heuristics and biases** Revisiting rationality; causal aspects of irrationality; different kinds of biases and beliefs; self-evaluation and self-projection; inconsistent and biased beliefs; probability estimation; trading applications – trade in counterfeit goods, financial trading behavior, trade in memorabilia

**Unit IV** **06 Hours**

**Choice under uncertainty** Background and expected utility theory; prospect theory and other theories; weighting; applications – reference points; loss

aversion; marginal utility; decision and performance and probability ownership and trade consumption, income, in sports.

**Unit V** **06 Hours**

**Intertemporal choice** Geometric discounting; preferences over time,

of inter-temporal decisions; hyperbolic; discounting instantaneous; utility alternative concepts – future projection, mental accounts, heterogeneous selves, procedural choice; policy analysis – mobile calls, credit cards, organization of government; applications – consumption and savings clubs and membership, consumption planning

## **Unit VI**

**06 Hours**

### ***Strategic Choice***

1. Review of game theory and Nash equilibrium – strategies, information, equilibrium in pure and mixed strategies, iterated games, bargaining, signaling, learning; applications – competitive sports, bargaining and negotiation, monopoly and market entry

2. Individual preferences; choice anomalies and inconsistencies; social preferences; altruism; fairness; reciprocity; trust; learning; communication; intention; demographic and cultural aspects; social norms; compliance and punishment; inequity aversion; policy analysis – norms and markets, labor markets, market clearing, public goods; applications – logic and knowledge, voluntary contribution, compensation design

### **Textbooks**

1 An Introduction to Behavioral Economics, by N. Wilkinson and M. Klaes

### **Reference Books**

1 Colin Cramer, George Loewenstein, Mathew Rabin Advances in Behavioral Economics, Princeton University Press

## **List of Assignments**

**2 -3 Assignment on Each Unit**

### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Elective V b) Computational Finance and Modelling

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	<b>3 Hours/Week</b>	<b>End Semester Examination:60 Marks</b>	<b>Theory</b>	<b>Credits</b> <b>3</b>
<b>Practical:</b>	<b>2Hours/Week</b>	<b>Continuous Assessment: 40 Marks</b>		
<b>Tutorials</b>	<b>NIL</b>	<b>TW &amp; Practical: NIL</b>	<b>TW &amp; Practical:</b>	<b>1</b>
		<b>TW &amp; Oral: 50 Marks</b>	<b>TW &amp; Oral:</b>	
		<b>Term Work:</b>	<b>Term Work</b>	
<b>Total</b>	<b>5 Hours/Week</b>	<b>Total: 150 Marks</b>	<b>Total</b>	<b>4</b>

### Course Overview

Computational finance emphasizes practical numerical methods rather than mathematical proofs and focuses on techniques that apply directly to economic analyses

### Prerequisite:

Numerical Methods, Probability, Statistics, ordinary and partial differential equations, linear algebra and analysis.

### Course Outcomes: On completion of the course, students will have the ability to:

1. Understand existing financial models in a quantitative and mathematical way.
2. Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering.
3. Explain the approaches required to calculate the price of options.
4. Identify the methods required to analyse information from financial data and trading systems.
5. Understanding Statistical Analysis
6. Understanding Incomplete Markets and Electronic Trading

### Unit I

**06 Hours**

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance: examples of exact solutions including Black Scholes and its relatives, finite difference methods including algorithms and question of stability and convergence, treatment of near and far boundary conditions, the connection with binomial models, interest rate models, early exercise, and the corresponding free boundary problems, and a brief introduction to numerical methods for solving multi-factor models.

### Unit II

**06 Hours**

Black-Scholes framework: Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. The Greeks: theta, delta, gamma, vega & rho and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local vol and volatility surfaces.

Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo



integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the “Greeks. ”

### **Unit III**

**06 Hours**

Financial Products and Markets: Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

### **Unit IV**

**06 Hours**

Application areas include the pricing of American options, pricing interest rate dependent claims, and credit risk. The use of importance sampling for Monte Carlo simulation of VaR for portfolios of options.

### **Unit V**

**06 Hours**

Statistical Analysis of Financial Returns: Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data.

### **Unit VI**

**06 Hours**

Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

### **Textbooks**

1. R. Seydel: Tools for Computational Finance, 2nd edition, Springer-Verlag, New York, 2004.
2. P. Glasserman: Monte Carlo Methods in Financial Engineering, Springer-Verlag, New York, 2004.

### **Reference Books**

1. W. Press, S. Teukolsky, W. Vetterling and B. Flannery, Numerical Recipes in C: The Art of Scientific Computing, 1997. Cambridge University Press, Cambridge, UK. Available on-line at: <http://www.nr.com/>
2. A. Lewis: Option Valuation under Stochastic Volatility, Finance Press, Newport Beach, California, 2000.
3. A. Pelsser: Efficient Methods for Valuing Interest Rate Derivatives, Springer-Verlag, New York, 2000.
4. D. Ruppert, Statistics and Data Analysis for Financial Engineering
5. R. Carmona: Statistical Analysis of Financial Data in S-Plus
6. N. H. Chan, Time Series: Applications to Finance
7. R. S. Tsay, Analysis of Financial Time Series
8. J. Franke, W. K. Härdle and C. M. Hafner, Statistics of Financial Markets: An Introduction

### **List of Assignments**

- 1 Implement different Numerical methods
- 2 Implement variance reduction methods
- 3 Study Financial Markets
- 4 Implement Monte Carlo Method

- 5 Analyze frequency data.
- 6 Study High Dimensional Covariance Matrix

**Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

## Elective V c) PSYCHOLOGY

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	03 Hours/Week	<b>End Semester Examination:</b> 60Marks	<b>Theory</b>	<b>Credits</b> 03
<b>Practical:</b>	02 Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
<b>Tutorials:</b>	00 Hours/Week	<b>TW &amp; Practical:</b> 00 Marks	<b>TW &amp; Practical:</b>	
		<b>TW &amp; Oral: 50 Marks</b>	<b>TW &amp; Oral:</b>	01
		<b>Term Work: 00 Marks</b>	<b>Term Work</b>	
<b>Total</b>	<b>05 Hours/Week</b>	<b>Total: 150 Marks</b>	<b>Total</b>	<b>04</b>

### Course Overview

Introduces students to the content areas of industrial psychology and the application of psychological theory to organizational issues. Topics include employment law, job analysis, recruitment and selection, training, performance appraisal and discipline, employee motivation, and workplace safety. Using an applied approach, this course will help prepare students for their roles as employees and managers.

### Prerequisite:

Statistics courses are a must for any psychology major. Statistics offers a core background for understanding how psychologists investigate human behaviour.

### Course Outcomes: On completion of the course, students will have the ability to:

1. Become conversant about the major content areas of Industrial Psychology (i.e., job analysis, recruitment, selection, employment law, training, performance management, and health/well-being issues in the workplace).
2. Gain further comfort with statistical concepts in the context of making personnel decisions to reinforce content learned in PSY203 or an equivalent introductory statistics course.
3. Gain practical experience by completing a series of hands-on projects involving job analysis, selection decisions, training programs, and employee well-being.
4. Deepen your understanding of tests and measurements so that you can collect accurate information and make sound data-based decisions.
5. Prepare for other focused seminar courses in Industrial/Organizational Psychology or Human Resource Management.
6. To allow the students to observe and interpret individual differences in behaviour in the light of sound theoretical systems of personality.

### Unit I

**06 Hours**

What is I/O Psychology? Research Methods, Statistics, and Evidence-based Practice, Introduction & Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation & Compensation, Job Design & Employee Well-Being, Recruitment.

### Unit II

**06 Hours**

Identifying Criteria & Validating Tests and Measures, Screening Methods, Intensive Methods.

### Unit III

**06 Hours**

Performance Goals and Feedback, Performance Coaching and Evaluation,

Evaluating Employee Performance

**Unit IV** **06 Hours**  
Employee Motivation, Satisfaction and Commitment, Fairness and Diversity

**Unit V** **06 Hours**  
Leadership, Organizational Climate, Culture, and Development, Teams in Organizations, The Organization of Work Behaviour

**Unit VI** **06 Hours**  
Stress Management: Demands of Life and Work

**Textbooks**

- 1 Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing
- 2 Introduction to Psychology, University of Minnesota Libraries Publishing, ISBN 13: 9781946135131
- 3 Introduction to Psychology, Manoj Kr Singh, Anmol Publications Pvt. Ltd.

**Reference Books**

- 1 Encyclopedia of Psychology (English, Hardcover, unknown), Oxford University Press Inc  
ISBN: 9781557981875, 9781557981875, Edition: 2000

**List of Assignments**

- 1 Case study on Legal Context of Industrial Psychology
- 2 How to get Employee Motivation, Satisfaction and Commitment in working environment?
- 3 How to reducing the stress for compromising demands of life?
- 4 Case Study on Evaluating Employee Performance

**Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

## Elective VI a) Enterprise Systems

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>	Credits
Lecture: 3 Hours/Week	<b>End Semester Examination:</b> 60Marks	Theory	03
Practical: 2 Hours/Week	<b>Continuous Assessment:</b> 40 Marks		
Tutorials: NA	<b>TW &amp; Practical:</b> NA	<b>TW &amp; Practical:</b>	
	<b>TW &amp; Oral:</b> 50 Marks	<b>TW &amp; Oral:</b>	01
	<b>Term Work</b> NA	<b>Term Work</b>	
	<b>Total</b> 150 Marks	<b>Total</b>	04

### Course Overview

The course deals with Enterprise Systems, Service Oriented Architecture.

### Prerequisite:

Have the knowledge of Databases and Networks.

### Course Outcomes: On completion of the course, students will have the ability to:

- Design and deploy Simple Web Applications using MVC
- Design SOA and ERP models
- Design of CRM models
- Design interactive network and application
- Manage, Maintain and configuration of Networking
- Learn how to use the user interface using ERP Tools and Technologies.

### Unit I

**06 Hours**

**Overview of:** Database Management Systems. Overview of Model - View - Control (MVC),Control (MVC) method of software development in a 3 tier environment

**Tools and Technologies:** overview of the following : Java server pages , Related Java Technologies, Microsoft .NET framework, PHP, Ruby on Rails, Javascript, Ajax.

### Unit II

**06 Hours**

**Service Oriented Architecture (SOA):** Principles of loose coupling, encapsulation Inter-operatibility ,Web Services as the implementation vehicle protocols, usage  
**Enterprise Resource Planning (ERP):** systems and their architecture, Overview of SAP and Oracle Applications, Generic ERP Modules: Finance, HR, Materials Management, Investment, etc , Examples of Domain Specific Modules .

### Unit III

**06 Hours**

Electronic Data Exchange, Customer Relationship Management (CRM), Supplier Relationship Management (SRM)

**Security Issues** - Authentication, Authorisation, Access control, Roles; single-sign-on, Directory servers, Audit trails; Digital signatures; Encryption: review of IPsec, SSL and other technologies; Simple Applications Demo .

### Unit IV

**06 Hours**

**Network management in ERP:** Overview of : MPLS, Virtual Private Networks (VPN),

Firewalls, Network monitoring and enforcement of policies.

### **Unit V**

**06 Hours**

**ERP Software Acquisition Process:** Tendering; conditions of contract, Commercial off the shelf software (COTS) versus Bespoke Implementations; Total cost of ownership, Issues on using Open source software or free software, Licensed software.

### **Unit VI**

**06 Hours**

**Hardware Architectures for Enterprise Systems :** Servers ,Clustering, Storage area networks, Storage units,Back-up strategies, Local Area Network (LAN) technologies and products, Data Centres.

Disaster recovery site design and implementation issues, Hardware Acquisition Issues.

### **Textbooks**

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal , Galgotia

### **Reference Books**

1. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota

### **List of Assignments**

1. Create a Movie Database Application using MVC
2. Creating an ASP.NET MVC Web Application Project.
3. Explore the client/server architecture of SAP. Learn how to use the user interface
4. Create vendor, material master data for purchasing. Execute the Purchasing process in SAP
5. A model of customer relationship management and business intelligence systems for catalogue and online retailers.
6. Firewalls configuration
7. COTS configuration and Implementation
8. A model of customer relationship management and business intelligence systems for catalogue and online retailers

### **Syllabus for Unit Tests:**

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

## Elective VI b) Advance Finance

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
<b>Lecture:</b>	3Hours/Week	<b>End Semester Examination:</b>	60Marks	<b>Theory</b>	<b>Credits</b> 3
<b>Practical:</b>	2Hours/Week	<b>Continuous Assessment:</b>	40 Marks	<b>TW &amp; Practical:</b>	NIL
<b>Tutorials:</b>	NA	<b>TW &amp; Practical:</b>	NA	<b>TW &amp; Oral:</b>	1
		<b>TW &amp; Oral:</b>	25 Marks	<b>Term Work</b>	
		<b>Term Work</b>	25 Marks		
<b>Total</b>	150 Marks	<b>Total</b>	4		

**Course Overview:** This course focuses on advanced financial decisions of corporate managers. The course uses case studies to illustrate the application of theoretical concepts to real-life.

**Prerequisite:** Basics of Financial accounting

**Course Outcomes:** On completion of the course, students will have the ability to:

1. Imbibe knowledge about the decisions and decision variables involved with financial activities of the firm.
2. Develop skills for interpretation business information and application of financial theory in corporate investment decisions, with special emphasis on working capital management.
3. Familiarizing the students with the corporate and financial restructuring.
4. Explain optionality and its application to financial management and financial decisions
5. Present ideas and advocate for decisions using effective finance arguments, models and frameworks
6. Analyse how organisations can effectively manage risk in today's uncertain economy

**Unit I : Sources of Funds (including regulatory framework) 06 Hours**

- Types of securities
- Issuing the capital in market
- Pricing of issue
- Valuation of Stocks and bonds

**Unit II: Dividend Decisions:** Traditional Approach, Dividend Relevance Model, 06 Hours  
Miller and Modigliani Model, Stability of Dividends, Forms of Dividends, Issue of bonus shares, Stock Split.

**Unit III: Evaluation of Lease Contracts, 06 Hours**  
**Corporate Restructuring**

- Mergers and Acquisitions- Types of Mergers, Evaluation of Merger Proposal
- Take-over
- Amalgamation
- Leverage buy-out
- Management buy-out
- Corporate Failure and Liquidation

#### **Unit IV : Financial Restructuring**

**06 Hours**

- Share Split
- Consolidation
- Cancellation of Paid-up Capital
- Other Mechanisms

#### **Unit V: Working Capital Management:**

**06 Hours**

- Working Capital Planning
- Monitoring and Control of Working Capital
- Working Capital Financing
- Managing the Components of Working Capital
  - Cash Management
  - Receivable Management
  - Inventory Management

#### **Unit VI: Introduction to derivatives**

**06 Hours**

- Basics of Futures, Forwards, Options, Swaps
- Interest rate Payoff Diagrams, Pricing of Futures, Put Call Parity, Option Pricing using Binomial Model and Black Scholes Model
- Use of Derivatives for Risk-Return Management- Credit Default Swaps

#### **Textbooks**

1. Brealey, Myers and Allen, *Principles of Corporate Finance*
2. Case Study Materials: To be distributed for class discussion

#### **List of Assignments**

Case study materials book will be given to students. Students are required to meet in groups before coming to class and prepare on the case for the day. Instructor may ask the student groups to present their analysis and findings to the class.

Further, the topic for class discussion will be mentioned beforehand and students should be prepared to discuss these topics in class. Few topics are mentioned below as examples. Instructor can add or change any topic as per requirement.

1. Topic: Historical perspectives of markets like major boom and busts, bull and bear cycles, major market crashes, bubbles
2. Topic: Major scams in the market, e.g. Satyam case

#### **Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI



## Elective VI c) Image Processing and Pattern Recognition

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	Credits 3
Practical:	2 Hours/Week	Continuous Assessment:	40 Marks	TW &	1
		TW & Oral:	50 Marks	Oral:	
Total	150	Marks Total	4		

### Course Overview

It emphasizes general principles of image processing, rather than specific applications. This course includes foundations of pattern recognition algorithms and machines, including statistical and structural methods.

### Prerequisite:

Fundamental knowledge of computer graphics algorithms, probability theory and transform operations in mathematics.

### Course Outcomes: On completion of the course, students will have the ability to:

The major **emphasis** of the course will be on creating a learning system through which management students can enhance their innovation and creative thinking skills, acquaint themselves with the special challenges of starting new ventures and use IPR as an effective tool to protect their innovations and intangible assets from exploitation.

1. Understand Basics of Image formation and transformation using sampling and quantization
2. Understand different types of signal processing techniques used for image sharpening and smoothing
3. Perform and apply compression and coding techniques used for image data
4. Understand the nature and inherent difficulties of the pattern recognition problems
5. Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques.
6. Understand and select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.

### Unit I: Introduction to Image Processing

**06 Hours**

Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.

### Unit II: Image Restoration

**06 Hours**

Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.

### Unit III: Segmentation Techniques

**06 Hours**

Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications, Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape

descriptors, Skelton detection, Hough trans-form, topological and texture analysis, shape matching.

**Unit IV: Pattern Recognition**

**06 Hours**

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

**Unit V: Statistical Patten Recognition**

**06 Hours**

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions, Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation.

**Unit VIDimension reduction methods**

**06 Hours**

Principal Component Analysis (PCA), Hough Transform, Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM),Gaussian mixture models.

**Textbooks**

1. Digital Image Processing – Ganzalez and Wood, Addison Wesley.
2. Fundamental of Image Processing – Anil K.Jain, Prentice Hall of India.
3. Pattern Classification – R.O. Duda, P.E. Hart and D.G. Stork, John Wiley.

**Reference Books**

1. Digital Picture Processing – Rosenfeld and Kak, vol.I & vol.II, Academic.
2. Computer Vision – Ballard and Brown, Prentice Hall.
3. Pattern Recognition and Machine Learning – C. M. Bishop, Springer.
4. Pattern Recognition – S. Theodoridis and K. Koutroubas, 4th Edition, Academic Press.

**List of Assignments**

1. Implement the noise reduction for the noisy image.
2. Implement various transformation methods
3. Implement the histogram equalization for two images
4. Implemented Hough Transform for circles from scratch.

**Syllabus for Unit Tests:**

Unit Test -1  
Unit Test -2

Unit – I, Unit – II, Unit - III  
Unit – IV, Unit – V, Unit - VI

**B. Tech. (Electronics) – 2014 Course**

<b>Semester- I</b>					<b>Contact Hours: 30 Hrs/week</b>						
					<b>Total Credits: 25</b>						
					<b>Total Marks: 700</b>						
Sr. no.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)					Total Marks	Total Credits
		L	P	T	End Semester Exam	Continuous Assessment			TW		
						Unit test	Tutorials / Assignments	Attendance			
1	Engineering Mathematics-I	3	1	0	60	20	10	10	-	100	4
2	Fundamentals of Civil Engineering	3	0	2	60	20	10	10	25	125	4
3	Engineering Graphics	4	0	2	60	20	10	10	25	125	5
4	Engineering Chemistry	4	0	2	60	20	10	10	25	125	5
5	Elements of Electronics Engineering	3	0	2	60	20	10	10	25	125	4
6	Professional Skill Development-I	2	0	0	30	0	20	0	0	50	2
7	Workshop Technology	0	0	2	0	0	0	0	50	50	1
<b>Total</b>		<b>19</b>	<b>01</b>	<b>10</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>

**Note:**

1. Sem-I & Sem-II are common to the branches (Electronics, Biomedical & E & T/C)
2. \* indicates subjects common to the branches (Electronics, Biomedical & E & T/C)
3. \*\* indicates subjects common to the branches (Electronics & E & T/C)
4. Engineering Mathematics –I, II, III are common to the branches (Electronics, Biomedical & E & T/C)
5. Internal assessment of 40 marks comprises of 20 marks average of two Unit tests,10 marks tutorials/assignments and 10 marks attendance

**B. Tech. (Electronics) – 2014 Course**

Semester- II												
<b>Contact Hours: 30 Hrs/week</b>												
<b>Total Credits: 25</b>												
<b>Total Marks: 700</b>												
Subject Code	Subject	Teaching Scheme(Hrs )			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
8	Engineering Mathematics -II	3	1	0	60	20	10	10	-	100	4	
9	Fundamentals of Mechanical Engineering	3	0	2	60	20	10	10	25	125	4	
10	Fundamentals of Engineering Mechanics	4	0	2	60	20	10	10	25	125	5	
11	Engineering Physics	4	0	2	60	20	10	10	25	125	5	
12	Fundamentals of Electrical Engineering	3	0	2	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	0	0	30	0	20	0	0	50	2	
14	Fundamentals of Computing	0	0	2	0	0	0	0	50	50	1	
	<b>Total</b>	<b>19</b>	<b>01</b>	<b>10</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>	

## ENGINEERING MATHEMATICS-I

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

### Unit I

#### MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

### Unit II

#### COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

### Unit III

#### DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

#### EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

### Unit IV

#### DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

#### INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

### Unit V

#### PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

## Unit VI

### JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

### MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

### Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

### References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

### Syllabus for Unit Test:

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

## 02: Fundamentals of Civil Engineering

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
<b>Course Objectives:</b>					
To make student understand the scope and application of Civil Engineering					
<b>Course Outcomes:</b>					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
<b>UNIT - I</b>					
<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>	
Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.					
<b>UNIT - II</b>					
<b>Surveying</b>				<b>(06 Hours)</b>	
Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.					
<b>UNIT - III</b>					
<b>Building Planning And Bye Laws</b>				<b>(06 Hours)</b>	
Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.					
<b>UNIT - IV</b>					
<b>Foundations and Earthquakes</b>				<b>(06 Hours)</b>	
Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.					

<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>	<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
<b>Reference Books:</b>		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	



<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

## ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

### Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

### SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes

4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

## ENGINEERING CHEMISTRY

Teaching Scheme:  
Lectures: 4Hrs/Week  
Practical: 2Hr/Week

Examination scheme:  
End Semester Examination: 60 marks  
Continuous Assessment: 40 marks

Credits Allotted:  
Theory: 04  
Practical: 01  
Term Work: 25marks

### Unit I

#### WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

(08 Hours)

### Unit II

#### MATERIAL CHEMISTRY

**Crystallography** : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement** : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

### Unit III

#### FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

### Unit IV

#### CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

### Unit V

#### ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

## Unit VI

### STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

### TERM WORK

#### Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

#### Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

#### References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

#### Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

**Course: ELEMENTS OF ELECTRONICS ENGINEERING**

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Lectures : 03 Hrs/week Practicals : 02 Hrs/week	End semester exam : 60 Marks Continuous Assessment : 40 Marks Term work : 25 Marks	03  01

**Course Prerequisite:**

Students have completed a course in Physics and have the knowledge of laws of Dynamics

**Course Objective:**

This course will introduce the concepts of electronic engineering . By the end of the course, student will be familiar with electronic components, semiconductor devices and their applications. The course emphasizes on Electronic devices, ICs and Digital systems.

**Course Outcomes:**

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

- 1 understand the basic semiconductor physics and semiconductor devices.
- 2 understand transport phenomenon of semiconductor devices through energy band diagrams.
3. to identify electronic components like, resistors, capacitors, inductors and to study characteristics of semiconductor devices.
4. apply the knowledge of diodes to the rectifier and filter circuits.
5. to represent numerical values in various number systems and perform number conversions between different number system and study applications of logic gates.

**Unit-I**

**(08 Hours)**

**Electron Dynamics:**

Motion of electron in electric, magnetic and combined electric and magnetic fields. Detection and focusing system of Oscilloscope tube-Television picture tube- LCD and Flat panel displays.

**Unit-II**

**(08 Hours)**

**Transport phenomenon in semiconductor:**

Mobility and conductivity - Drift and Diffusion currents – Continuity Equation – Minority carrier injection and recombination in Homogeneous semiconductor – Thermistors – Peizo Resistors – Hall Effect – Thermoelectric effect

**Unit-III**

**(08 Hours)**

**Electronic components:**

Resistors -Inductors and Capacitors and their types – Construction and characteristics of PN junction diode – Zener Diode – Tunnel diode - Bipolar junction transistors – CB,CC,CE circuits, Field Effect transistors .

**Unit-IV**

**(08 Hours)**

**Electronic Devices and Linear ICs:**

Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: FET - SCR - LED - VI characteristics – applications. Introduction to Op-Amp and Timers.

**Unit-V****(08 Hours)****Digital system:**

Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary –addition, subtraction, multiplication and division.

Logic gates: OR, AND, NOT, Exclusive-OR, NOR, NAND gates, Logic networks, Gate Standardization, Introduction to Logic Circuits –Combinational and Sequential Circuits.

**(08 Hours)****Unit-VI****Consumer Electronics:**

Basic study of various products such as radio receivers , television sets , MP3 players, video recorders , DVD players , digital cameras , microwaves , personal computers , video game consoles , telephones and mobile phones , laptops and palmtops and fax machines

**Term work: For term work assessment the students will have to perform minimum of eight practicals.**

- 1) To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.
- 2) To study CRO and different modes of operation and some application.
- 3) To plot V-I characteristics of PN junction diode.
- 4) To plot regulation characteristics of half wave rectifier with and without capacitor filter.
- 5) To plot regulation characteristics of Full wave rectifier with and without capacitor filter.
- 6) To plot input-output characteristics of CE configuration of BJT.
- 7) To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.
- 8) To realize the Boolean expression using basic gates.
- 9) To verify the De-Morgan's theorem.
- 10) To fabricate at least 5 electronics component on a PCB.

**TEXT BOOKS**

1. Mottershed Allen, Electronic Devices & Circuits, PHI
2. R. P. Jain, Modern Digital Electronics, Mc Graw Hill

**REFERENCE BOOKS**

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
4. Millman & Halkis, Integrated Electronics, MGH

**Syllabus for Unit Test :**

Unit Test 1	Unit I ,II & III
Unit Test 2	Unit IV, V &VI

## Workshop Technology

### TEACHING SCHEME:

Theory: -  
Practical: 02 Hours / Week

### EXAMINATION SCHEME:

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

### CREDITS ALLOTTED:

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.



## ENGINEERING MATHEMATICS-II

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment:40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

### Unit I

#### DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

### Unit II

#### APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

### Unit III

#### FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

#### INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

### Unit IV

#### INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

#### CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

### Unit V

#### SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

## Unit VI

### MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

#### Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

#### References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

#### Syllabus for Unit Test:

**Unit Test I :- Unit I, II, III**

**Unit Test II :- Unit IV, V, VI**

**FUNDAMENTALS OF MECHANICAL ENGINEERING**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted</b>
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p><b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p><b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

### List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner

5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

### References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johnston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.

## 10: Engineering Mechanics

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>			
The Students should have knowledge of			
1.	Scalar and Vector		
2.	Newton's law of motion		
3.	Law of friction		
4.	Concept of physical quantities, their units and conversion of units		
5.	Concept of differentiation and integration		
<b>Course Objectives:</b>			
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.		
<b>Course Outcomes:</b>			
<b>The student should be able to</b>			
1.	calculate resultant and apply conditions of equilibrium.		
2.	analyze the truss and calculate friction force.		
3.	calculate centroid and moment of inertia.		
4.	solve problem on rectilinear motion.		
5.	solve problems on curvilinear motion.		
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.		
<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>	
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.		
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>	
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.		
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>	
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.		

<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>		
A) The term-work shall consist of minimum <b>Five</b> experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.		
<b>Text Books:</b>		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
<b>Reference Books:</b>		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	



## ENGINEERING PHYSICS

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

### UNIT – I

#### MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

#### NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

### UNIT – II

#### SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

#### SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

### UNIT – III

#### THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

#### NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08hours)**

## UNIT-IV

### OPTICS - I

#### INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC.

#### DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

## UNIT-V

### OPTICS - II

#### POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

#### LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

## UNIT-VI

### ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

### QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

## TERM WORK

### Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Planck's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

### Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

### Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

### Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

## 02: Fundamentals of Electrical Engineering

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

### Course Pre-requisites:

The Students should have

1. Mathematics
2. Physics

### Course Objectives:

The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.

### Course Outcomes:

1. Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems
2. Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks
3. Describe construction, principle of operation, specifications and applications of capacitors and batteries
4. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer
5. Define basic terms of single phase and three phase ac circuits and supply systems
6. Know and use electrical safety rules

<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute	

	permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

#### **Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$ ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

<b>Text Books:</b>	
1) B.L.Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi	
2) V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi	
3) I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd	
<b>Reference Books:</b>	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## FUNDAMENTALS OF COMPUTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Practical: 2 Hours/Week	Term Work: 50 Marks	01

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### Course Prerequisite:

Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.

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### Course Objective:

This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language, software file system, computer graphics and its various multimedia applications.

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**Course Outcomes:** At the end of the course, a student will be able to

1. Write C programs using conditional statements and loops.
  2. Execute the logic using Arrays and strings and perform matrix operation using them.
  3. Perform logic operations using Structures & Unions and use them with pointers.
  4. Write C program for File manipulations and Dynamic memory allocation
  5. Understand the concept and application of Graphics & Multimedia.
- 

### Unit –I

(08 Hours)

**Introduction:** Computer systems, Hardware & software concepts.

Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

**Basic of C:** Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, bit-wise Operators expressions, type conversions, conditional expressions, precedence and order of evaluation, Managing input and output operations, Sample programs.

**Conditional Statements and Loops:** Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs

### Unit-II

(08 Hours)

#### Arrays & Strings

Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations

## Unit –III

(08 Hours)

### Function & Pointers

**FUNCTIONS:** basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, example c programs. Passing arrays & strings to functions.

**Pointers:** concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

## Unit-IV

(08 Hours)

### Structures & Unions

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications.

## Unit-V

(08 Hours)

### Files and Dynamic Memory Allocation

Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.

Dynamic memory allocation, malloc, calloc, realloc ,free. Concepts of linked lists, Sample programs

## Unit-VI

(08 Hours)

### Graphics and Multimedia

**Introduction to Computer Graphics:** Overview of Computer Graphics, Computer Graphics Application, Description of graphics devices, Input Devices for Operator Interaction

**Introduction to Multimedia:**History, elements of multimedia – text, audio, video, image, animation, Multimedia applications different areas

### TEXT BOOKS

1. Programming in ANSI C – E Balagurusamy (5<sup>th</sup> Edition-TMH)
2. Computer Graphics: Principles and Practices in C – Andrea Von Dam, Steven K Fiener, F Hughes John [2<sup>nd</sup> Edition- Pearson]

### REFERENCE BOOKS

1. Let Us C- Yashwant Kanitkar
2. D. Hearn, M. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 - 7808 - 794 – 4
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communication and Applications"
4. Judith Jeffcoate, " Multimedia Technique"



**Term work will consist of minimum of ten assignments based on C programming language.**

**List of Practicals**

1. a. Write a C program to take user Input and print it on the screen.  
b. Write a C program to perform addition or subtraction of two numbers.  
c. Write a C program to find whether the number is Odd or Even.
2. a. Write a C program to find out Prime numbers.  
b. Write a C program to find out Fibonacci series.
3. Write C programs to print different patterns
4. a. Write a C program to do factorial using recursion.  
b. Write a C program to find out Armstrong number.
5. Write a C program to sort the array in Ascending & Descending order.
6. Write C programs to perform operations on 2-D arrays
7. Write a C program to perform different operations on strings.
8. Use of Pointers
  - a. Write a C program to swap numbers using pointers
  - b. Write a C program to show the use of pointers in arrays.
  - c. Write a C program to use functions using pointers.
9. a. Write a C program to create student mark sheet using structures  
b. Write a C program to show the use of structure using pointers
10. Write a C program to perform different operations on Files.
11. Write a C program to create single Linked List.
- 12.** Application of Graphics and Multimedia

# Bharati Vidyapeeth University, Pune

## Faculty of Engineering & Technology

### Programme : B.Tech (Electronics) Sem – III (2014 Course)

Sr · No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			T W & P R	T W & O R		Theo ry	T W	Total Cred its
		L	P	T		Un it Te st	Attenda nce	Assignm ents						
15	Engineeri ng Mathemat ics-III	3	0	1	60	20	10	10	-	-	100	4	-	4
16	Analog Electronic s	4	2	0	60	20	10	10	50	-	150	4	1	5
17	Signals & Systems	3	2	0	60	20	10	10	-	50	150	3	1	4
18	Digital Logic Circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
19	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4
20	Profession al Skill Developm ent-III	4	0	0	100	0	00	0	-	-	100	4	0	4
	<b>Total</b>	<b>20</b>	<b>8</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>21</b>	<b>04</b>	<b>25</b>

## Bharati Vidyapeeth University, Pune

### Faculty of Engineering & Technology

#### Programme : B.Tech (Electronics) Sem – IV (2014 Course)

Sr No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)							Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW	TW	Theory		TW	Total Credits	
		L	P	T		Unit Test	Attendance	Assignments	& PR	& OR					
21	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4	
22	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5	
23	Instrumentation & Control System	3	0	1	60	20	10	10	-	-	100	4	0	4	
24	Analog Communication	3	2	0	60	20	10	10	-	50	150	3	1	4	
25	Data Structure & Files	3	2	0	60	20	10	10	-	50	150	3	1	4	
26	Professional Skill Development- IV	4	0	0	100	-	--	-	-	-	100	4	0	4	
<b>Total</b>		<b>20</b>	<b>08</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>	

**Total Credits Sem – III : 25**

**Total Credits Sem – IV : 25**

**Grand total : 50**

**B.Tech.(Electronics) Sem-III**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- III**

**SUBJECT: - Engineering Mathematics-III**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**Credits: 04**

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**Course prerequisites:**

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

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**Course objective:**

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

## **Contents:**

### **Unit-I**

#### **Linear Differential Equations (LDE) (06Hours)**

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

### **Unit-II**

#### **Complex Variables (06Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

### **Unit-III**

#### **Transforms (06Hours)**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

### **Unit-IV**

#### **Laplace Transform (LT) (06Hours)**

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

### **Unit -V**

#### **Vector Differential Calculus (06Hours)**

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

## **Unit-VI**

### **Vector Integral Calculus**

**(06Hours)**

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

#### **Assignments:**

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### **Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

#### **Text Books:**

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

#### **Reference Books:**

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- III**

**SUBJECT: - Analog Electronics**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 4 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; PR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>05</b>

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**Course prerequisites:**

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

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**Course objective:**

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.



6. Design, built and test any small electronic circuit on PCB.

**Contents:**

**Unit-I**

**Transistor Biasing (08Hours)**

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

**Unit-II**

**BJT Amplifiers (08Hours)**

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

**Unit-III**

**Field Effect Transistor (FET) (08Hours)**

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

**Unit-IV**

**MOSFETs (08Hours)**

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction ,breakdown effects and temperature effects, MOSFET as VLSI device

**Unit -V**

**Wave shaping and Multivibrator Circuits (08Hours)**

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

## **Unit-VI**

### **Optoelectronic devices and PCB design**

**(08Hours)**

Construction ,V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

#### **List of Experiments:**

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

#### **Assignments:**

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. “Electronic Devices and Circuits” by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication
3. “Electronic Devices and Circuits “ by Millman ,Halkies,TMH publication

**Reference Books:**

1. “Electronic Devices and Circuits” by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits” by J.B. Gupta-Katson educational series
3. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. “Printed Circuits Handbook “ by Clyde F. Coombs - McGraw Hill Handbooks
5. “Microelectronic Circuits Theory and applications “by Adel S. Sedra , Kenneth C. Smith- Oxford



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- III**

**SUBJECT: - Signals and Systems**

**Teaching Scheme:**

**Lecture: 3 Hours/week**

**Tutorial: 1Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW & OR.: 50 Marks**

**Credits: 04**

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**Course prerequisites:**

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

**Course objective:**

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

**Contents:**

**Unit-I**

**Introduction to signals**

**(06 Hours)**

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

## **Unit-II**

### **Classification of Discrete time systems (06 Hours)**

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

## **Unit-III**

### **Continuous Time system Analysis: (06 Hours)**

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

## **Unit-IV**

### **System Analysis in Laplace Transform (06 Hours)**

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

## **Unit-V**

### **System Analysis in Z-Transform (06 Hours)**

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

## **Unit VI:**

### **Correlation and Spectral Density (06 Hours)**

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation

between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

**Assignments:**

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

**Content Delivery Methods:** Chalk & talk, Power point presentation, Quiz

**Assessment Methods:**

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

**Reference Books:**

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham"s outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) SEM: - III  
SUBJECT: - Digital Logic Circuits**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; PR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>04</b>

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**Course Prerequisite:**

1. Fundamentals of Number Systems.

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**Course Objective:**

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

## **Contents:**

### **Unit –I**

#### **Number Systems, Codes & reduction techniques: (6 Hours)**

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

### **Unit-II**

#### **Combinational Logic Modules and their Applications (6 Hours)**

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

### **Unit-III**

#### **Logic Families (6 Hours)**

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

### **Unit-IV**

#### **Sequential Logic Modules (7 Hours)**

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.



## **Unit-V**

### **Shift Registers & Counters**

**(5 Hours)**

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

## **Unit-VI**

### **PLDs & Memories**

**(6 Hours)**

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

### **List of Experiments:**

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

### **Assignments:**

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter,timers,and various multi-vibrator circuits, small processor ports or scrolling display
4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register

6. Design example based on state machine

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12<sup>th</sup> reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI
3. Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications*, Pearson Education Asia, Second Indian Reprint 2002

**Reference Books :**

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3<sup>rd</sup> edition, 4<sup>th</sup> reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI
4. Thomas L Floyd & R.P Jain, *digital Fundamentals* (Eight editions), Pearson



**Class: B.Tech (Electronics) SEM: - III**  
**SUBJECT: - Circuit Theory**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; PR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>04</b>

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**Course prerequisites:**

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
  - Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.
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**Course objective:**

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

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**Course Outcomes:** On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.
4. To find all the parameters relating to a given series or a parallel resonant circuit.

5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

**Contents:**

**Unit I**

**Fundamentals Of Network (6 Hours)**

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State  
Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

**Unit II**

**Application Of Graph Theory (6 Hours)**

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

**Unit III**

**Transient Analysis (6 Hours)**

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

**Unit IV**

**Resonance (6 Hours)**

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits

## **Unit V**

### **Passive Filters**

**(6 Hours)**

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

## **Unit VI**

### **Two Port Networks**

**(6 Hours)**

Network Functions, Two port network parameters,  $Z$ ,  $Y$ ,  $H$ ,  $ABCD$  and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

### **List of Experiments:**

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find  $Z$  and  $Y$  parameters of given two port network.
8. To find  $H$  and  $ABCD$  parameters of given two port network.

### **Assignments:**

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books :**

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

**References Books:**

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

**B.Tech.(Electronics) Sem-IV**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem: - IV**

**SUBJECT: - Analog Integrated Circuits**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; PR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>04</b>

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**Course prerequisites:**

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

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**Course objective:**

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

**Contents:**

**Unit-I**

**Fundamentals of Operational Amplifier**

**(06 hours)**

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.



## **Unit-II**

### **Operational Amplifier – Linear circuits**

**(06 hours)**

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

## **Unit-III**

### **Operational Amplifier - Non-linear circuits**

**(06 hours)**

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

## **Unit-IV**

### **Active filters and waveform generators**

**(06 hours)**

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038

## **Unit-V**

### **Special function IC's**

**(06 hours)**

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

## **Unit-VI**

### **Interfacing circuits**

**(06 hours)**

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

### **List of Experiments:**

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

**Assignments:**

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4<sup>th</sup> Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10<sup>th</sup> edition, 2010

**References Books:**

1. David A. Bell, “Operational Amplifiers and Linear ICs”, Oxford publication, 3<sup>rd</sup> edition, 2011
2. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill, 3<sup>rd</sup> edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4<sup>th</sup> edition, 2010.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- IV**

**SUBJECT: - Electronic Circuits and applications**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 4 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; PR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>05</b>

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**Course prerequisites:**

- Knowledge of linear circuit theory
  - Basic concept of BJT
- 

**Course objective:**

1. To make student understand analysis of multistage transistor amplifier.
  2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
  3. To make student understand analysis and design of voltage regulators.
  4. To make student understand the behavior of high frequency BJT amplifiers
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

**Contents:**

**Unit-I**

**Multistage amplifiers**

**(08hours)**

Need of Multistage amplifiers, Parameter evaluation such as  $R_i$ ,  $R_o$ ,  $A_v$ ,  $A_i$  & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct

coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

## **Unit-II**

### **Feedback amplifiers (08 hours)**

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

## **Unit-III**

### **Power amplifiers (08 hours)**

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

## **Unit-IV**

### **Oscillators (08 hours)**

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

## **Unit- V**

### **Regulators (08 hours)**

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

## **Unit-VI**

### **High frequency amplifiers**

**(08hours)**

High frequency T model. Common base short circuit current frequency response, alpha cut-off frequency, CE short circuit current frequency response, high frequency hybrid  $\pi$  CE model, Amplifier response taking into account source and load resistances.

#### **List of Experiments:**

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

#### **Assignments:**

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### **Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

#### **Text Books:**

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication

2. "Electronic devices and circuits "by Millaman Halkies ,TMH publication
3. "Integrated Electronics", by Millman J and Halkias .C., TMH publication

**Reference Books:**

1. "Electronic Devices and Circuits "by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits "by J.B. Gupta- KATSON educational series books
3. " Microelectronic Circuits Theory and applications "by Adel S. Sedra, Kenneth C. Smith- Oxford
4. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. "Electronic Principles "by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. "Basic Electronics" by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- IV**

**SUBJECT: - Instrumentation & Control System**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Tutorial: 1Hour/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>Credits:</b>	<b>04</b>

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**Course prerequisites:**

- Basic knowledge of signals.
  - Basic mathematical tools like Laplace transform.
  - Basic knowledge of software like MATLAB.
- 

**Course objective:**

This course provides in depth knowledge of the various control systems. Also it introduces the stability of system, transducers, controllers etc.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2. Measure various Non-electric quantities such as displacement, temperature, angular speed, acceleration etc using suitable transducer.
3. Determine the error in various control systems.
4. Evaluate the stability of a system using Routh's Stability Criterion, root locus and different graphical methods like Bode plot and polar plot.
5. Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

## **Contents:**

### **Unit I**

#### **Control System (06 Hours)**

Introduction to Control System, control problems, Feedback and Non-feedback Systems, Transfer Function, Analysis of T.F. using Block diagram and signal flow graph.

### **Unit II**

#### **Transducers and Controller Components (06 Hours)**

Classification of Transducers and its Characteristics. RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge and Electromagnetic flow-meter. Linear Approximation of Nonlinear Systems, synchros, dc and ac servomotors, tacho-generators, electro hydraulic valves, electro pneumatic valves.

### **Unit III**

#### **Time Response Analysis (06 Hours)**

Standard Test Signals, Time Response of First order system and second order system, steady state error ( $e_{ss}$ ) and error constants ( $K_p$ ,  $K_v$ ,  $K_a$ ), performance indices.

### **Unit IV**

#### **Stability (06 Hours)**

Concept of stability, necessary conditions for stability, Hurwitz and Routh stability criteria, stability of system modeled in state variable form, root locus technique.

### **Unit V**

#### **Frequency Response Analysis (06 Hours)**

Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.

### **Unit VI**

#### **Controllers (06 Hours)**

Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram



**List of Practicals:**

1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. To draw Root Locus theoretically and verify it using MATLAB.
3. To draw Bode plot theoretically and verify it using MATLAB.
4. Magnitude and phase plot of Lead network.
5. Magnitude and phase plot of Lag network.
6. To Study characteristics of temperature transducer.
7. To Study characteristics of LVDT for displacement measurement.
8. Study of Strain gauge.

**Assignments:**

1. Transfer function of closed loop system.
2. Transient response specifications of second order system.
3. Describe characteristics of temperature transducers..
4. Effect of addition of poles and zeros.
5. Describe architecture of PLC.
6. Simulation of Controller using Virtual Lab and LabVIEW.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books /Reference Books:**

1. I. J. Nagrath & M. Gopal, "Modern Control Engineering", New Age International, New Delhi (Fifth Edition) 2007.
2. Ogata, K., "Modern Control Engineering", Prentice Hall, second edition, 1991
3. A K Sawhney, Electrical and Electronic Measurements and Instrumentation, Dhanpt Rai and Co. Ltd.
4. H S Kalsi, Electronic Instrumentation, Tata McGraw-Hill.
5. Gopal. M., "Control Systems: Principles and Design", Tata McGraw-Hill.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- IV  
SUBJECT: - Analog Communication**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; OR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>04</b>

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**Course prerequisites:**

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series & transform

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**Course objective:**

1. To introduce to student essential components of communication system and emphasize need of modulation.
2. To make student recognize concept of noise and its effects.
3. To make student understand amplitude & frequency modulation and demodulation and its mathematical background.
4. To make student understand working of radio receivers.

---

**Course Outcomes:** On successful completion of this course, students will be able to

- 1.Describes basic components of communication system and explains need of modulation.
- 2.Describes concept of noise and also recognizes its effects.
- 3.Describes amplitude and frequency modulation and demodulation and can do analysis in time and frequency domain.
- 4.Describes components of communication receiver system.

## **Contents:**

### **Unit-I**

#### **Introduction to Communication Systems**

**(6 Hours)**

Review of signals and systems, Frequency domain of signals, Block schematic of communication system, types of communication channels, base band signals, RF bands, Necessity of modulation.

### **Unit-II**

#### **Noise**

**(6 Hours)**

Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.

### **Unit-III**

#### **Amplitude Modulation**

**(6 Hours)**

Amplitude Modulation, low level and high level transmitters, Frequency spectrum of AM wave, Representation of AM, power relations in AM, Generation of AM, DSB suppressed carrier (DSBSC)-modulator, Single Side Band (SSB):-Principle, Filter method, phase shift method and third method, Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters, Diode detector, practical diode detector, and square law detector. Demodulation of DSBSC, Demodulation of SSBSC.

### **Unit-IV**

#### **Angle Modulation**

**(6 Hours)**

Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis. Amplitude limiting, FM demodulators

## **Unit-V**

### **Radio Receivers**

**(6 Hours)**

Block diagram of AM and FM Receivers, TRF receiver, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection. IF Amplifiers. Tracking, AGC, Mixers.

## **Unit -VI**

### **Pulse Analog Modulation**

**(6 Hours)**

Pulse modulation. Sampling process, Sampling Theorem for low pass and band pass signals, Nyquist criteria , Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM.

### **List of Experiments (Minimum 08):**

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of SSB Modulation & Demodulation.
4. Analysis of standard signals (square and triangular) and Modulated signals (all types of AM, FM) using spectrum analyzer.
5. Sampling And Reconstruction.
6. Study of Pulse Amplitude Modulation (PAM.)
7. Study of Pulse Width Modulation.(PWM)
8. Study of Pulse Position Modulation.(PPM)
9. Study of PAM-TDM.
10. Study of Super heterodyne (AM) Receiver.

### **Assignments**

1. Design of circuit for noise and noise figure analysis using Multisim.
2. Simulation of AM modulation and demodulation using MATLAB.
3. Simulation of FM modulation and demodulation using MATLAB.
4. Design and simulation of AM Receiver using MATLAB. Simulink.

5. Design of PWM modulator using Multisim.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Book:-**

B.P.Lathi 'Modern Digital and analog Communication System' Oxford University press.

**Reference Books:-**

1. George Kennedy 'Electronics Communication System'- IV th Edition-Tata McGraw Hill Publication.
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- IV**

**SUBJECT: - Data structures and Files**

<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam:</b>	<b>60 Marks</b>
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment:</b>	<b>40 Marks</b>
	<b>TW &amp; OR.:</b>	<b>50 Marks</b>
	<b>Credits:</b>	<b>04</b>

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#### **Course prerequisites:**

- Basic Knowledge of C language.

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#### **Course objective:**

This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the concept of linked list, stack, queues, graph and tree.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Write a program involving pointers and structures.
2. Write a program involving search and sorting techniques.
3. Write a program using linked and double linked lists.
4. Implement stacks and queues involving linked list.
5. Perform operations on a tree using linked lists.
6. Find the shortest path in a given graph.

#### **Contents:**

##### **Unit-I**

##### **C Programming Revision**

**(5 Hours)**

Pointers, Arrays, Single and Multi-Dimensional arrays, Row major and Column Major, Arrays and polynomials, Structures , Call by Value ,Call by Reference , Passing arrays  
Passing a function to function, Pointer to function ,Pointers.

## **Unit-II**

### **Data Structure and Analysis of algorithms. (4 Hours)**

Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis .Recursion. Sorting: Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.

## **Unit-III**

### **Linked Lists (4 Hours)**

Definition, operations on linked list, Reversing the links, Merging of linked lists, Circular Linked list, Recursive operation on linked list, Doubly linked list, Linked list and Polynomials,

## **Unit-IV**

### **Stack and Queues (3 Hours)**

Operation on stacks, Stack as an array, Stack as a linked list, Application of stack, Infix to prefix conversion, Infix to postfix conversion, Postfix to prefix conversion, Postfix to infix conversion.

Representation of Queue as an array, Queue as an linked list, Circular Queue, Priority queue

## **Unit-V**

### **Tree (3 Hours)**

Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree. AVL trees

## **Unit-VI**

### **Graphs (3 hours)**

Definition ,Adjacent vertices and Incident edges, graph representation, depth first search ,breadth first search, Spanning tree, Kruskal.s Algorithm, Shortest path algorithm, Dijkstra.s algorithm.

### **List of Experiments:**

1. Program to create & manipulate database using structure.
2. Program to add two polynomial using array of structure.
3. Program to implement primitive operation on Sequential file.
4. Program to search for record from a given list of records stored in array using
  - i) Linear search
  - ii) Binary search
5. Program to sort an array of names using
  - i) Bubble sort
  - ii) Insertion sort
  - iii) Quick sort
6. (a) Program to implement following operation on singly linked list:
  - i) Create
  - ii) Delete
  - iii) Insert
  - iv) Display
  - v) Search(b) Program to add two polynomials using linked list.
7. (a) Program to implement stack using:
  - i) Array
  - ii) Linked list(b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.
8. Program to Implement Queue using: (i) Array (ii) linked list
9. Program to create a Binary search tree & Perform following primitive operation on it:
  - i) Search
  - ii) Delete
  - iii) Traversals ( inorder, pre-order, post-order -recursive)
  - iv) Non-recursive in order traversal
10. Program to create a graph using adjacency list & traverse it using BFS & DFS methods



**Assignments:**

1. State various types of data types and create a database of students in a class using structures.
2. Write a C code to create a digital clock, rainbow etc.
3. Case study on any real time application.

Example :

- i. Whatsapp, Hike, Wechat, Line social communication software
  - ii. Cars lined up at a car wash.
  - iii. Customers at a grocery store check out.
  - iv. Airplane taking off and landing on a runway, etc
4. Comparison between various types of programming languages.
  5. Write a c program to construct tower of Hanoi.
  6. Write a c program to sort structures on the basis of structure elements.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. "Data structure using C" ISRD group, TMH.
2. "Data Structure through C" ,Yashwant kanetkar,BPB Puplication.

**Reference Books:**

1. "Data structure using C" AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. "Data structure and Algorithm Analysis in C" Weiss, Mark Allen Addison Wesley.
3. "Data structure – A Pseudocode Approach with C", Richard F Gilberg Behrouz A. Forouzan, Thomson
4. "Let us C" .Yashwant Kanetkar.BPB Publication.

**SUBJECT: - Rehabilitation Engineering**

**Bharati Vidyapeeth University, Pune**  
**Faculty of Engineering & Technology**

**Programme : B.Tech (Electronics) Sem – V (2014 Course)**

Sr. No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			T W & P R	T W & O R		Theory	T W	Total Credits
						Unit Test	Attendance	Assignments						
27	Microprocessors and Microcontrollers	4	2	0	60	20	10	10	50	-	150	4	1	5
28	Electronic Instruments & Measurement System	3	2	0	60	20	10	10	-	50	150	3	1	4
29	Digital Communication	3	2	0	60	20	10	10	-	50	150	3	1	4
30	Power Devices & Machines	3	2	0	60	20	10	10	-	50	150	3	1	4
31	Electromagnetic Engineering	3	0	1	60	20	10	10	-	-	100	4	-	4
32	Professional Skill Development-V	4	0	0	100	0	-	-	-	-	100	4	-	4
	<b>Total</b>	<b>20</b>	<b>08</b>	<b>01</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Optional Subject**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme						Credits			
		L	P	T	ESE	Continuous Assessment			Practical		Total	Theory	TW	Total
						Unit Test	Attendance	Assignment	TW PR	TW OR				
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--	100	4	--	4

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electronics) Sem – VI (2014 Course)**

Sr · No.	Name of the Course	Teaching Scheme (Hrs/week)			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			T W & PR	T W & O R		Theo ry	T W	Total Credi ts
						Un it test	Attenda nce	Assignme nts						
33	Digital Signal Processing	4	2	0	60	20	10	10	-	50	150	4	1	5
34	Embedded Systems	3	2	0	60	20	10	10	-	50	150	3	1	4
35	VLSI Design	3	2	0	60	20	10	10	50	-	150	3	1	4
36	Project Managem ent & Finance	3	0	0	60	20	10	10	-	-	100	3	-	3
37	Electronic Circuit Design	4	2	0	60	20	10	10	-	50	150	4	1	5
38	Profession al Skill Developm ent-VI	4	0	0	100	0	-	-	-	-	100	4	-	4
	<b>Total</b>	<b>21</b>	<b>8</b>	<b>0</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	<b>21</b>	<b>4</b>	<b>25</b>

**Total Credits Sem – V : 25**

**Total Credits Sem – VI : 25**

**Grand total : 50**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- V**

**SUBJECT: - Microprocessors & Microcontrollers**

**Teaching Scheme**

**Lecture: 4 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW & PR: 50 Marks**

**Credits: 05**

**Course Prerequisites:** Students should have basic knowledge of:

- Hexadecimal Number System
- Concept of Encoder Decoder & Multiplexer Demultiplexer

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**Course Objectives:**

- To understand the architecture, instruction sets and various techniques to interface them with different real world I/O devices to accomplish certain tasks.
- To study the architecture of microcontrollers like 8051 and PIC and the instruction set and programming concepts.
- To know the techniques of interfacing them to the real world peripheral devices.
- To impart practical knowledge of 8051, and PIC Microcontroller.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the different block of microprocessor and microcontroller
2. Study the architecture and instruction set of 8051 and PIC microcontrollers.
3. Use the knowledge of instruction set to perform practical for 8051 and PIC Microcontrollers.
4. Interface peripheral devices with 8051 microcontroller for different applications.

## **Contents:**

### **Unit I**

**(08 Hours)**

#### **Introduction to Microprocessors**

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann Architectures Internal architecture of 8 bit Microprocessor 8085, concept of fetch –decode and execute, Stack and Subroutines, concept of Memory mapped I/O, I/O mapped I/O

### **Unit-II**

#### **8051 Micro Controllers**

**(08 Hours)**

Architecture, Pin configuration, 8051 timers, counter and related SFR's, Internal RAM structure, 8051 addressing modes.8051 Interrupts Interrupt Priority in the 8051 concept of RESET. Introduction to 8051 assembly language programming: JUMP, LOOP and CALL instructions, Arithmetic instructions, Logic and Compare instructions, and I/O PORT Single bit instruction programming, single bit operations with CY.

### **Unit-III**

#### **8051 Serial Communication &Interfacing of 8051(08 Hours)**

Serial Communication of 8051: Basics, SBUF register, SCON and PCON registers, Modes of operation Simple program of serial communication.

Interfacing of 8051 with devices: LED, LCD, keyboard, LM35 temperature sensor & A/D converter

### **Unit-IV**

#### **Communication Protocols**

**(08 Hours)**

Use of communication protocols, need of communication interface in embedded system

Serial communication protocols: I2C, CAN, USB, UART, Serial peripheral interface(SPI),synchronous serial protocol(SSP).

Parallel communication protocol: PCI,PCI-X

RS232C, RS485/422.

### **Unit -V**

#### **PIC18F Family**

**(08 Hours)**

PIC18F programming model, instruction set Data copy, arithmetic, branch, logical, bit manipulation and multiply-divide operations, Stacks, subroutines and macros, Role of Assembler.

## **Unit-VI**

### **Interrupts, Timers & Serial I/O in PIC18F**

**(08 Hours)**

Concepts of Interrupts and Timers, Interrupts and their implementation in PIC18, The PIC18 timers, Use of Interrupts in applications. Concept of serial I/O, SPI protocol

#### **List of Experiments:**

##### **Any 8 experiments should be conducted**

1. Study of 8051 $\mu$ c using Keil software:
  - (a) Block transfer without memory overlapping
  - (b) Block transfer without memory overlapping
2. (a) To convert BCD no. to Hex no.
  - (b) To convert Hex no. to BCD no.
3. To perform: (a) BCD up Counter
  - (b) BCD down Counter
4. To generate a square wave of 5ms delay
5. To interface stepper motor with 8051 $\mu$ c
6. To interface LED with 8051 $\mu$ c
7. To interface Keyboard with 8051 $\mu$ c
8. To interface ADC/DAC with 8051 $\mu$ c
9. To perform 8/16-bit addition & subtraction using PIC microcontroller.
10. Serial communication by PIC microcontroller

#### **List of Assignments:**

1. Explain a Boolean processor of microcontroller 8051 with two examples
2. Mention a real time application of microcontroller 8051.
3. Mention a real time application of PIC microcontroller.
4. Design a microcontroller (8051) based interfacing system with memory.
5. What is memory address decoding? Explain the different types of decoding.
6. An overview on PIC families.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. Muhammad Ali Mazidi, Janice Gillespie Mazidi, “The 8051 Microcontroller and Embedded System” Pearson Education.
2. Muhammad Ali Mazidi, Rolin D. McKinlay, Danny Causey,” PIC Microcontroller and Embedded Systems”3rd Edition ,Pearson Education
3. Ramesh Gaonkar “Fundamentals of Microcontrollers and Applications in Embedded Systems” (with the PIC18 Microcontroller Family) 2007 Edition, Penram international

**Reference Books:**

1. John B Peatman “Designing with PIC Microcontrollers” 2004 Pearson Education.
2. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
3. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Second Edition Penram International & Thomson Asia,





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech. (Electronics) Sem: - V**

**SUBJECT: - Electronic Instruments and Measurement System**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW &OR : 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

- Knowledge of process instrumentation.
- Knowledge of Integrated circuits.

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**Course Objectives:**

- To help the students to have knowledge of the basic of instrumentation.
- To study the principles of working of various signal generators and wave analyzers
- To study the principle of working of CRO is specifications, applications in detail and study the working of various advanced CRO's and their applications.

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**Course Outcomes:** On successful completion of this course, students will be able to:

1. Describe specifications, features and capabilities of electronic instruments
2. Use the electronic instruments like signal generators, wave analyzers, and various oscilloscopes by knowing their specifications for electronic measurements.
3. Make the required measurement using various instruments

## **Contents:**

### **Unit-I**

#### **Fundamentals of Instrumentation & Measurement: (06 Hours)**

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

### **Unit-II**

#### **Measuring Instruments (06 Hours)**

Voltage, current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes, LCR-Q meter.

### **Unit-III**

#### **Signal Generators & counters (06 Hours)**

standard signal generators, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

### **Unit-IV**

#### **Oscilloscopes: (06 Hours)**

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes & its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

### **Unit-V**

#### **Communication Measurements: (06 Hours)**

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer-system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer, EMI/EMC standards.

## **Unit-VI**

### **Signal Analyzers & computer aided measurements:**

**(06 Hours)**

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

**Content Delivery Methods:** Chalk & talk, Power point presentation

### **Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

### **List of Experiments:**

1. Peak, average and r.m.s. measurement using rectifier circuit.
2. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
3. Measurements on DSO:
  - i) FFT analysis of LF signal
  - ii) Capturing transients
  - iii) Storing and retrieving number of different signals
  - iv) Study of various operations like add, subtract, integrate, differentiate.
4. Measurement and timing analysis of digital signals using Logic Analyzer.
5. Measurement of Total harmonic distortion using distortion factor meter.
6. Measurements on L-C-R Q meter.
7. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).

8. Study of characteristics of Diode, Transistors using Curve Tracer.

**List of Assignments:**

1. Calibration of DVM for any one range: e.g. 200V dc, 200Vac, 200mA dc, using standard calibrator or standard 6½ DMM.
2. Presentation on LCR-Q meter.
3. Describe any one real time applications of random noise generator.
4. Mathematical operations using Lab view software.
5. Seminar on network analyzer.
6. Describe any one real time applications of power scope.

**Text Books:**

1. Oliver-Cage, “Electronic Measurements and Instrumentation”, TATA McGraw Hill, 1975.
2. M.M.S. Anand, “Electronics Instruments and Instrumentation Technology”, Prentice Hall India, New Delhi, 2009.
3. Albert D. Helfrick and William D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2010.

**Reference Books:**

1. Coombs, Clyde F. Jr., “Electronic Instrument Handbook”, McGraw Hill, 2000.
2. J.J. Carr, “Elements of Electronic Instrumentation and Measurement”, Pearson Education India, New Delhi, 2011.
3. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill, 1997.
4. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, New Delhi, 2010



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem :- V  
SUBJECT :- Digital Communication Systems**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW &OR : 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

- Understanding of continuous and discrete linear systems.
- Knowledge of probabilities and random variables.
- Understanding of Fourier Transform.

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**Course Objectives:**

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand the basics of baseband and pass band digital communication systems.
- To analyze error performance of a digital communication systems.
- To acquire the knowledge of spread spectrum communication systems.

**Course Outcomes:** At the end of the course, a student will be able to

1. Solve and analyze problems related to Probability theory & random processes.
2. Identify and describe different modulation & detection techniques in digital communication & compare their performance.
3. Characterize error-control coding techniques

- Analyze Performance of spread spectrum communication systems.

**Contents:**

**Unit –I**

**(06 Hours)**

**Overview of Probability Theory and Random Variables:**

Sample space, events, Conditional probability, Joint probability, Baye's rule, random variables. Continuous and discrete random variables, Cumulative distribution Function, probability distribution function, Statistical averages, Random Processes, Time average, Ergodicity.

**Unit -II**

**Digital transmission of analog signals**

**(06 Hours)**

Introduction to Digital Communication System, Sampling Process, Quantization–Uniform, Non-Uniform, Companding, A-Law,  $\mu$  Law, Pulse code modulation Delta Modulation, Adaptive Delta Modulation, Delta Sigma Modulation, Differential Pulse Code Modulation.

**Unit –III :**

**(06 Hours)**

**Baseband Transmission and Reception:**

Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester, Properties & their spectra, M-ary Signaling, ISI, scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers.

**Unit-IV**

**(06 Hours)**

**Bandpass Modulation Techniques:**

ASK, PSK, FSK, Binary Phase shift keying, Differential Phase shift keying, Differential encoded PSK, Quadrature PSK, M-ary PSK, Quadrature Amplitude shift keying (QASK), Binary frequency shift keying, Minimum shift keying (MSK) , signal space representation, Performance evaluation of modulation techniques in terms of probability of error (No derivations)

**Unit-V**

**Error Control Coding:**

**(06 Hours)**

Types of Errors & codes, Linear block codes, error detection & correction, Hamming codes. Cyclic codes: Encoding and syndrome decoding. Convolutional codes, Introduction to turbo codes.

**Unit-VI**

**(06 Hours)**

**Spread Spectrum Techniques:**

Introduction, Generation of PN Sequences and its properties, Direct Sequence Spread Spectrum Signals, Frequency Hopped Spread Spectrum Signals, Introduction to Multiple Access Techniques: CDMA, TDMA, FDMA.

**List of Experiments:**

**Minimum 8 experiments should be conducted.**

1. To verify the sampling theorem.
2. To study Pulse Code Modulation System (PCM) System.
3. To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.
4. To perform ASK (Amplitude Shift Keying) System.
5. To study PSK (Phase Shift Keying) System.
6. To study FSK (Frequency Shift Keying) System.
7. To study of Quadrature Phase Shift Keying (QPSK).
8. To study of Spread Spectrum techniques.
9. To simulate any digital modulation scheme using MATLAB.
10. To perform different Data Formats
11. To study of Hamming codes.

**List of Assignments:**

**Any six assignments can be completed**

1. Study of sampling theorem using Virtual Labs
2. Study of ASK/FSK/PSK system using Virtual Labs.
3. Study of hamming code.
4. Experiments on random signals using MATLAB
5. Simulation of communication system using MATLAB.
6. Study of Eye Diagram using oscilloscope
7. Presentation on any communications topic relevant to the course.

8. Industrial Visit

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
  1. Unit Test
  2. Assignments
  3. Continuous Assessment
  4. End term Examination

**Text books:**

1. Sklar, Bernard, "Digital Communications, Fundamentals & Applications," Second Edition, Prentice-Hall Inc.,2001.
2. Leon W. Couch, "Digital and Analog Communication Systems", Sixth Edition, Pearson Education, 2001.
3. Lathi B P, and Ding Z "Modern Digital and Analog Communication Systems," Fourth Edition ,Oxford University Press.

**Reference Books:**

4. Haykin Simon, "Digital Communication Systems," Forth Edition,John Wiley and Sons, New Delhi.
5. Taub, D. Schilling, and G. Saha, "Principles of Communication Systems," Third Edition, Tata McGraw Hill.
6. John G. Proakis , "Digital Communication" ,Fifth Edition, Pearson Education.





**Bharati Vidyapeeth Deemed University,  
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**Class: B.Tech (Electronics) Sem:-V  
SUBJECT: - Power Devices & Machines**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW &OR : 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

- Knowledge of the principals and applications of electronic devices including semiconductor diodes, bipolar-junction and field-effect transistors.
- Understanding of transformers and magnetically coupled circuits

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**Course Objectives:**

- To understand and acquire knowledge about various power semiconductor devices.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Compare various power devices with their driver circuits & protection circuits
2. Comprehend the principle operation and models of different types of power electronic converters AC-DC, DC-AC and DC-DC converter systems.
3. Describe the basic principles of HVDC, UPS, motors, etc.

**Contents:**

**UNIT I :**

**Power devices**

**(06 Hours)**

Power Diodes: Construction, Switching characteristics; Power BJT, PBJT: Construction, Operation, switching characteristics, Power MOSFET: PMOSFET, Construction, Operation, Static characteristics, switching characteristics, safe Operating Area, IGBT: Construction, Operation, Switching characteristics, Safe operating area.

Thyristor: Construction, Operation, transistor analogy, static characteristics, switching characteristics, thyristor turn-on, thyristor turn-off. DIAC / TRIAC – construction and operating Principle, Applications. GTO: Construction, Operation, Turn off mechanism, Applications, driver, protection and snubber circuits for power devices

## **UNIT II.**

**(07 Hours)**

### **Single phase AC-DC converters**

Concept of line commutation, Single phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage, Fourier series expressions for supply current, power factor improvement, performance factors of line commuted converters, effect of source impedance.

## **UNIT III**

**(05 Hours)**

### **Three phase AC-DC converters**

Three phase half controlled and fully controlled converters- Circuit diagram, operation and waveforms for resistive and highly inductive loads, Analysis of output voltage and supply current including following performance parameters: average and RMS output voltage.

## **UNIT IV**

**(06 Hours)**

### **Inverters**

#### **Single & Three-phase Inverters:**

Circuit diagram, operation & waveforms for single phase full bridge & Push pull inverters. Switching techniques for obtaining square, quasi-square & sinusoidal PWM o/p waveforms. Use of Pulse width modulated IC's for Inverter control. Fourier analysis of quasi-square waveform & harmonic load currents for R & RL loads. Circuit diagram, operation & waveforms for three phase voltage source bridge inverters for 120 degree & 180 degree conduction for balanced star resistive load.

## **UNIT V.**

**(06 Hours)**

### **Switched & resonant DC/DC converters**

Control of DC/ DC converters. Circuit diagram, Waveforms & operation (o/p voltage calculation) of step down chopper (Buck converter), Step up chopper (Boost converter) & 2-

quadrant type C chopper. Circuit diagram, waveforms, operation & design of Fly back converter (SMPS)

**Need for resonant converters:**

Circuit diagram, waveforms & operation of SLR half bridge DC/DC converter in low frequency (discontinuous conduction) mode.

**UNIT VI**

**(06 Hours)**

**Introduction to Motors and Power converter applications**

**Motors:** DC motors, AC Motors, Special Purpose Motors, Induction Motor, Universal Motor, Stepper Motor, Servomotors etc. (Qualitative analysis only)

**Applications:** UPS, HVDC transmission, electronic ballast

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End term Examination

**List of Experiments:**

1. Study of characteristics of SCR
2. Study of Triggering circuits
3. Study of characteristics of IGBT
4. Study of characteristics of TRIAC
5. Study of single phase half controlled converter
6. Study of single phase fully controlled converter
7. Study of three phase half controlled converter
8. Study of TRIAC based AC motor control
9. Study of three phase VSI inverter
10. Study of first quadrant chopper
11. Study of UPS
12. Study of light dimmer

**List of Assignments:**

1. Real life applications of inverters.
2. Real life applications of PV cells.

3. Applications of single phase converter.
4. Different types of cyclo converters.
5. Describe AC Voltage regulators.
6. Real life applications of power devices.

**Text Books:**

1. M. H. Rashid, "Power Electronics Circuits, Devices And Applications", PHI, 3rd Edition, 2004, New Delhi
2. M D Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi
3. P. C. Sen, "Modern Power Electronics", S. Chand & Co., New Delhi

**Reference Books:**

1. S. Tamil Asgar, "Power Electronics", PHI, 2004, New Delhi
2. N. Mohan, T. M. Undeland & W. P. Robbins, "Power Electronics, Converters Applications And Design", John Willey and sons, 3rd edition, Singapore
3. V. R. Moorthi, "Power Electronics, Devices, Circuits & Industrial Applications", Oxford University Press, New Delhi, 2005.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-V**

**SUBJECT: - Electromagnetic Engineering**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hour/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**Credits: 04**

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**Course Prerequisites:**

Fundamentals of integration, differentiations, partial diffraction.

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**Course Objectives:**

- Provide fundamentals of Static Electromagnetic Fields.
- Explain basics of the vector Differential, Integral operators to Electromagnetic theory & Electrostatic & Electromagnetic fields.
- Define and derive different laws in Electrostatic & Electromagnetic fields.
- Explain Maxwell's equations and concepts of transmission lines.
- Analyze techniques for formulating and solving problems in Electrostatic & Electromagnetic fields.
- Develop mathematical skills related with differential, integral and vector calculus.

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**Course Outcomes:** On successful completion of this course, students will be able to

4. Comprehend the fundamentals of Electrostatic and Electromagnetic fields..
5. Apply Gauss' law, Ampere's Law, Biot-Savart law, Faraday's law and laws related with steady magnetic field while solving problems in Electrostatic and Electromagnetic fields.
6. Develop field equations from understanding of Maxwell's Equations.

7. Extend the knowledge of basic properties of transmission lines to analyze electromagnetic wave propagation in generic transmission line geometries.
8. Demonstrate mathematical skills related with differential, integral and vector calculus.

**Contents:**

**Unit I**

**Co-ordinate Systems**

**(5 Hours)**

Vector Algebra, product of vectors, Co-ordinate systems, Curl, Divergence & Gradient, Stoke's Theorem, Poisson's and Laplace Equations, Coulomb's law, line, Surface & Volume Charge distribution.

**Unit II**

**Electrostatic Fields**

**(7 Hours)**

Electric Field Intensity, Electric Field due to infinite line and surface charges, Electric Flux Density, Gauss law (differential and integral form) and its applications, Divergence Theorem, Electric Potential and gradient, Work done, Energy Density, Electric Dipole and moment. Polarization in Dielectrics, Boundary conditions for Dielectric and Dielectric, boundary conditions for Conductor and Dielectric, boundary conditions for Conductor and free space. Method of Images for point and line charge, Capacitance – parallel, co-axial and spherical, Continuity equation.

**Unit III**

**Magnetostatic Fields**

**(6 Hours)**

Biot - Savart law, Magnetic Field Intensity due to infinite and finite line. Ampere's Circuital Law in integral and differential form, Applications of Amperes Circuital law, Magnetic flux density, vector magnetic potential, Magnetic Torque, moment and dipole, nature of magnetic material, magnetization, Magnetic boundary conditions

**Unit IV**

**Time Varying Fields & Wave Propagation**

**(7 Hours)**

Faradays law of induced emf, displacement current, Maxwell's Equations in point form & Integral form for various fields, Wave equations, wave propagation through different medium,

skin depth, Poynting theorem, wave polarization, Reflection of plane wave from conducting medium, perfect dielectric.

### **Unit V**

#### **Transmission Lines**

**(6 Hours)**

Physical Description of Transmission line propagation, Transmission Line equations, Characteristic equation of infinite Transmission Line, Complex analysis of sinusoidal waves, Transmission lines equations & their solutions in phasor form, Uniform terminated Transmission Line, Input impedance, Phase velocity and group velocity, Short circuited and open circuited line, Reflection coefficient VSWR, smith chart (Numerical expected) and applications.

### **Unit VI**

#### **Waveguides & Electromagnetic radiation**

**(5 Hours)**

Plane wave analysis of parallel-plate waveguide, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguide, EMI/EMC concepts, basic radiation principles, Hertzian dipole, magnetic dipole, thin wire antennas, antenna specifications, antenna arrays.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### **Assessment Methods:**

4. Unit Test
5. Continuous Assessment
6. End term Examination

#### **List of Assignments:**

1. Analyze Coulombs law, Gauss Law, Divergence theorem with different problems on Scilab / MATLAB (Refer [www.scilab.in-resources/completd](http://www.scilab.in-resources/completd) book and Hayt& Buck, Engineering Electromagnetics, 7th Edition Tata McGraw-Hill).
2. Analyze Maxwell's equations for different fields on Scilab / MATLAB
3. Experimental study on antenna trainer kit & study different antenna specifications.
4. Analyze experimentally waveguides on Microwave test bench.
5. Analyze uniform plane wave for different media on Scilab / MATLAB

6. Analytical problems on transmission lines.

**List of Tutorials:** The main objective of this tutorial is to focus on the outcomes defined in the theory syllabus by solving the following problems based on paper work.

1. Find the Electric field intensity and electric flux density at a given point due to following charge distributions. (In all coordinate systems)

- Point charges
- Line charges (finite and infinite)
- Surface charges (finite and infinite)
- Mixed charges (Point charge, Line charge, Surface charge)

2. Application of Gauss's law

- Given  $\rho_v$  (volume charge density) in a particular region, find  $\bar{D}$  (electric flux density) using Law at the given location.
- Given  $\rho_s$ (surface charge density), find  $\bar{D}$  (electric flux density) using Gauss's Law at the given location.
- Given  $\bar{D}$  (electric flux density), find total charge enclosed by the surface (Q),  $\rho_v$  (volume charge density) using Gauss's Law.(In all coordinate systems).

3. Find the electrostatic fields (Tangential and Normal) at the boundary between,

- Free space and dielectric medium
- Free space and conductor
- Dielectric medium and conductor
- Two dielectric media.
- Two dielectric media when boundary is defined by a equation of plane.

4. Find  $\bar{H}$  (Magnetic field intensity) and  $\bar{B}$  (Magnetic flux density) at a given point due to,

- Infinitely long current carrying conductor
- Finite current carrying conductor
- Infinite conducting surface
- Finite conducting surface



- Different current carrying configurations (i.e. thin conductor, surface all together)
5. For the following current carrying configurations, find the  $\vec{H}$  (Magnetic field intensity) in a given region (or point) using Ampere's circuital law.
    - Infinitely long current carrying conductor
    - Infinite cylindrical surfaces of different radii all centered at the same axis.
    - Spherical surfaces of different radii all centered at a given point.
  6. Given the (Magnetic field intensity) of a particular region, find current (I), current density (J), enclosed by the given surface. (In all coordinate systems).
  7. Given  $\vec{H}$  (or  $\vec{E}$ ) and the region properties (like  $\epsilon$ ,  $\mu$ ,  $\sigma$  etc.), find  $\vec{B}$ ,  $\vec{D}$  and  $\vec{E}$  (or  $\vec{H}$ ) using Maxwell's equations. (In all coordinate systems).
  8. Given the primary constants (R, L, G, C) along with the generator specifications and termination, find secondary constants ( $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $Z_0$ ) and other parameters like Velocity, wavelength, received voltage, received power, reflection coefficient etc.
  9. Problems on Transmission Line Analysis.
  10. Problems on Impedance matching and design of stub matching using Smith Chart.

**Text Books:**

1. A. Murthi, "Electromagnetic fields", S. Chand.
2. Edminister J.A, "Electromagnetics", Tata McGraw-Hill.

**Reference Books:**

1. Hayt & Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill.
3. Kraus, Fleisch, "Electromagnetics with applications", 5th Edition, McGraw Hill.
4. A. Das & S. K. Das, "Microwave Engineering", 2<sup>nd</sup> edition, McGraw Hill.
6. Jordan & Balmain, "Electromagnetic waves & radiating systems", 2<sup>nd</sup> edition, PHI.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VI**

**SUBJECT: - Digital Signal Processing**

**Teaching Scheme**

**Lecture: 4 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW& OR: 50 Marks**

**Credits: 05**

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**Course Prerequisites:**

- Knowledge of mathematics
- Knowledge of signals and systems

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**Course Objectives:**

- To introduce the concept of discrete Fourier transform.
- To learn the algorithm of fast computation.
- To design the finite impulse response filter & infinite impulse response filter.
- To learn the finite word length effect of filter.
- To understand the architecture & programming of DSP processor.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Compute the Discrete Fourier transform & Fast Fourier transform.
2. Design FIR and IIR filters.
3. Understand the finite word length effect in digital filters.
4. Implement the various applications on DSP processor.

**Contents:**

**Unit –I**

**(07 Hours)**

**Discrete Fourier Transform:**

Definition, periodicity concept, relationship with Z transform and Fourier series, properties, circular convolution, applications like linear filtering, overlap save, overlap add method, frequency analysis etc.

**Unit-II**

**(09 Hours)**

**Fast Fourier Transform Algorithm:**

Direct computation of D.F.T., its computational complexity, FFT algorithms, their classification, radix 2 FFT algorithms, DIT – FFT, DIF –FFT, Inverse radix 2 algorithms, FFT algorithms for composite value of N, Goertzel algorithm, Chirp Z transform algorithm, Quantization effects, applications.

**Unit-III**

**(08 Hours)**

**Design of FIR Filters**

Realization of FIR filters, Symmetric and anti symmetric FIR filters, design of linear phase FIR filters using different windows, frequency sampling method, FIR differentiators, Hilbert transformers, and Optimum equiripple linear FIR filters.

**Unit-IV**

**(08 Hours)**

**Design of IIR Filters:**

Realization of IIR filters, Butterworth and Chebyshev approximations, frequency transformations, design of IIR filters from analog filters using Approximation of derivatives, impulse invariance, Bilinear transform, design of IIR filters from pole zero plots.

**Unit-V**

**(08 Hours)**

**Finite Word Length Effects in Digital Filters**

Number representation, fixed point, sign-magnitude, one's complement, two's complement forms, floating point numbers, Quantization, truncation, rounding, effects due to truncation and rounding, Input quantization error, Product quantization error, co-efficient quantization error, zero-input limit cycle oscillations, overflow limit cycle oscillations, scaling, Quantization in Floating Point realization IIR digital filters, finite word length effects in FIR digital filters, quantization effects in the computation of the DFT- quantization errors in FFT algorithms.

**Unit-VI**

**(08 Hours)**

## **Introduction to DSP Processors**

Introduction to fixed point and floating point DSP processor, multiplier and multiplier accumulator (MAC), modified bus structures and memory access schemes in DSPs, multiple access memory, multiport memory, VLIW architecture, pipelining, special addressing modes, on-chip peripherals .

Features of TMS 320C67xx DSP processor, architecture of TMS 320c67xx DSP processor, architecture features: computational units, bus architecture memory, data addressing, address generation unit, program control, program sequencer, pipelining, interrupts, features of external interfacing, Speech Processing: Speech analysis, digital processing of audio signals.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

### **Assessment Methods:**

7. Unit Test
8. Continuous Assessment
9. End term Examination

### **List of Experiments:**

**Minimum 10 experiments should be conducted using MATLAB & at least one using hardware.**

1. To find DTFS for periodic and DTFT for non periodic signal.
2. To find DFT IDFT of DT signal.
3. To find the response of DT system using convolution.
4. To find the stability of DT system using the concept of convolution.
5. To perform convolution using overlap and add method.
- 6 To perform circular convolution.
7. To plot pole zero plot of Z-domain using transfer function.
8. To solve the difference equation and find the system response using Z transform.
9. To find the impulse invariance IIR digital filter to realize the first order analog Butterworth filter.
10. To design IIR filter for first order analog Butterworth approximation using bilinear transformation.
11. To find and plot the frequency response for the rectangular and Hamming window.
12. To Design FIR filter using frequency sampling method.
- 13.To plot spectrogram of speech signal.
- 14.To implement convolution sum using DSP processor.
15. To implement Speech processing applications using DSP processors.

**List of Assignments:****Assignments should be conducted using SCILAB**

- 1.Linear and circular convolution
- 2.DFT and IDFT
- 3.FFT & IFFT
- 4.Realization of filters
- 5..Design of FIR filter
- 6.Design of IIR filter

**Text Books:**

- 1.Proakis J., Manolakis D., "*Digital Signal Processing*", Pearson Education

**References Books:**

1. Babu R., "Digital Signal Processing", 4th Edition, Scitech Publications.
2. Salivahanan, Ganpriya and Vallavraj,"Digital signal Processing"Tata McGraw-Hill.
3. Ifeachor, Jervis "Digital Signal Processing ", Pearson Education.
- 4.Texas Instruments, DSP Manual.
5. B. VenkataRamani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", Tata McGraw Hill.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics) SEM:-VI**

**SUBJECT: - Embedded Systems**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW& OR: 50 Marks**

**Credits: 04**

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### **Course Prerequisites:**

- Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

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### **Course Objectives:**

- To understand need and application of ARM Microcontroller in embedded system.
- To study the architecture of ARM series microcontroller
- To understand architecture and features of typical ARM7& ARM CORTEX-M3 Microcontroller.
- To learn interfacing of real world input and output devices

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

### **Contents:**

#### **Unit 1: Introduction to Embedded Systems**

**(4 Hours)**

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

**Unit 2: Introduction to embedded programming & RTOS****(8 Hours)**

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

**Unit 3: ARM7 Based Microcontroller****(8 Hours)**

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block ( PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer.

**Unit 4: Interfacing with ARM7****(6 Hours)**

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

**Unit 5: ARM CORTEX Processors****(6 Hours)**

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

**Unit 6: Interfacing with ARM CORTEX M3****(4 Hours)**

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, Motor control using PWM.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

3. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
4. End term Examination

**List of Experiments: Minimum 8 experiments should be conducted.**

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768
9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7.

**List of Assignments:**

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.
3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

**Text Books:**

1. Rajkamal, “Embedded system-Architecture, Programming and Design”, TMH Publications, Edition 2003.
2. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developers Guide – Designing and Optimizing System Software”, ELSEVIER.
3. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M”, Newness, ELSEVIER.

**Reference Books:**

1. LPC 214x User manual (UM10139) :- [www.nxp.com](http://www.nxp.com).
2. LPC 17xx User manual (UM10360) :- [www.nxp.com](http://www.nxp.com)
3. ARM architecture reference manual : - [www.arm.com](http://www.arm.com)
4. Trevor Martin, “An Engineer’s Introduction to the LPC2100 series”, Hitex (UK) Ltd.





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:-VI  
SUBJECT: - VLSI Design**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW& PR: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

- Analog Electronics
- Digital Electronics

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**Course Objectives:**

- To introduce the VLSI Design Flow and design styles
- To introduce the VHDL Hardware Description Language (HDL) that shall help in describing a circuit to the tools for simulation and further processing of the same towards implementation.
- To introduce MOSFET physics and CMOS logic gates.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Design and simulate digital system using structural, Behavioral, dataflow or mixed style of Modeling.
2. Apply concepts of Finite State Machine On sequential circuits.
3. Realize digital hardware system utilizing PLDs.
4. Identify MOSFET Physics and CMOS structures.
5. Implement CMOS combinational logic Design.

**Contents:**

**UNIT I:**

**(07 Hours)**

**HDL Modeling and Design Flow**

Introduction to VLSI design flow (with reference to an EDA tool), sequential, data flow and structural modeling, functions, procedures, attributes, test benches, synthesizable and non synthesizable statements, packages and configurations, VHDL modeling.

**UNIT II:**

**(05 Hours)**

**FSM and sequential logic Principles**

Sequential circuits, Meta stability synchronization, design of finite state machines and state minimization, Modeling of FSM-Mealy and Moore machines, FSM case studies- traffic light control, lift control, UART.

**UNIT III:**

**(05 Hours)**

**Programmable logic devices**

CPLD: Introduction, study of architecture. FPGA: Introduction, study of architecture, PLAs, PALs, function implementation using PLDs.

**UNIT IV:**

**(07 Hours)**

**MOS Device Physics**

MOSFET structure, MOS I/V characteristics, body effect, Scaling of MOS circuits, MOSFET capacitances, MOS small signal model, MOS amplifiers.

**UNIT V:**

**(06 Hours)**

**CMOS VLSI**

CMOS parasites, equivalent circuit, CMOS inverter characteristics, power dissipation, power delay product, Layout design rules, introduction to CMOS layout, CMOS logic structures, concept of regularity, modularity and locality.

**UNIT VI:**

**(06 Hours)**

**CMOS Logic Circuits:**

CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using CMOS gates , W/L calculations of CMOS, CMOS transmission gates, Designing with Transmission gates.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End term Examination

**List of Experiments:**

1. To model 8:1mux, 1:8 demux, 3:8line decoder, 8:3 encoder using VHDL
2. To model adder and subtractor
3. To model synchronous and asynchronous D FF
4. To model 4- bit universal shift register
5. To model 4-bit counter
6. To model bidirectional buffer
7. To model parity generator and checker
8. Study of RAM/FIFO
9. Study of Temperature sensing using ADC
10. Study of real time moving generator chip CMOS

**List of Assignments:**

1. Simulate TLC
2. Simulate UART
3. Simulate LIFT controller
4. Design Barrel shifter.
5. Design a Mealy and Moore Sequence Detector
6. Real life applications of FPGA/CPLD

**Text Books:**

1. Neil IL E. Weste and Kamran Eshraghain,"Principles of CMOS VLSI Deign", Pearson Education Publication.
2. Wayne Wolf, "Modern VLSI Design", Prentice Hall Publication.
3. J.Bhaskar"A VHDL primer" Pearson Education Publication.
4. BehzadRazavi,"Design of Analog CMOS Integrated Circuits", Tata McGraw Hill

**Reference Books:**

1. John Walkerly,"Digital Design Principles and Practices",Prentice Hall Publication
2. Douglas Perry,"VHDL", Pearson Education Publication.
3. Charles Roth, "Digital System Design using VHDL", Tata McCraw Hill.

4. Wayne Wolf, "FPGA Based System Design", Prentice Hall
6. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2011.
7. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", TMH, 3rd Ed., 2011.
8. ParthPratimSahu, "VLSI Design", McCraw Hill Education Pvt. Ltd.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VI  
SUBJECT: - Project Management & Finance**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks  
Continuous Assessment: 40 Marks  
Credits: 03**

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**Course Prerequisite:**

- Understanding the various forms of Math, Economics and Statistics.

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**Course Objectives:**

- To understand basic principles/concepts of project management and finance.
- To describe the most well-known theories and perspectives on project managements.

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**Course Outcomes:** At the end of the course, a student will be able to

1. Describes the Characteristics, objectives and Stages of Project management.
2. Explain importance of time and work estimation in Project management.
3. Analyze Management Concepts for Developing Project Plan.
4. Analyze and Understand Financial & Project Management.
5. Demonstrate Scope, Objectives and Importance of Financial Management.
6. Identify and understand the main responsibilities and tasks of Securities and Exchange Board of India (SEBI) in money market and capital Market.

**Unit -I****(06 Hours)****Introduction to Project management:**

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

**Unit –II****(06 Hours)****Work Definition:**

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Documentation Introduction to CMM, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, ,CPM/PERT Networks

**Unit-III****(06 Hours)****Management Concepts:**

Developing Project Plan (Baseline) , Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

**Unit-IV****(06 Hours)****Project Implementation:**

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

**Unit-V****(06 Hours)****Financial Management:**

Introduction of Finance, Types of Finance, Financial Management, Scope & Objectives of Financial Management, function of finance manager, Importance of Financial Management, Sources of finance, Security Finance.

**Unit-VI****(06 Hours)****Working Capital Management:**

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph.

**List of Assignments:**

1. Explain the nature and purpose of financial management
2. Discuss the relationship between financial objectives, corporate objectives and corporate strategy.
3. Identify the nature and role of money and capital markets, both nationally and internationally.
4. Write in brief on Concepts & Importance of organization.
5. Critically evaluate various approaches to the financial management
6. Explain the functions of a stock market and a corporate bond market..

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. Shtub, Bard and Globerson, "Project Management: Engineering, Technology, and Implementation", Prentice Hall, India
2. C. Paramasivan and T. Subramanian, "Financial Management", New age international publishers.
3. John M Nicholas, "Project Management for Business and Technology: Principles and Practice", Prentice Hall, India, 2002.
4. Cleland and King, "VNR Project Management Handbook".
5. Wiest and Levy, "Management guide to PERT/CPM", Prentice Hall. India.

**Reference Books:**

1. Horald Kerzner, "Project Management: A Systemic Approach to Planning, Scheduling and Controlling", CBS Publishers, 2002.
2. S. Choudhury, "Project Scheduling and Monitoring in Practice".
3. P. K. Joy, "Total Project Management: The Indian Context", Macmillan India Ltd.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VI**

**SUBJECT: - Electronics Circuit Design**

**Teaching Scheme**

**Lecture: 4 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW& OR: 50 Marks**

**Credits: 05**

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**Course Prerequisites:**

- Knowledge of basic electronics components and its functions.
- Knowledge of rectifiers, amplifiers, filters etc.
- Knowledge of basic Data acquisition systems.

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**Course Objectives:**

- To introduce the basic concepts needed for Circuit design.
- To introduce the techniques such as signal amplification, filtering, audio power amplification etc
- To emphasize the understanding and practical implementations of the electronics circuits.

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**Course Outcomes:** At the end of the course, a student will be able to

1. Choose proper electronic component for designing circuits.
2. Design basic electronics circuits like rectifiers, filters, voltage regulators, amplifiers, etc.
3. Distinguish between linear power supply and SMPS.
4. Implement Data Acquisition Systems.

**Contents:**

**Unit-I**

**Electronic Components Selection:**

**(08 Hours)**



Passive and active components, types of resistors, capacitors and Inductors. Transformers types: power transformer, audio frequency transformer and intermediate frequency transformer. Integrated Circuits (ICs), wire/cable selection, shielding and grounding techniques.

## **Unit-II**

### **Design of Analog Filter: (08 Hours)**

Low pass filter and high pass filter. Design of Inductor Filter, Capacitor filter, LC- filter, RC- Filter and  $\pi$  section Filter.

## **Unit-III**

### **Design of Linear power supply: (08 Hours)**

Block Schematic, Types of voltage regulators, Design of Zener diode shunt regulator, Transistor shunt regulator and transistor series voltage regulator. Short circuit protection, fold back current limiting. Discrete components & IC based design for linear power supply e.g. Three terminal regulators (LM317, LM78XX).

## **Unit-IV**

**(08 Hours)**

### **Switched Mode Power Supply:**

Topology of SMPS. Comparison between Linear Power Supply and SMPS. IC based design for switch mode power supply with latest SMPS ICs.

## **Unit-V**

### **Design of Data Acquisition System: (08 Hours)**

Circuit level design of DAS, Design should include signal sensing, isolation, and signal conditioning ADC storage & display systems.

## **Unit-VI**

**(08 Hours)**

### **Audio Power Amplifier:**

Design of Audio Power Amplifier: Design using ICs like TBA810, Design of signal conditioner, Design of pre amplifier, Design should include various controls, Parameters optimization & protection circuits.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

10. Unit Test
11. Continuous Assessment
12. End term Examination.

**Mini Project & Assignments:**

Mini-project should be from small systems required in laboratory or real life, project to be designed, tested on bread board, fabricated on manual or CAD based PCBs with due consideration to mechanical aspects for enclosure & control panel design. Complete documentation in the form of project report is to be submitted. Due consideration should be given to Mini Project while assessing students for term work.

Five assignments must be completed. Out of five assignments four should be corresponding to complete design of analog and digital system. Fifth assignment should be corresponding to the software simulation of system.

Use of softwares like MULTISIM / PROTEUSis expected.

**List of Assignments:**

1. Design of low pass filter.
2. Design of linear power supply using discrete components.
3. SMPS Topology.
4. Data acquisition system.
5. Design of audio power amplifier.

**Text Books:**

1. P.M.Chirliyal, "Analysis & Design of Integrated Electronic Circuits", Wiley Eastern.
2. Hayt&Nudeck, "Electronic Circuit Analysis & Design ", Jaico Publishing House.
3. Horowitz Paul & Winfield Hill, "Art of Electronics", Cambridge University Press 2<sup>nd</sup> Edition 1989.
4. B.S.Sonde, "Introduction to system Design Using Integrated Circuits", Wiley Eastern-2<sup>nd</sup> Edition.
5. M.M.Shah, "Design of Electronic Circuits & Computer Aided Design", Wiley Eastern.

**Reference Books:**

1. Sergio Franco, "Design with Operational amplifiers and analog Integrated circuits", 3<sup>rd</sup> edition, TMH.
2. Franklin P. Prosser, David E. Winkel, "The Art of Digital Design", PHI.
3. Gotlib, "Power Supply Design", PHI

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electronics) Sem – VII (2014 Course)**

<b>Semester- VII</b>					<b>Contact Hours: 23 Hrs/week</b>							
					<b>Total Credits: 25</b>		<b>Total Marks: 750</b>					
Sr. No.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Credits
		L	T	P	Continuous Assessment			Tw &Pr	TW & OR			
					End Semester Exam	Unit Test	Tutorials / Assignments			Attendance		
40	Computer Networks	3	0	2	60	20	10	10	-	50	150	4
41	Programmable Logic Controllers & Applications	3	0	2	60	20	10	10	50	-	150	4
42	Electronic System Design	3	0	0	60	20	10	10	-	-	100	3
43	Advanced Communication System	2	0	0	60	20	10	10	-	-	100	2
44	ELECTIVE-I	3	1	0	60	20	10	10	-	50	150	4
45	Project Stage-I	0	0	4	-	-	-	-	-	50	50	4
46	In-plant Training	0	0	0	-	-	-	-	-	50	50	4
<b>Total</b>		<b>14</b>	<b>01</b>	<b>08</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>750</b>	<b>25</b>

**Elective-I**

- 1) Mobile & Broadband Communication
- 2) Digital Image processing

- 3) Advanced Digital Signal Processing
- 4) Advance Computer Programming

# Bharati Vidyapeeth University, Pune

## Faculty of Engineering & Technology

### Programme : B.Tech (Electronics) Sem – VIII (2014 Course)

<b>Semester- VIII</b>												<b>Contact Hours: 28 Hrs/week</b>	
												<b>Total Credits: 25</b>	
												<b>Total Marks: 750</b>	
Sr. No.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)							Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			Tw &Pr	TW & OR			
						Unit Test	Tutorials / Assignments	Attendance					
47	Optical Communication Fiber	3	0	2	60	20	10	10	50	-	150	4	
48	Biomedical Engineering	3	0	2	60	20	10	10	-	50	150	4	
49	Wireless Network	3	1	0	60	20	10	10	-	-	100	4	
50	Elective-II	3	1	0	60	20	10	10	-	50	150	4	
51	Seminar	0	0	2	-	-	-	-	-	50	50	1	
52	Project Stage-II	0	0	8	-	-	-	-	-	150	150	8	
	<b>Total</b>	<b>12</b>	<b>02</b>	<b>14</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>300</b>	<b>750</b>	<b>25</b>	
53	Environmental Studies	3	0	0	60	20	10	10	-	-	100	0	

#### **Elective-II**

- 1) Agricultural Electronics
- 2) SOC (System on Chip)

- 3) Speech Processing
- 4) Fuzzy Logic & Neural Network



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VII**

**SUBJECT: - Computer Networks**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 02 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 marks**

**Credits: 04**

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**Course Prerequisites:**

Analog communication, Digital communication systems.

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**Course Objectives:**

1. To introduce various topologies and types of computer networks.
  2. To introduce network hardware & OSI layers.
  3. To know how of congestion control mechanism.
  4. To familiarize the TCP/IP protocol.
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**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the types of computer networks and topologies.
2. Identify the functions of network connectors, Hubs, Switches, Routers, Bridges, NIC & network layers.
3. Implement various algorithms used in computer networks.
4. Use TCP/IP protocol.
5. Apply the various Network security techniques.

## **Contents:**

### **Unit I**

**[06 Hours]**

#### **Introduction to computer networks**

Networks definition & requirements, Networks topologies, Types of networks, network software issues, reference models- OSI TCP/IP and Hybrid.

### **Unit II**

**[06 Hours]**

#### **Physical layer**

Transmission media Guided media-twisted pair, coaxial cable, optical fiber, unguided media-RF allocation, terrestrial microwave, satellite communication, cellular telephone, EIA 232 D interface standard, modem-types, block schematic & standards network device: network connectors, Hubs, Switches, Routers, Bridges, NIC, Fast Ethernet, Gigabit Ethernet.

### **Unit III**

**[06 Hours]**

#### **Data Link Layer**

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC-types of stations, modes of operation, HDLC frame formats, additional features, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS & WANS.

### **Unit IV**

**[06 Hours]**

#### **Network Layer**

Design issues, Routing algorithms – shortest path, distance vector routing, link state routing, flow based routing, routing for mobile hosts, Congestion control – congestion prevention policies-leaky bucket algorithm, token bucket algorithm, congestion control in virtual circuit subnet and choke packets, RSVP.

### **Unit V**

**[06 Hours]**

#### **TCP/IP Protocol suit overview**

TCP/IP and internet, IP protocol and it's header format, addressing, subnetting, other networks layer protocol – ARP, RARP, ICMP, IGMP, TCP, UDP, DHCP, Domain name system (DNS), Email, HTTP, IPV 6.

### **Unit VI**

**[06 Hours]**

#### **Network security**

Cryptography Algorithms and Trust Models, Ciphers vs Codes, Symmetric-key algorithms (DES, AES), Public- key algorithms – RSA, Digital signatures, IPSec, Firewall, Managements of publics keys, communications security, Authentication Protocols.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Experiments**

1. Study of Networking.
2. Introductions to Network Simulation.
3. Study of LAN.
4. Study of Installation of Windows 2003 Server & introduction to DHCP.
5. i) Character transfer using Simplex method  
ii) Character transfer using Full-Duplex method
6. Simulation and implementation of bit stuffing Simulation and implementation of CRC
7. Study of Medium Access sub layer protocols and simulate using Network Simulator.
8. Simulation and implementation of  
i) Stop-and Wait protocol  
ii) Go-Back-N protocol  
iii) Selective repeat Protocol
9. Simulation and implementation of i) Distance Vector Routing Algorithm ii) Link State Routing algorithm
10. Study of Token Bucket Algorithm.
11. Study of TCP/IP Protocol Suite and Simulation Address resolution protocols.

**List of Assignments:**

1. Study of types of Networks and topologies.
2. Study of Network Hardware.
3. Study of TCP/IP Architecture
4. Study of Physical Layer
5. Study of Data Link Layer.
6. Describe the various Encoding techniques.
7. Study of Network Layer.
8. Study of Congestion control Mechanism.
9. Study of Session layer.
10. Study of Presentation layer.
11. Study of Application layer.
12. Study of Network security Mechanism.

**Text Books**

1. Andrew Tanenbaum, "Computer networks", Prentice Hall.
2. B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition

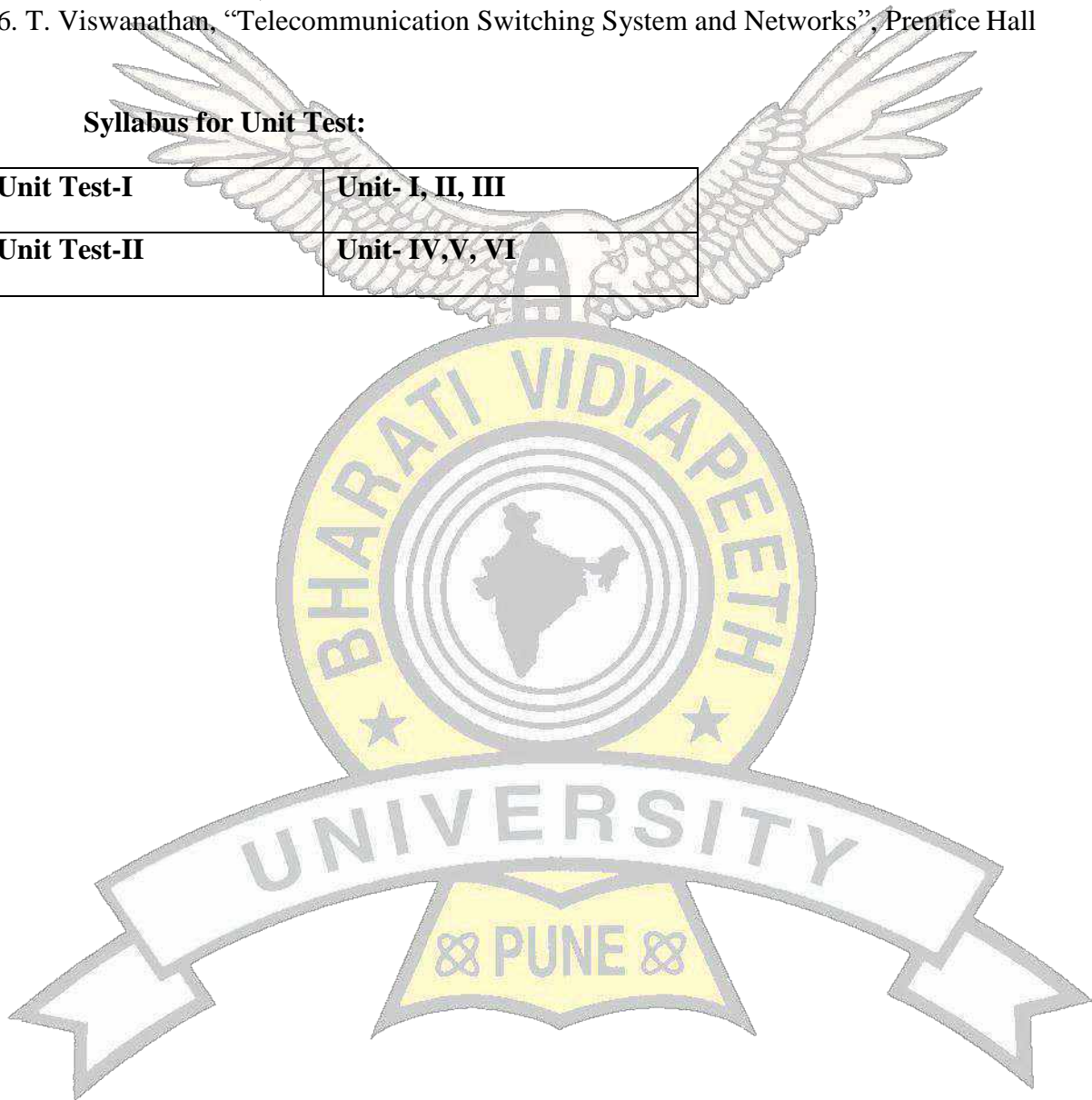


## References

1. S. Keshav, "An Engineering Approach to Computer Networking", Pearson Education
2. J.F. Kurose and K. W. Ross, "Computer Networking – A top down approach featuring the Internet", Pearson Education, 5th Edition
3. D. Comer, "Computer Networks and Internet/TCP-IP", Prentice Hall
4. William Stallings, "Data and computer communications", Prentice Hall
5. L. Peterson and B. Davie, "Computer Networks – A Systems Approach" Elsevier Morgan Kaufmann Publisher, 5 th Edition.
6. T. Viswanathan, "Telecommunication Switching System and Networks", Prentice Hall

## Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI





**Class: B. Tech (Electronics) Sem: -VII**

**SUBJECT: - Programmable Logic Controllers and Applications**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 02 Hours/week**

**Examination Scheme**

**End semester Exam: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW &Pr: 50 marks**

**Credits: 04**

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**Course prerequisites:**

Digital Electronics, Embedded systems, Power Electronics

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**Course objective:**

1. To make the student aware of automation in industries.
  2. To introduce the student to the programmable logic controllers.
  3. To give the know-how of NC, CNC machines & their role in manufacturing industries.
  4. To impart the knowledge of protocols & networking of PLCs
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Write the ladder logic for applications using logical & mathematical instructions.
2. Write the ladder logic for applications using program & data flow instructions.
3. Interface digital & analog input/output to the PLC
4. Identify NC, CNC machines and networking of PLCs.
5. Identify the components of SCADA and HMI.

## Contents

### Unit I

#### **Process Control & Automation [06 Hours]**

Definition of Process control, PID Controller, Cascade control, Analog control, Digital control, Types of Automation, Advantages and limitations of Automation, controllers & actuators. Introduction to PLC, architecture, working of PLC, functions of PLC, selection of PLC, ladder programming

### Unit II

#### **Transmitters and Signal Conditioning [06 Hours]**

Need of transmitters, 2-Wire & 3-Wire transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, Necessity of Analog input, output interface to PLC. Analog and Digital signal conditioning for various parameters, Smart and Intelligent transmitters.

### Unit III

#### **Input and Output modules [06 Hours]**

Various functions of PLC like mathematical, logical, dataflow, special functions. Interfacing of Input and Output devices with PLC. Sourcing & sinking, Classification of input & output modules, discrete & analog modules.

### Unit IV

#### **PLC and Human Machine Interface (HMI) [06Hours]**

PLC based automated systems. High frequency inputs. PLC programming standard IEC61131, Soft PLC techniques. IT Interfaces required: for ERP, MIS, MES. Supporting Applications interfaces: RFID, Barcode, Vision Systems. HMI: Block Diagram, Types, Advantages, Applications.

### Unit V

#### **SCADA & Distributed control system [06Hours]**

Elements of SCADA, Features of SCADA, MTU- functions of MTU, RTU- Functions of RTU, Applications of SCADA, Communications in SCADA- types & methods used, Introduction to DCS, Architecture of DCS, Input and output modules, communication module, Specifications of DCS

## Unit VI

### Automation and CNC (Computer Numeric Control) Machines

[06 Hours]

Introduction of NC and CNC Machines: Need of CNC machines, Applications of CNC machines in manufacturing, Advantages of CNC machines.

Networking of PLCs - Network topology, industrial network, bus network, Device bus network, Process bus network, Modbus protocol Device net, Controlnet, AS-I interface, Foundation field bus, Profibus

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Practicals:**

1. Application examples based on timers & counters.
2. Design & implement ON-OFF controller circuit
3. Application examples based on data flow instructions.
4. Application examples based on mathematical instructions.
5. Application examples using One shot rising instruction.
6. Application examples using advanced instructions.
7. Examples based on Industrial applications
8. Interfacing of analog inputs to PLC.

**List of Assignments:**

1. Conduct survey for different types of PLC programming.
2. Selection of PLC for a application with specifications.
3. Classify the timers & Counters with applications.
4. Design of signal conditioning circuit for any one analog application.
5. Identify sinking & sourcing PLC input output module.
6. Interface switch & sensor to PLC as input.
7. Communication between PLC HMI using Modbus protocol
8. Identify the applications of soft PLC.
9. Study of DCS in any industrial plant.

10. Practical examples where SCADA has played important role.
11. Identify different types of CNC machines (with applications) in industries.
12. Justify the need of networking of PLCs.

**Text Books:**

1. John W. Webb, Ronold A Reis, “Programmable Logic Controllers, Principles and Applications”; 5th Edition, Prentice Hall of India Pvt. Ltd
2. MadhuchhandaMitra, SamarjitSen Gupta, “Programmable Logic controllers and Industrial Automation”; Penram International Publishing India Pvt. Ltd

**Reference Books:**

1. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education
2. Kilian, “Modern control technology: components & systems, Delmar 2nd edition.
3. Bela G Liptak, Process software and digital networks, 3rd edition, 2002.
4. Pollack. Herman, W & Robinson., T. “Computer Numerical Control”, Prentice Hall. NJ.
5. Pabla, B.S. & Adithan, M. “CNC Machines”, New Age Publishers, New Delhi
6. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication Reference Books

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem: -VII  
SUBJECT: - Electronic System Design**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 00Hours/week**

**Examination Scheme**

**End semester Exam: 60 marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**Credits: 03**

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**Course Pre-requisites:**

Analog Electronics, Digital Electronics, Microprocessors & Microcontrollers, VLSI Design.

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**Course Objectives:**

1. To introduce analog and digital interfacing techniques
  2. To create awareness of EDA tools and techniques for testing and fault diagnosis
  3. To imbibe the importance of international standards for electronic systems and packaging techniques
  4. To enable the students to design electronic systems compliant with EMI specifications
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Address interfacing issues in analog and digital circuits.
  2. Use EDA tools and Laboratory Instruments for testing and fault diagnosis.
  3. Identify various international standards, specifications for electronic systems.
  4. Use grounding and shielding techniques for safety in electronic systems and PCB designing.
-

## **Contents:**

### **Unit I**

#### **Hardware Design- Analog**

**[06 Hours]**

Analog Signal Conditioning: Factors affecting choice of Op-Amps in signal conditioning, applications, Need for Instrumentation Amplifiers- Case study. Error budget analysis with Case study. ADCs: Interpretation of ADC specifications from design view point, considerations in selecting references ( $V_{ref}$  for ADC). DACs: Interpretation of DAC specifications.

### **Unit II**

#### **Hardware Design- Digital**

**[06 Hours]**

**Interface examples for LED, HB LED, LCD, Keyboard, Relays** (Electromagnetic and Solid State). Microcontrollers: Comparative study of different Microcontroller architectures, Factors affecting choice of Microcontroller for different applications with case study. Introduction to buses and protocols used in Electronic products- I2C, SPI, CAN, Lin, Flexray.

### **Unit III**

#### **EDA Tools and Standards**

**[06 Hours]**

Different approaches to development of application software for Electronic Product. Debugging tools and techniques for software- Features of EDA, CAD, Simulators, Assemblers, ICE, and IDE. Documentation practices and templates for above software. Introduction to various international standards like IEEE, FCC, IEC, BS & ISO standards.

### **Unit IV**

#### **Testing and Fault Diagnosis**

**[06 Hours]**

Analyses- DC/ Operating Point Analysis, AC (Frequency Response), Transient, Sensitivity, Monte Carlo. Debugging/ Fault finding- Features and limitations of Analog CRO, DSO, Logic Analyzer and Mixed Signal Oscilloscopes in finding hardware/software faults.

### **Unit V**

#### **ESD and Packaging**

**[06 Hours]**

Packaging & Enclosures of Electronic System: Need for Environmental Testing, Effect of environmental factors on electronic systems: Temperature, Humidity, Vibration and Shock tests, nature of environment and safety measures. Packaging's influence and its factors. Cooling in/of Electronic System: Heat transfer, approach to thermal management, mechanisms for cooling, operating range, basic thermal calculations, cooling choices, heat sink selection.

## Unit VI

### PCB Design and EMC

[06 Hours]

PCB Design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits, Grounding of Electronic Systems: Safety grounds, signal grounds, single-point ground systems, multipoint-point ground systems, hybrid grounds, functional ground layout, practical low frequency grounding, hardware grounds, grounding of cable shields, ground loops, shield grounding at high frequencies.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Assignments:**

1. State factors affecting choice of Op-Amps in signal conditioning.
2. State the need for Instrumentation Amplifier with an example.
3. State the need for signal conditioning circuits with an example
4. State selection criteria of Microcontroller for application with case study of one application.
5. Explain in details the I2C protocol for interfacing peripherals
6. Explain in details the SPI protocol for interfacing peripherals
7. Explain following International standards in detail
  - a. IEEE standards.
  - b. FCC standards.
  - c. IEC standards.
  - d. BS standards.
  - e. ISO standards.
8. List the different Layout design & Tools available in market and write the specifications in detail.
9. State need for Environmental Testing. Temperature, Humidity, Vibration and Shock tests etc.
10. State the need of Cooling in an Electronic system.
11. Explain the PCB design practices for Analog and Mixed signal circuits, High speed digital circuits, Precision circuits.
12. State the need for Grounding of Electronic Systems.



### Text Books

1. Bernhard E. Bürdek, “History, Theory and Practice of Product Design”, SpringerScience, 2005
2. Paul Horowitz, “Art of Electronics”, Cambridge University Press.

### Reference Books

1. Howard Johnson, Martin Graham, “High-speed Digital design- A Handbook of Black Magic”, Prentice Hall Publication.
2. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design – A Systematic Approach”, Springer,2007.
3. Tim Williams, “EMC for Product Designers”, Elsevier, Fourth edition 2007.
4. Jerry C Whitaker, “The Electronics Handbook”, CRC Press, IEEE Press, ISBN 08493-8345-5.
5. David Bailey, “Practical Radio Engineering and Telemetry for Industry”, Elsevier ISBN 07506 58037.
6. Pressman, “Software Engineering - A Practitioner's Approach”.
7. W.Bosshart“Printed Circuit Boards - Design & Technology”, 1st edition, Tata McGraw Hill.
8. G. Pahl and W. Beitz J. Feldhusen and K.-H. Grote, “Engineering Design – A Systematic Approach”, Springer, 2007.
9. John G. Webster, “Measurement, Instrumentation, and Sensors Handbook”, CRC Press, 1999.
10. Peter Wilson, “The Circuit Designer’s Companion”, Elsevier Ltd, 2012

### Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem: - VII**

**SUBJECT: - Advanced Communication System**

**Teaching Scheme**

**Lectures: 02 Hours/week**

**Practical: 00Hours/week**

**Examination scheme**

**End Semester Exam:60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**Credits: 02**

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**Course Prerequisite:**

Analog Communication, Digital Communication Systems

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**Course Objectives:**

1. To introduce radar & satellite communication system with its working principle and implementation techniques.
2. To enable student to integrate communication technologies in multidisciplinary applications.
3. To make the student aware of advanced communication techniques.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Compare radio frequency and microwave frequency communication with respect to its working principle and its applications.
2. Describe satellite subsystem and analyze link budget for satellite.
3. Identify the fundamentals of orbital mechanics, the characteristics of common orbits used in satellite communications
4. Explore the concept of cognitive radio communication.
5. Apply different modulation techniques and access techniques for wireless communications.

**Contents:**

**Unit I**

**[04 Hours]**

## **Introduction to microwave techniques**

Introduction to microwave fundamentals, microwave frequencies and microwave devices, microwave transmission lines- reflection coefficient and transmission coefficient, standing waves , wave guides, rectangular wave guides, TE mode wave, power transmission in wave guide, power losses, excitation of modes in wave guide

### **Unit II [04 Hours]** **Satellite communication**

Basic transmission theory, system noise temperature and G/T ratio, orbital mechanics, look angle determination, satellite subsystem.

### **Unit III [04 Hours]** **Satellite link design**

Design of downlink, link budget, design of uplink, modulation techniques, multiplex techniques, earth station, application overview-Radio and satellite navigation, GPS position location.

### **Unit IV [04 Hours]** **Radar**

Radar fundamentals, radar principle, radar range equation, types of radar pulsed radar system, MTI, radar beacons, FMCW radar, Doppler radar, phased array radar, plane array radar.

### **Unit V [04 Hours]** **Cognitive radio**

Cognitive Radio Architecture, Dynamic Access Spectrum, Spectrum Efficiency, Spectrum Efficiency gain in SDR and CR, Spectrum Usage, OFDM as PHY layer , OFDM Modulator, OFDM Demodulator

### **Unit VI [04 Hours]** **Mobile Communication**

Mobile telephone service, Transmission protocols, Introduction to GSM, GPRS, CDMA switching techniques, Quality of service (QOS).

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

#### **List of Assignments:**

1. Study of microwave components and equipments
2. Study of measurement of microwave frequency
3. Simulation of microwave building blocks
4. Study of Radar communication
5. Study of Satellite communication
6. Simulation of radar building blocks
7. Simulation of satellite communications building blocks

8. Visit to Mobile Telephone Switching Office (MTSO).
9. Compare GSM, GPRS and CDMA switching techniques.
10. Explain in detail the concept of cognitive radio
11. Analysis of 3G and 4G systems using any appropriate simulation tool.
12. Study of Transmission of Audio signal over satellite link.

**Text books:**

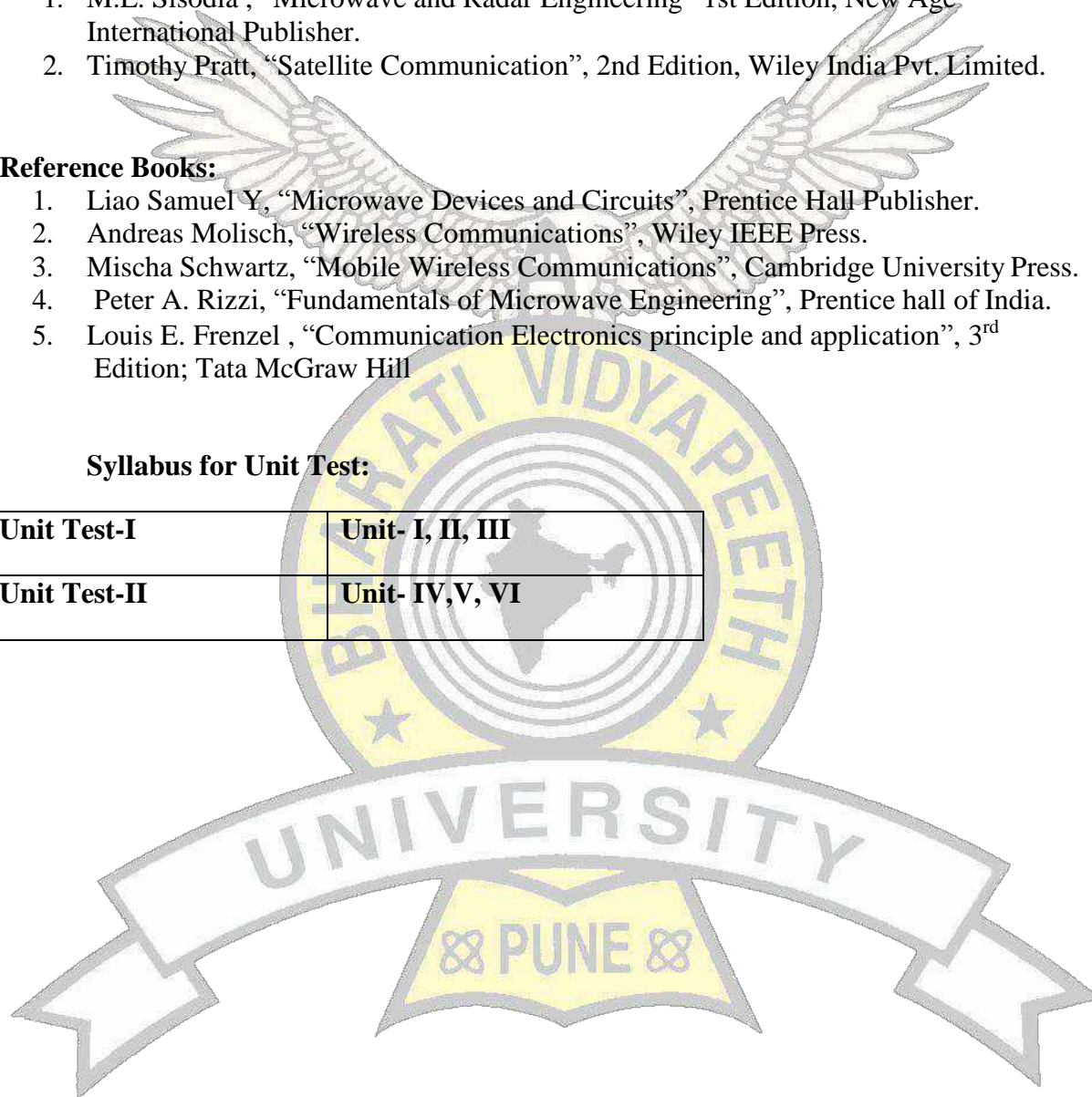
1. M.L. Sisodia , “Microwave and Radar Engineering” 1st Edition, New Age International Publisher.
2. Timothy Pratt, “Satellite Communication”, 2nd Edition, Wiley India Pvt. Limited.

**Reference Books:**

1. Liao Samuel Y, “Microwave Devices and Circuits”, Prentice Hall Publisher.
2. Andreas Molisch, “Wireless Communications”, Wiley IEEE Press.
3. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press.
4. Peter A. Rizzi, “Fundamentals of Microwave Engineering”, Prentice hall of India.
5. Louis E. Frenzel , “Communication Electronics principle and application”, 3<sup>rd</sup> Edition; Tata McGraw Hill

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VII**

**SUBJECT: - Elective-I Mobile and Broadband Communication**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 01 Hour/week**

**Examination scheme**

**End semester Exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 marks**

**Credits: 04**

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**Course Prerequisites:**

Analog Communication, Digital Communication

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**Course Objectives:**

1. To make students familiar with fundamentals of mobile communication systems
  2. To make students familiar with GSM and CDMA technologies.
  3. To make students familiar with B-ISDN, services of B-ISDN, ATM networks.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Develop mobile communication systems (cellular theory) and the characteristics of different multiple access techniques in mobile communication
2. Analyze the different inter-networking challenges and solutions in wireless mobile Networks and Transport Layers.
3. Develop applications that are mobile-device specific and demonstrate current practice in mobile communication contexts.

## **Contents:**

### **Unit I**

#### **Mobile and Personal Communication**

**[05 Hours]**

Past, Present, and Future, The Cellular Concept, Multiple Access Technologies for Cellular System, Cellular System Operation and Planning: General Principles, Initial Implementations of the Cellular Concept: Analog Cellular Systems

### **Unit II**

#### **Digital Cellular Mobile Systems**

**[07 Hours]**

GSM Standardization and Service Aspects, GSM Reference Architecture and Function Partitioning, GSM Radio Aspects, Security Aspects, GSM Protocol Model, IS-95: The North American CDMA Digital Cellular Standard, Introduction, Service Aspects, Network Reference Model and Security Aspects, 4G Systems: Introduction to OFDM and MC-CDMA

### **Unit III**

#### **Mobile Network & Transport Layer**

**[06 Hours]**

Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile adhoc networks, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery, Transaction oriented TCP, TCP over 2.5/3G wireless networks, Support for Mobility, File systems, Wireless application protocol, i-mode, SyncML, WAP 2.0.

### **Unit IV**

#### **ISDN**

**[05 Hours]**

Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series Recommendations, Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

### **Unit V**

#### **B-ISDN architecture and standards, B-ISDN Services**

**[06 Hours]**

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements, B-ISDN protocols, User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy.

### **Unit VI**

#### **ATM**

**[07 Hours]**

Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols, ATM switching, ATM cell processing in a switch, Matrix type switch, Input, Output buffering, Central buffering, ATM Traffic and congestion Control, Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Tutorials/Experiments:**

1. Analyze Cellular Concept & cellular hierarchy.
2. Study of Cellular system operation & planning.
3. Analyze GSM architecture & GSM service aspects.
4. Study of CDMA Digital cellular standards.
5. Study of design principles of Mobile IP, mobile transport layer.
6. Analyze and study of architecture of ISDN standards and addressing.
7. Study of B-ISDN Protocols.
8. Analyze design principles of ATM cells, AAL services, protocols and ATM switching.

**List of Assignments:**

1. Visit mobile station/telephone switching & prepare visit report.
2. To carryout telephone signal switching system using EPBX trainer.
3. To carry out AT commands mobile communication using GSM trainer.
4. To transfer data between two computers using ISDN terminal adapter modem.
5. To understand CDMA trainer using DSSS technology.
6. Analyze digital & analog cellular systems.
7. To study Mobile IP & Mobile Transport Layer
8. Analyze ISDN protocol architecture, ISDN connections, Addressing, Interworking.
9. To study B-ISDN protocols, User plane, Control plane, Physical layer & Line coding.

10. Analyze handoff management in mobile communication by virtual lab.
11. To study AAL services and protocols and ATM switching.
12. Analyze ATM Traffic and congestion Control.

**Text Books:**

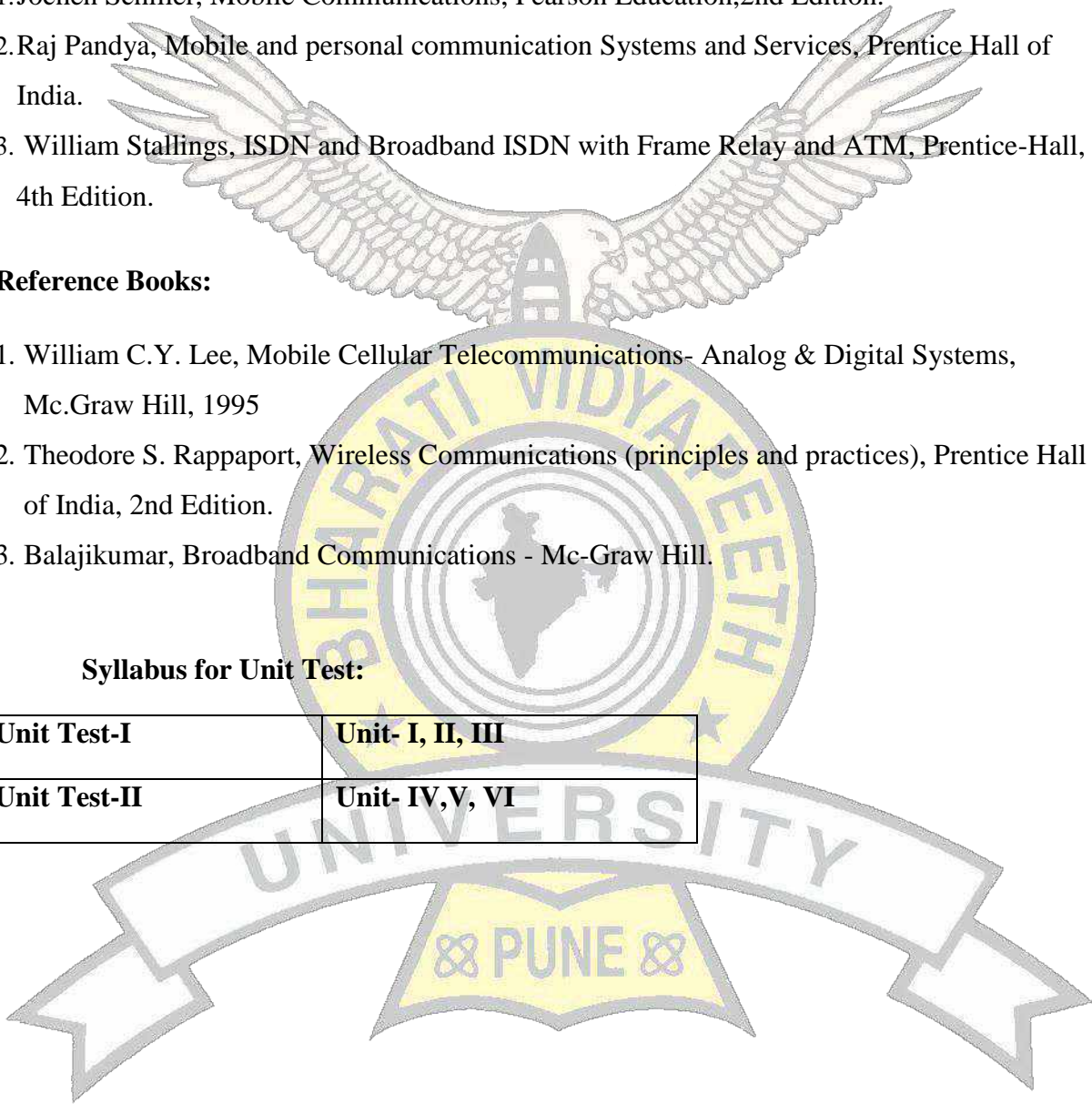
1. Jochen Schiller, Mobile Communications, Pearson Education, 2nd Edition.
2. Raj Pandya, Mobile and personal communication Systems and Services, Prentice Hall of India.
3. William Stallings, ISDN and Broadband ISDN with Frame Relay and ATM, Prentice-Hall, 4th Edition.

**Reference Books:**

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Theodore S. Rappaport, Wireless Communications (principles and practices), Prentice Hall of India, 2nd Edition.
3. Balajikumar, Broadband Communications - Mc-Graw Hill.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>







**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B.Tech (Electronics) SEM:- VII**

**SUBJECT:- Elective - I Digital Image Processing**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 04**

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**Course prerequisites:**

Signals and Systems, Digital Signal Processing.

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**Course objective:**

- 1 To introduce the image fundamentals and enhancement techniques.
  - 2 To introduce the image segmentation and representation techniques.
  - 3 To familiarize various morphological operations on image.
  - 4 To introduce the concepts of image registration and image fusion.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate the fundamentals of digital image processing.
2. Design the image enhancement filters.
3. Analyze morphological operations and its effects on image.
4. To perform various morphological operations on image.
5. Determine features of various images by using segmentation method.

**Contents:**

## **Unit I**

### **Fundamentals Digital Image Processing**

**[06 Hours]**

Introduction, Fundamental steps in digital image processing and components, Elements of visual perception, Image sensing and acquisition, sampling and quantization, An Introduction to the mathematical tools used in digital image processing, Digital image representation, Relationships between pixels, Color models, Noises in color images.

## **Unit II**

### **Image Enhancement**

**[06 Hours]**

Spatial domain, Gray level transformations, Intensity transformation functions, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filtering, Frequency domain, Introduction to Fourier Transform, One-Dimensional Fourier Transform and Inverse of Fourier Transform, Smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

## **Unit III**

### **Multi Resolution Analysis and Compressions**

**[06 Hours]**

Multi resolution analysis, Image pyramids, Multi resolution expansion, Wavelet Transforms, Image compression, Fundamentals Models, Elements of Information Theory, Error free Compression, Lossy Compression, Compression Standards.

## **Unit IV**

### **Morphological Operations in Image Processing**

**[06 Hours]**

Dilation and erosion, Opening and Closing, Hit or Miss transformation, Morphological algorithms, Extensions to grey scale images, Image Watermarking.

## **Unit V**

### **Image Segmentation and Feature Extraction**

**[06 Hours]**

Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, First and second order edge detection operators, Hough transform, Types of Hough transform, shape features, Boundary descriptors, Localized feature extraction detecting image curvature.

## **Unit VI**

### **Applications of Digital Image Processing**

**[06 Hours]**

Image Classification, Image Recognition, Image Understanding, Working principle of Video Motion Analysis (GIF), Introduction to Iris Recognition, Difference between 2D and 3D image Sources of 3D Data sets, Image processing in 3D, Measurements on 3D images..

### **Content Delivery Methods:**

Chalk & talk, Power point presentation.

### **Assessment Methods:**

1. Unit test
2. Continuous Assessment
3. End Semester Examination

**List of Tutorials/Experiments:**

1. Study of Reading and Displaying Image in different File Format.
2. Study of Simple Binary and Gray Level Transformation.
3. Study of Histogram and Histogram Equalization of Image
4. Study of Smoothing of Image in Special Domain using Averaging and Median Method.
5. Study of Edge Detection of Image using First and Second Order.
6. Study of Morphological Operations.
7. Study of Segmentation using Thresholding.
8. Study of Image Compression using DCT.
9. Study of Hough transforms.
10. Study of Feature Detection and Feature Identification.
11. Study of Image Sources in 2D and 3D.
12. Study of Iris Recognition.

**List of Assignments:**

1. Discuss Digital image representation and Color Model.
2. Study of Fundamental steps in digital image processing and components.
3. Study of Spatial domain, Gray level transformations and Intensity transformation functions.
4. Discuss Histogram processing, Fourier Transform, Gaussian filters.
5. Perform various Morphological Operations on image.
6. Study of Dilation and erosion, Opening and Closing, Image Watermarking.
7. Analysis of resolutions of Image and color intensity.
8. Study Wavelet Transforms, Image compression and Compression.
9. Study image Segmentation and Thresholding, Hough transform.
10. Study of Boundary descriptors, Localized feature detection and extraction.
11. Discuss Video Motion Analysis.
12. Study of applications of Digital Image Processing in 2D and 3D.

**Text Books:-**

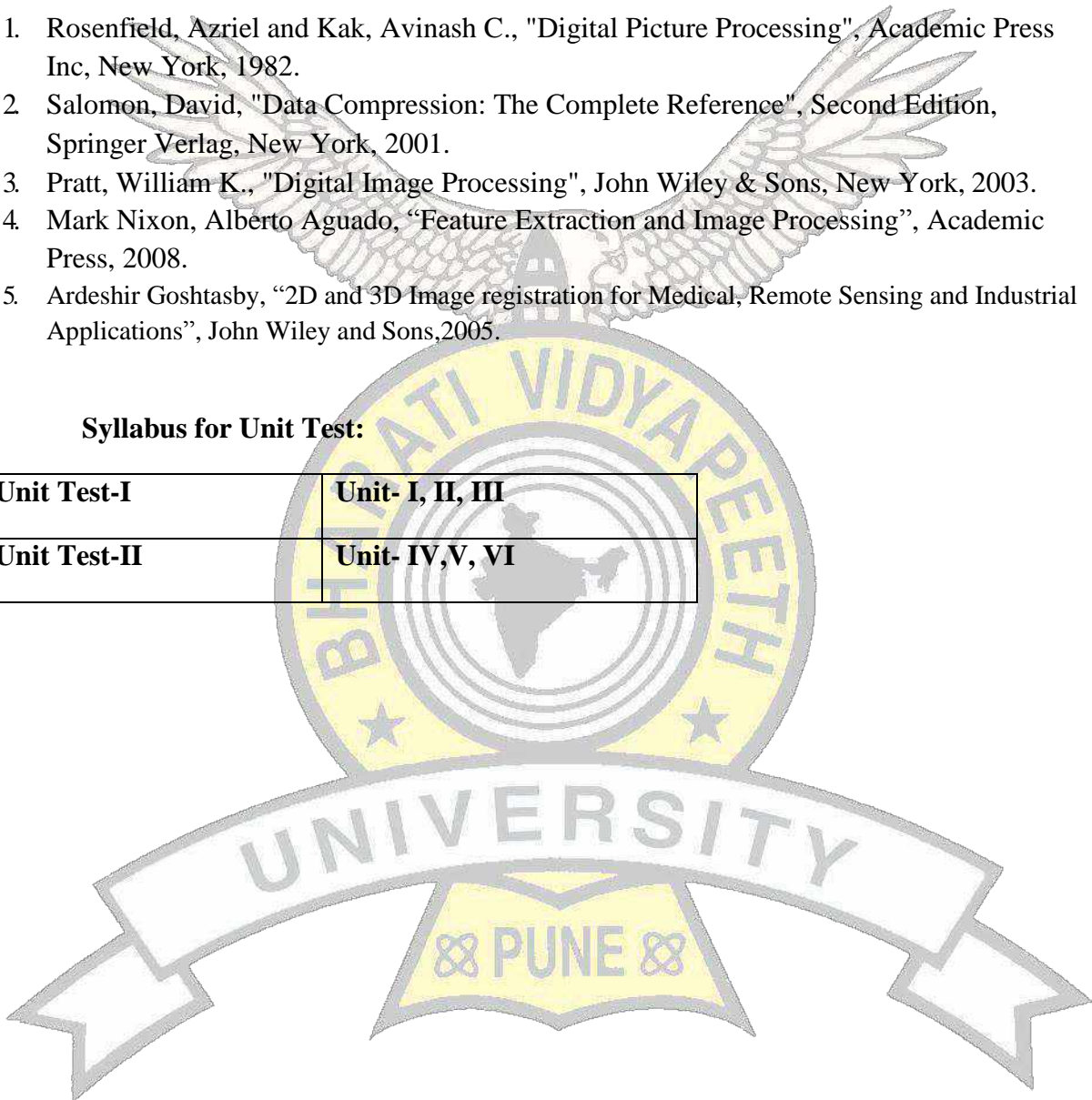
1. Gonzalez, Rafael C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.

**Reference Books:-**

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David, "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.
4. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.
5. Ardeshir Goshtasby, "2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons, 2005.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>





**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem :- VII**

**SUBJECT: - Elective-I Advanced Digital Signal Processing**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hour/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

Signals & systems, Digital Signal Processing

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**Course Objectives:**

1. To make student familiar with basic principles of spectral estimation methods.
  2. To introduce the advanced concepts and techniques of digital signal processing.
  3. To create awareness about the practical applications in the field of Digital Signal Processing.
  4. To introduce DSP processor architecture.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Apply parametric and non-parametric techniques for estimating the power spectral density.
  2. Design and implement multistage sampling rate converter.
  3. Design appropriate adaptive filter in communication applications.
  4. Perform multi-resolution analysis using wavelet transform.
  5. To implement the signal processing application using DSP processor.
- 

**Contents:**

**Unit I  
DSP Processor Characteristics**

**[06 Hours]**

Features of DSP Processors, Harvard and modified Harvard Architecture, Multiply-Accumulate operation, Single Cycle Execution, Multiple on chip buses, ALU, MAC, Shifter Processing Units, Address Generation units, Modulo addressing, Bit reversed addressing, Efficient Looping Mechanisms, Examples of DSP Processors, Applications of DSP Processors

**Unit II** [06 Hours]

**Linear Prediction**

Random Processes, Stationary Random Process, Ergodic Random Process, AR process, MA process and ARMA process, AR lattice and ARMA lattice Ladder Filters, Forward and backward linear prediction, Solution of Normal Equations, Levinson-Durbin Algorithm, Properties of Linear Prediction Error Filters.

**Unit III** [06 Hours]

**Power Spectrum Estimation**

Estimate definition, Nonparametric methods-Periodogram, modified periodogram, Bartlett's method, Blackman-Tukey Method, Performance Comparisons of nonparametric methods, Parametric methods, Methods for estimating parameters of AR, MA and ARMA models

**Unit IV** [06 Hours]

**Multirate DSP fundamentals**

Need for Multi-rate DSP, Decimation by factor  $D$ , Interpolation by factor  $I$ , Sampling rate conversion by rational factor  $I/D$ , software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

**Unit V** [06 Hours]

**Adaptive filters**

FIR adaptive filters – the MMSE criterion and LMS and RLS algorithms, Adaptive Lattice-Ladder Filters - Recursive Least Squares Lattice Ladder Algorithms, Applications of Adaptive Filters

**Unit-VI** [06 Hours]

**Time Frequency Representation of signals**

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation, tiling diagrams. Short Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrogram.

**Content Delivery Methods:**Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit test
2. Continuous Assessment
3. End Semester Examination

### List of Tutorials/Experiments:

1. Study of various addressing modes of DSP.
2. Describe the power spectrum estimation using Blackman and Tukey method.
3. Describe the role of Adaptive filters in Communication.
4. A brief survey of DSP applications in speech processing.
5. Implementation of Multi-rate application in digital audio processing.
6. Implementation of sub band coding for speech signal.
7. Discuss in detail various applications of wavelet transforms.
8. Explain the process of digital FM stereo signal generation.
9. Demonstration of Hardware and Software utilities for DSP starter kits.

### List of Assignments:

1. Present a comparative study of DSP processors based on their features and applications.
2. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods.
3. Estimation of PSD of two sinusoids plus noise using Welch method
4. Find linear prediction coefficients and reflection coefficients using Levinson Durbin Algorithm .
5. Implement program to convert CD data into DVD data
6. Implement LMS algorithm using MATLAB.
7. Record a speech file in your own voice. Find pitch period for a voiced part of the segment.
8. Perform continuous and discrete wavelet analysis of a signal.
9. Implementation of Linear / Circular convolution on DSP processor.
10. Implementation of FIR filter using DSP processor
11. Design an Adaptive filter using LMS algorithm.
12. Mini-project based on the Matlab/Scilab.

### Text books:

1. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education, Fourth Edition, 2007.
2. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", TMH

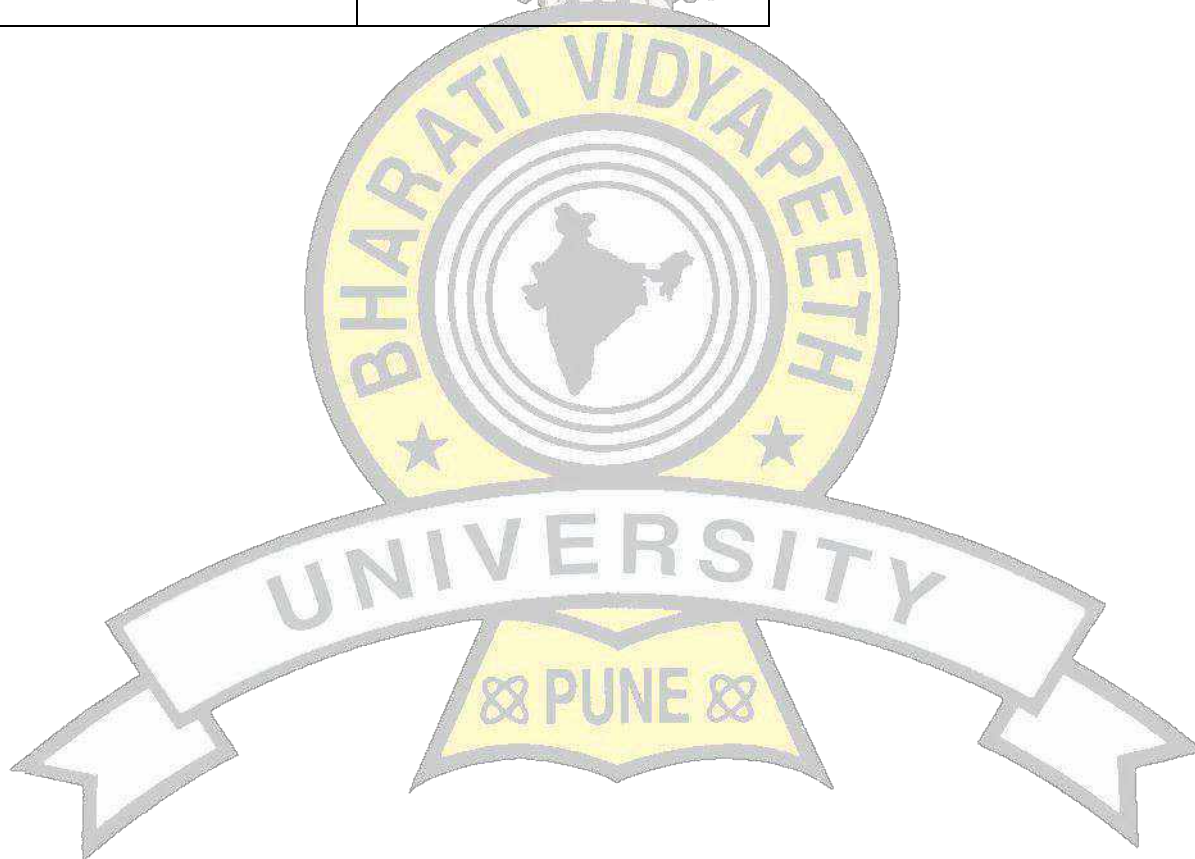
### Reference Books:

1. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education. 2007.
2. Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education. 1985

3. Manolakis, D.G., Ingle, V.K. and Kogon, M.S., “Statistical and Adaptive Signal Processing”, Artech House. 2005.
4. Diniz, P.S.R., “Adaptive Filtering: Algorithms and Practical Implementation”, Kluwer. 1997
5. S. D. Apte, “Advanced Digital Signal Processing,” Wiley Publications, 2014.
6. Leon Cohen, “Time-Frequency Analysis”, Prentice Hall,1995.
7. K.P Soman, K.I Ramchandran, N.G.Reshmi, “Insight into Wavelets- from theory to Practice,” PHI Learning Private Limited, Third Edition, 2010.
8. Rao R M and A S Bopardikar, “Wavelet Transforms Introduction to theory and Applications”, Pearson Education, Asia, 2000.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>







**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- VII**

**SUBJECT: - Elective-II Advanced Computer Programming**

**Teaching scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & Oral: 50 marks**

**Credits: 04**

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**Course prerequisites:**

Fundamentals of computing

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**Course objective:**

1. To introduce object oriented programming concepts.
  2. To develop programming ability by learning advanced coding techniques.
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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate basic knowledge of object oriented programming concepts.
  2. Write simple programs in Java.
  3. Apply Java for HTML and Applet applications.
  4. Use SQL for database manipulation
- 

**Contents**

**Unit I**

**[06 Hours]**

**Object Oriented Programming:**

Programming fundamentals, Basic Concepts, Different Programming Paradigms, Evolution of Different Programming Languages and their Characteristics, Object-Oriented Paradigm, Objects and Classes, Data Abstraction and Encapsulation,

Inheritance, Polymorphism, DynamicBinding, Message Communication, Benefits of OOP, Applications of OOP, Java Language as an OOP Language.

**Unit II** [06 Hours]

**Introduction to Java:**

Introduction to Java, Different Characteristics of Java, C++ and Java:Feature Comparisons, Improvements, Detailed Overview, Constants,Variables and Data Types, Operators and Expressions, Decision Making and Branching and Decision Making and Looping, Classes Objects and Methods, Arrays, Strings and Vectors, Interfaces.

**Unit III** [06 Hours]

**Threads:**

Packages in Java, Multithreaded Programming concepts and applications, Managing Errors and Exceptions, Managing Input/Output Files in JAVA.

**Unit IV** [06 Hours]

**HTML and Java Applets:**

History, W3C Standards, Standard HTML Tags for Image and TextFormatting, Tables, Lists, Frames. Introduction to dynamic HTML. JavaApplets: History, Introduction, HTML and Java Applet. Basic Applet programming, Applets on Web. Applet applications for Web.

**Unit V** [06 Hours]

**SQL and Java:**

Introduction to databases, Data Models, Concepts, Schema, RelationalQuery. Detailed Overview of SQL Language, Basic SELECT Query, WHERE Clause, ORDER BY Clause, Merging Data from MultipleTables: INNER JOIN, INSERT Statement, UPDATE Statement, DELETESStatement, and Installation of MySQL or PL SQL. Setting MySQL / PL SQLUser Account.

**Unit VI** [06 Hours]

**Database Connectivity:**

Introduction to JDBC, JDBC Architecture, Types of JDBC drivers, ResultSet, Metadata, Stored Procedure, Callable Procedure, Connection Procedure.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Tutorials/Experiments:**

1. Write a Java program to implement Class and Inheritance Concept.
2. Write a Java program to differentiate between method overloading and method overriding.
3. Write a Java program to understand the use of String class and string buffer class
4. Write a Java program to implement the concept of Package.
5. Write a Java program to implement concept of Exception Handling.
6. Write a program to implement Frame and different graphics objects.
7. Write a program to implement Java Applet.
8. Write a SQL Program for implementation of DDL, DML, and DCL.

**List of Assignments:**

1. Write a C++ or Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Implementation of different string functions by using switch case.
4. Write a Java Program implement multiple inheritances by using Interface.
5. Write a Java Program to perform different file operations.
6. Write a program to implement multithreading.
7. Design a College website containing detailed information using HTML Tags.
8. Write a program to implement a Java Applet.
9. Write a Java program to demonstrate JDBC connectivity.
10. Comparison of different database
11. Justify the role of SQL for database manipulation
12. A mini project on Java and SQL.

**Text Books:**

1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
2. Database System Concepts, Sixth Edition by Henry Korth, McGraw Hill Publishing Company
3. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company

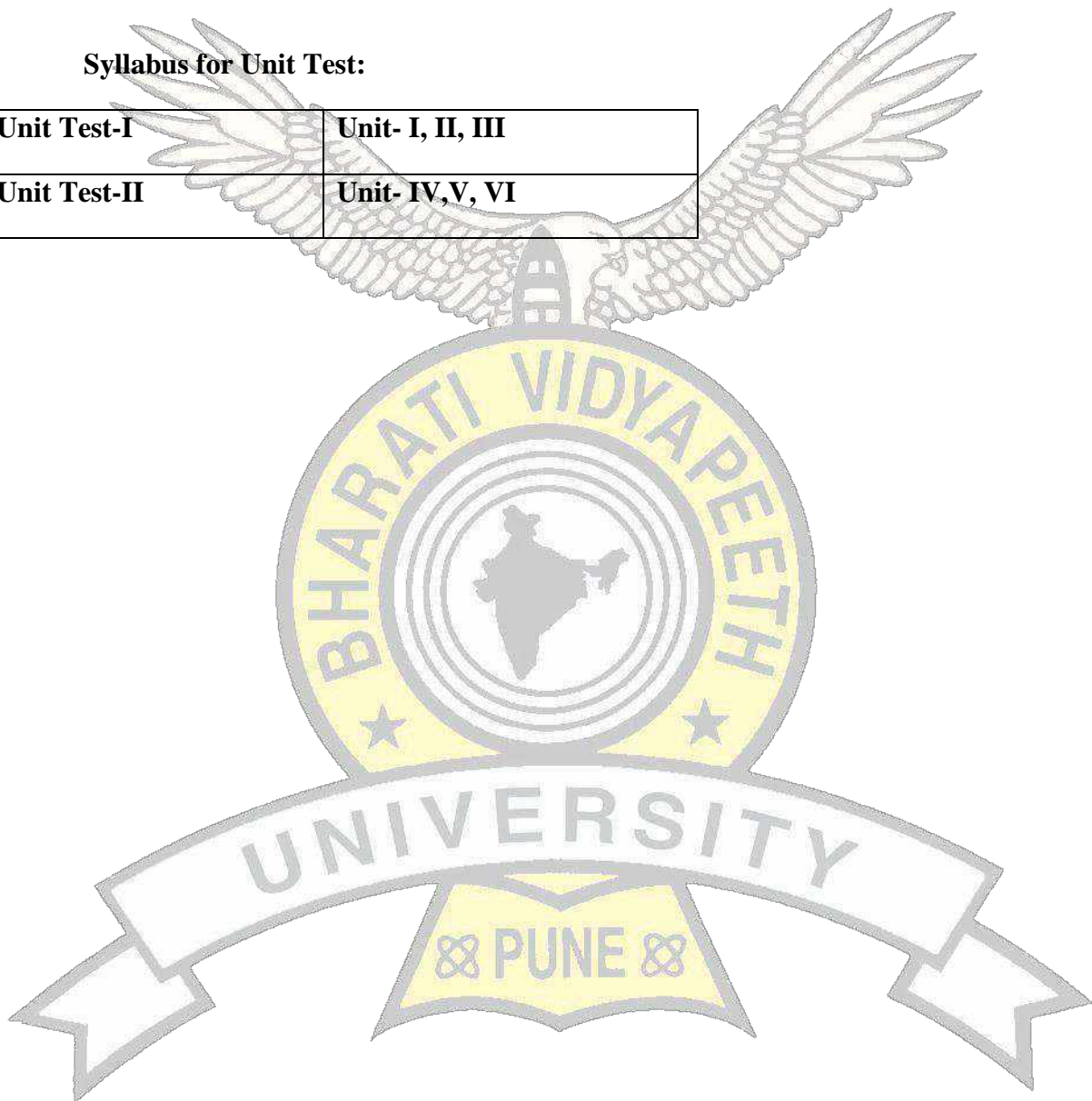
4. Java: How to Program by Deitel and Deitel

**Reference Books:**

1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.
2. Korth, “Database System Concepts”, MGH Publication.
3. Ivan Bayross, “Programming with SQL”, Sybase Publication.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- VII**

**SUBJECT: - Project stage - I**

**Teaching scheme**

**Practical: 04 Hours/week**

**Examination scheme**

**TW & Oral: 50 marks**

**Total Credits: 04**

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**Course objective:**

1. To familiarize the students with the product development cycle
2. To impart the importance of working as a team.
3. To introduce the student to literature survey and documentation process.
4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the problem for practical Engineering application
2. Formulate and design appropriate solution
3. Write specifications and identify constraints
4. Work as an effective team member
5. Effectively plan the financial budget for the project.

Project Stage –I includes various steps such as:

1. Problem Identification
2. Information gathering
3. Feasibility study
4. Synopsis
5. System analysis
6. Requirement analysis



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VII**

**SUBJECT: - In-plant Training**

**Teaching scheme**

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**Examination scheme**

**TW & OR: 50 marks**

**Credits: 04**

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**Course Objectives:**

1. To familiarize the students to industrial work processes.
2. To work as an effective team member.
3. To develop the communication and presentation skills.
4. To introduce the student to work ethics in industry.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Work effectively in an industrial environment.
2. Effectively communicate and present himself/herself.
3. Identify the various sections in the industry.
4. Work in a team.

**In-plant Training:**

Every student has to undergo training on site or in office of some company in June & July for one and half month to get the exposure and practical experience. He has to submit the detailed report of training, on the basis of which the term work and oral marks should be awarded.

**Note: -** Student should complete in-plant industrial training after semester-VI for a period of six weeks. Evaluation will be done in semester-VII.



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- VIII**

**SUBJECT: - Optical Fiber Communication**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 02 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & PR: 50 marks**

**Total credits: 04**

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**Course prerequisites:**

Analog Electronics, Analog Communication

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**Course objective:**

1. To lay down the foundation for optical communication engineering.
  2. To introduce the working of optical transmitter and receiver.
  3. To familiarize the students to optical devices and concepts of various modulation techniques.
  4. To introduce the students to Optical Fiber measurement techniques.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate the advantages and applications of optical fiber communication.
2. Identify different optical Sources/detectors with their operating principle.
3. Choose the multiplexing technique and optical amplifier for optical communication.
4. Select the connectors /couplers in Optical fiber link and explain measurement technique for the optical fiber losses.

**Contents:**

## Unit I

[06 Hours]

### Introduction:

Advantages of optical fiber communication over other communication systems, Ray theory transmission, Electromagnetic mode theory for optical propagation, types of fibers, transmission characteristics of optical fibers-attenuation, scattering losses, fiber bend loss, dispersion, polarization, preparation of optical fibers.

## Unit II

[06 Hours]

### Optical transmitter

**Optical sources:** Basic Concepts, Light Emitting Diodes, Semiconductor Laser, Laser Diodes, Line Coding, Laser Characteristics, Different modulation schemes.

**Optical transmitters:** LED drive circuits for digital and analog transmission.

## Unit III

[06 Hours]

### Optical Receivers and Optical links:

**Optical receiver:** Detector responsivity, Rise time and Bandwidth, P-N Photo Diode, P-I-N Photo Diode, Avalanche Photo Diode, Receiver Noise, Receiver Sensitivity.

Point to point Links: System design considerations, Link Power budget, Rise Time budget, Multichannel transmission techniques.

## Unit IV

[06 Hours]

### WDM concept and Optical Amplifier:

WDM Concept, WDM Light wave Systems, WDM Components, System Performance Issues, Time Division Multiplexing, Sub Carrier Multiplexing, Code Division Multiplexing. Types of Optical Amplifier and its applications, Amplifier Noise, Optical SNR, Raman Amplifier.

## Unit V

[06 Hours]

### Optical Components and Optical Networks:



Power launching & Coupling: Fiber optic splices, connectors & couplers & Coupling losses. Optical couplers, Isolators and Circulators. Network Concepts, network Topology, SONET/SDH.

## Unit VI

[06 Hours]

### Optical Fiber measurements and application.

Fiber attenuation measurements, Fiber dispersion measurements, fiber numerical aperture measurement, reflectance and return loss measurements. OTDR. Application in military, industrial applications and applications in local area network.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

#### List of practicals:

1. Optical Source Characteristics: Aim: To plot the electrical and optical characteristics of different light sources.
2. Numerical Aperture of fiber: Aim: To estimate the numerical aperture of given fiber.
3. To measure the attenuation of given MMSI and SMSI fibers.
4. To measure the attenuation variation in length of optical cable.
5. To measure the attenuation due to bending of optical fiber.
4. Optical Detector Characteristics: Aim: To plot the frequency response of detectors with different values of load resistor.
5. Fiber Bandwidth/Data rate: Aim: To estimate the bandwidth of given fiber.
6. Transmission of analog signal using a simple fiber optic link.
7. Transmission of Digital signal using a simple fiber optic link.
8. To perform Frequency modulation using optical fiber.
9. To perform PWM using optical fiber
10. To find the optical power using "Optical Power Meter".
11. To find the optical response using "OTDR".
12. Determination of input, output and transfer characteristics of Optocoupler.

### List of Assignments:

1. Explain different types of optical fibers.
2. Study of Electromagnetic mode theory of optical propagation.
3. Classify the types of optical connectors and couplers.
4. Study of the fiber optic analog and digital lab using Virtual Lab.
5. Study of the fiber optic bidirectional communication using Virtual Lab
6. Study of bending losses in optical fiber using virtual lab.
7. Study of LED and Detector characteristics using Virtual Lab
8. Study of attenuation loss in optical fiber using Virtual Lab
9. Numerical based on acceptance angle, N.A. and Number of guided modes.
10. To find power efficiency, optical power in LEDs.
11. Calculation of optical power budget.
12. Measurement of attenuation in optical fiber.

### Text Books

1. Gerd Keiser, "Optical Fiber Communications", Tata McGraw Hill, Fourth Edition.
2. John M. Senior, Optical Fiber Communications-Principles and Practice, Prentice Hall of India, second Editio

### References

1. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", Tata Mc Graw-Hill International Edition, 1998.
2. Djafar K.Mynbaev and Lowell L.Scheiner "Fiber optic communication Technology" Pearson education, 2001.
3. Eric Udd, Fiber Optic Sensors, John Wiley, New York, 1991.
4. J.H. Franz and V. K. Jain, "Optical Communication - Components and systems", Narosa Publishing house, 2000.
5. Bhattacharya "Semiconductor Opto Electronic Devices", PHI Learning, New Delhi, 1995

### Syllabus for Unit Test:

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem: - VIII**

**SUBJECT: - Biomedical Engineering**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & OR: 50 marks**

**Credits: 04**

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**Course prerequisites:**

Analog Electronics, Instrumentation and control system.

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**Course objectives:**

1. To introduce various biopotentials, their measurements, and interpretations associated with human body.
  2. To familiarize the student with medical equipments.
  3. To expose the students to clinical laboratory equipments.
  4. To imbibe the importance of patient's safety.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Classify systems in a human body and Identify bio-potentials
2. To acquire and analyze ECG, EMG, EEG signals.
3. Correlate the parameters like B.P., ECG and PCG with the functioning of heart.
4. Categorize life saving equipments such as cardiac and respiratory equipments according to their applications.
5. Identify the equipments present in ICU/NICU and clinical laboratory.

6. Recognize physiotherapy equipments used for pain relief and describe various electrodes and techniques used for surgery.

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**Contents:**

**Unit I** **[06 Hours]**

**Human body & Origin of Bio-potentials**

Human body: cell structure, overview of different systems in the body: cardiovascular system, respiratory system, nervous system, musculoskeletal system, gastrointestinal system, endocrine system and lymphatic system, Origin of Bio-potentials: action potential and muscle contraction, bio-potentials such as ECG, EEG, EMG.

**Unit II** **[06 Hours]**

**Electrocardiograph, Phonocardiograph and Blood pressure measurements**

Electrocardiography: ECG lead system, typical set up for ECG, electrodes used for ECG, Phonocardiograph: heart sounds and heart murmurs, microphones used in Phonocardiograph (PCG), recording set up of PCG, Blood pressure measurement techniques: direct and indirect methods, relationship between ECG, PCG and Blood pressure as a function of time.

**Unit III** **[06 Hours]**

**Cardiac and Respiratory Equipments**

Types of defibrillator, defibrillator electrodes, types of pacemaker, pacemaker leads and batteries, ventilator and Modes of ventilator.

**Unit IV** **[06 Hours]**

**ICU and NICU-Architecture and monitoring systems**

Architecture of ICU and NICU, patient monitoring system, central monitoring system, ambulatory monitoring system, Baby incubator and Phototherapy unit

**Unit V** **[06 Hours]**

**Clinical Laboratory Instruments**

Colorimeter, spectrophotometer, flame-photometer, blood cell counter, auto analyzer and pH/blood gas monitoring.

## Unit VI

[06 Hours]

### Physiotherapy & surgical diathermy instruments and Patient Safety

Short wave diathermy machine, microwave diathermy machine, surgical diathermy unit, types of electrodes used for electro-surgery, Patient safety: grounding, shielding and effect of electrical current on human body.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Experiments:**

1. Study of Blood Pressure measuring techniques (Analog & Digital).
2. Study of ECG waveform & Heart Rate measurement using ECG system.
3. Study of Phonocardiograph.
4. Detection of Apnea and Tachypnea using respiration rate monitor and Respiration Simulator.
5. Study of DC Defibrillator.
6. Study of External Pacemaker.
7. Study of Spectrophotometer.
8. Study of Surgical Diathermy Unit.

**List of Assignments:**

1. State in your own words; Human body systems and their functions.
2. Choose any two Bio-potentials and state the vital role with the help of diagrammatic representation.
3. Differentiate between heart sounds and heart murmurs. Where and why they originate?
4. Association between ECG and B. P as a function of time.
5. Elaborate concepts of cardiac equipments.
6. Importance of Ventilator as a life supporting instrument.

7. Sketch ICU and NICU Architecture. Categorize and locate ICU and NICU equipments and their significance.
8. Describe central monitoring system for 8 bedded ICU.
9. Categorize blood tests and give importance of various clinical laboratory equipments.
10. By applying acquired knowledge select appropriate physiotherapy equipment for pain relief and explain.
11. Identify the equipment used for surgery in O.T. and describe.
12. Visit to the hospital/industry to understand the concepts of biomedical instruments.

#### **Text Books**

1. R. S. Khandpur, "Hand book of Biomedical Instrumentation", Tata McGraw Hill Publishing Company limited, New Delhi.
2. Leslie Cromwell, Fred J. Weibel, Erich A. Pfeiffer, "Biomedical Instrumentation and Measurements", Second Edition, PHI.

#### **Reference Books:**

1. Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Forth Edition, PHI.
2. John G. Webster, "Medical Instrumentation- Application and Design", Third Edition, John Wiely and Sons Inc., New York.
3. Richard Aston, "Principles of Biomedical Instrumentation and Measurement", Merrill Macmillan Publishing Company, New York.
4. Dr. M. Arumugam, "Biomedical Instrumentation", Anuradha Agencies.

#### **Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VIII**

**Subject: - Wireless Networks**

**Teaching Scheme**

**Lecture: 03Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**Credits: 04**

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**Course Prerequisites:**

Digital Communication

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**Course Objectives:**

1. To familiarize the students with fundamentals of wireless communication systems
2. To introduce the concepts and techniques associated with Wireless Cellular Communication systems.
3. To familiarize with state of art standards used in wireless cellular systems.
4. To introduce new technologies in wireless systems

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the types of wireless communication systems.
2. Analyze the radio channel characteristics.
3. Analyze improved data services in cellular communication.
4. Work with GSM/CDMA/UWB technologies.

**Contents:**

**Unit I**

**Introduction**

**[06 Hours]**

Wireless network generations, evolution of next-generation networks, Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

## **Unit II**

### **Cellular Communications**

[06 Hours]

Introduction to Cellular Communications, cellular terminology, cell structure and cluster, Frequency reuse, Multiple Access Technologies, Cellular Processes-Call Setup, Handover etc, Teletraffic Theory, Capacity Building, Blocking Probability

## **Unit III**

### **GSM**

[06 Hours]

GSM: Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi- frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber.

## **Unit IV**

### **CDMA**

[06 Hours]

Introduction to CDMA, Spread spectrum, CDMA call processing, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization, power control in CDMA.

## **Unit V**

### **3G and 4G Wireless Standards/UWB**

[06 Hours]

GPRS, EDGE technology, IMT-2000 standards, UMTS technology, WCDMA, LTE, 4G Technologies, Multicarrier Modulation, OFDM-MIMO Systems, WiMAX, UWB Definition and Features, UWB Wireless Channels, Bit-Error Rate Performance of UWB.

## **Unit VI**

### **Emerging Wireless Network Technologies**

[06 Hours]



WLAN technology, HIPERLAN, WPAN, WMAN, Mobile Ad-hoc network(MANET), Mobile IP and mobility management, Mobile TCP, Wireless sensor networks, RFID technology, WATM, Wireless application protocol, Home RF.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Tutorials/Experiments:**

1. Comparison of different wireless network generations.
2. Study of design principles of propagation models of cellular system.
3. Analyze the concept of frequency reuse, interference and multipath effects.
4. Study of design principles of cellular structure.
5. Study of multiple access technologies.
6. Analyze different methods of capacity expansion in cellular system.
7. Study of GSM architecture, channels and call setup procedure.
8. Study of CDMA calls processing.
9. Study of LTE & 4G network design issues.
10. Study of HIPERLAN standards & MANET.
11. Study of wireless sensor networks and WATM.
12. Study of WAP standards & Home RF.

**List of Assignments:**

1. Visit mobile station/telephone switching & prepare visit report.
2. To carry out AT commands mobile communication using GSM trainer.
3. To understand CDMA trainer using DSSS technology.
4. Analyze Radio Propagation and Propagation Path Loss Models on Scilab.
5. Analyze principles of cellular communication on Scilab (Refer Wireless Communications by T. L. Singal).
6. Analyze capacity of CDMA, calculate processing gain, number of users per cell, bandwidth efficiency, open loop power control in CDMA on Scilab. (Refer Scilab

Textbook Companion for Wireless Communications and Networking by V. Garg)

7. Prepare Ad-hoc network at your premises using mobile terminals/ laptops etc and analyze parameters like capacity, flexibility, complexity etc.
8. Comparison of HIPERLAN, WATM .
9. Understand about Wi-Fi network and its' different standards, protocols and requirements for connecting a Wi-Fi network on Virtual LAB. (Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
10. Simulating WiMAX network on Virtual LAB.(Refer VLAB IIT Kharagpur, Advanced network Technologies Lab)
11. Study the basics of Mobile and Adhoc network, various standards and different routing protocols including proactive and reactive on virtual lab.
12. Analyze Wireless Sensor Network Data Acquisition, Transmission, and Aggregation on virtual lab.

**Text Books:**

1. T L Singal, Wireless Communications, McGraw Hill Education India, 2014.
2. Kaveh Pahlavan, Prashant Krishnamurthy, Principles of Wireless Networks, Pearson Education Publication.

**Reference Books:**

1. William C.Y. Lee, Mobile Cellular Telecommunications- Analog & Digital Systems, Mc.Graw Hill, 1995
2. Wireless Communications (principles and practices) -(2nd Edition)-Theodore S. Rappaport (Prentice Hall of India).
3. Vijay Garg, Wireless Communication & Networking, Morgan Kaufmann Series

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VIII**

**SUBJECT: - Elective II Agricultural Electronics**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1Hours/Week**

**Examination Scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 marks**

**Credits: 04**

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**Course Prerequisites:**

Basic Electronics, Instrumentation & control systems.

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**Course Objectives:**

1. To inculcate the ability to recognize environmental problems and to provide solutions to agricultural sector.
  2. To give overview of technology of advanced topics like DAS, SCADA and Virtual Instrumentation.
  3. To enable students to select practices needed to develop and implement the Engineering Automation for Agricultural sector.
  4. To introduce Greenhouse Technology & Role of Electronics Governance.
- 

**Course Outcomes:** After successfully completing the course students will be able to

1. Describe the role of computers & virtual instrumentation.
2. Provide communication solution for interpreting environmental parameters with Electronics systems.
3. Describe Instrument technology used in agriculture & apply knowledge of Electronics in Agriculture.

#### 4. Describe Greenhouse Technology & Role of Electronics Governance

### Contents

#### Unit I

##### **Review of computers & Virtual instrumentation [06Hours]**

Data loggers, Data acquisitions systems (DAS), Supervisory control and data acquisition (SCADA), Basics of PLC, Functional block diagram of computer control system, alarms, interrupts. Virtual Instrumentation: Historical Perspective, advantages, Block diagram and architecture of virtual instrument, data flow techniques, graphical programming in data flow, comparison with conventional programming.

#### Unit II

##### **Communication Systems [06Hours]**

Use of field buses, functions, international standards, field bus advantages and disadvantages, Instrumentation network: sensor networks, Open networks-advantages and limitations, HART Network, Foundation field bus network. Profibus PA: Basics, architecture, model, network design. Foundation field bus segments: General consideration, network design

#### Unit III

##### **Instrument technology for agriculture [06Hours]**

Instrument for measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil moisture & temperature.

#### Unit IV

##### **Precision Farming [06Hours]**

An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming.

#### Unit V

##### **Electronics in Agriculture [06Hours]**

Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage.

## Unit VI

### Applications & Electronics Governance

[06Hours]

Greenhouse: History of modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse. Crop Preservation : Importance of Preservation of various commodities and parts of plants, Drying process for preservation, Variable identification for drying process, Electronic control system for grape drying process. Agriculture & Electronics Governance: Governance products & services in agriculture sector, Role of Electronics Governance in Agricultural sector.

**Content Delivery Methods:** Chalk & talk, Power point presentation NPTEL videos.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Tutorials/Experiments**

1. Case study of PLC for irrigation system.
2. Case study of Latest irrigation system.
3. Study of Profibus protocol for networking.
4. Role of GIS/GPS positioning system for precision farming.
5. Study of Computers and Geographic information systems for precision farming.
6. Concept of crop preservation.

**List of Assignments:**

1. Study of Data Acquisition Systems (DAS).
2. Study of Data logger.
3. Study of basics of PLC and applications in Agriculture electronics.
4. Study of Communication systems used in Agriculture electronics.
5. Study of Transducers and control systems.
6. Study of electronics systems for PH, gas, humidity, conductivity and temperature measurement.
7. Study of selective crop spraying, flow control, yield monitoring, green house environment control.
8. Study of Electronics Governance in Agricultural sector.
9. Describe GIS/GPS positioning system for precision farming.
10. Describe advantages and disadvantages of field bus and Open networks.
11. Write a note on HART Network.
12. Write a note on Greenhouse.

### **Text Books**

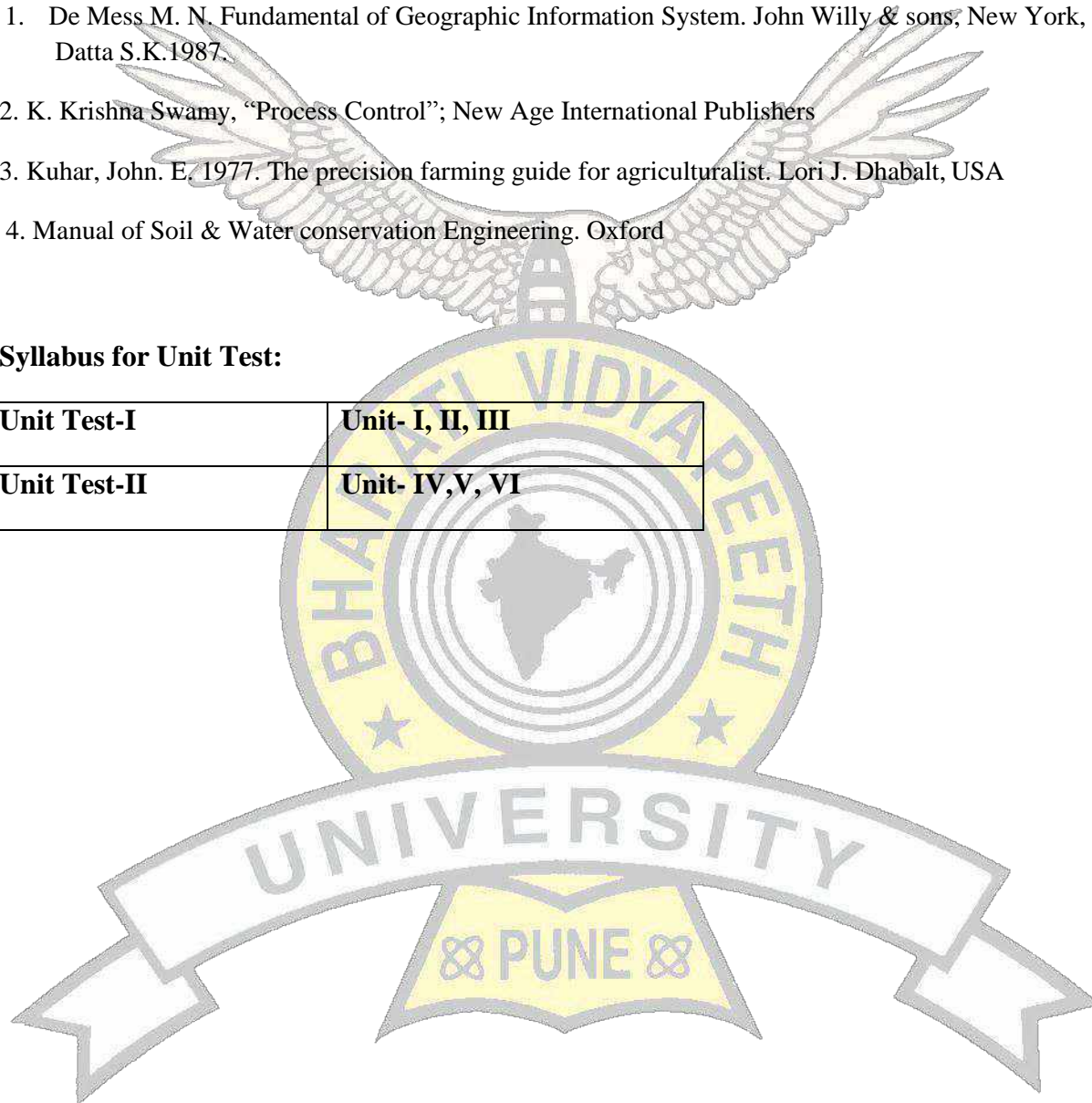
1. Curtis Johnson, “Process Control Instrumentation Technology”; 8th Edition, Pearson Education
2. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication

### **Reference Books**

1. De Mess M. N. Fundamental of Geographic Information System. John Willy & sons, New York, Datta S.K.1987.
2. K. Krishna Swamy, “Process Control”; New Age International Publishers
3. Kuhar, John. E. 1977. The precision farming guide for agriculturalist. Lori J. Dhabalt, USA
4. Manual of Soil & Water conservation Engineering. Oxford

### **Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>





**Class: B.Tech (Electronics) SEM: -VIII**  
**SUBJECT: - Elective-II System on Chip**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 4**

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**Course Prerequisites:** Digital Electronics, VLSI Design

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**Course objective:**

- 1) To make students familiar with fundamentals of SOC design methodology.
- 2) To categorize requirements of SOC design.
- 3) To recognize essentials of SOC design.
- 4) To comprehend applications of SOC.

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**Course Outcomes:** On successful completion of this course, students will be able to

- 1) Conceptualize SOC design methodology
- 2) Understand SOC design flow
- 3) Design complex SOC
- 4) Intellectualize future trends in SOC design

**UNIT-I**

**SOC Design Methodology**

**(06 Hours)**

The age of Megagate SOC's, The fundamental trends of SOC design, An improved design methodology for SOC design.

**UNIT -II**

**SOC Design**

**(06 Hours)**

Hardware System Structure, Software trends, Current SOC Design Flow, Six Major Issues in SOC Design.

### **UNIT -III**

#### **SOC Architecture (06 Hours)**

The basics of Processor-Centric SOC architecture, Accelerating Processors for Traditional Software Tasks, System Design with Multiple Processors, New Essentials of SOC Design Methodology

### **UNIT -IV**

#### **System-Level Design of Complex SOCs (06 Hours)**

Complex SOC System Architecture Opportunities, Major Decisions in Processor-Centric SOC Organization, Communication Design = Software Mode + Hardware Interconnect, Hardware Interconnect Mechanisms, The SOC Design Flow

### **UNIT -V**

#### **Advanced Topics in SOC Design (06 Hours)**

Pipelining for Processor Performance, Inside Processor Pipeline Stalls, Optimizing Processors to Match Hardware, Multiple Processor Debug and Trace, Issues in Memory Systems

### **UNIT -VI**

#### **Scope of SOC (06 Hours)**

The designer's dilemma in SOC design, The SOC design transition, future of SOC design, Future applications of complex SOC.

#### **List of Tutorials/Experiments:**

- 1) Study of SOC Components
- 2) Study of Integration Technology in SOC with standard CMOS process.
- 3) Study of Technology challenges in SOC design.
- 4) Study of SOC design requirements
- 5) Study of SOC architecture
- 6) Study of SOC test methodology
- 7) Application of SOC in Communication
- 8) Application of SOC in Computer
- 9) Application of SOC in Consumer
- 10) Case study: Complex SOC

#### **List of Assignments:**

- 1) What are the challenges in SOC design? Describe in brief.
- 2) List various design elements, tools and methodologies playing an important role in SOC Design.
- 3) Using diagram, explain SOC design flow.



- 4) Which are the important issues in SOC design? Explain in detail.
- 5) Discuss the basics of processor -centric SOC design.
- 6) Write essentials of SOC design methodology.
- 7) Define complex SOC system architecture opportunities.
- 8) Explain major decisions in processor-centric SOC organizations.
- 9) Discuss pipelining and exceptions.
- 10) Explain issues in memory system.
- 11) Describe designer's dilemma wrt SOC.
- 12) List future applications of complex SOC.

**Content Delivery Methods:** Chalk & talk, Power point presentation NPTEL videos.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**Text book:**

1. Chris Rowen, Engineering the Complex SOC, Prentice Hall, 2004.

**Reference books:**

1. Rainer Leupers, Olivier Temam, Processor and System-on-Chip Simulation, Springer, 2010
2. Michael J. Flynn, Wayne Luk, Computer System Design System on Chip, Wiley, 2011
3. Bashir M. Al-Hashimi, System-on-Chip: Next Generation Electronics, IET, 2006
4. Steve Furber, ARM System on Chip Architecture, Pearson India, 2000
5. Wayne Wolf, Ahmed Amine Jerraya, Multiprocessor Systems-on-Chips, Elsevier, 2005
6. SudeepPasricha and NikilDutt, On-Chip Communication Architectures System on Chip
7. Interconnect, Elsevier, 2008



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem: - VIII**

**SUBJECT: - Elective-II Speech Processing**

**Teaching scheme**

**Lecture: 3 Hours/Week**

**Tutorial: 1 Hour/Week**

**Examination scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW& Oral: 50 Marks**

**Credits 04**

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**Course Prerequisite:**

Engineering Mathematics-III, Signals and Systems, Digital Signal processing

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**Course Objective:**

1. To introduce acoustic theory and time domain models for speech processing.
  2. To give overview of sampling, quantization and different modulation techniques.
  3. To enable students to apply STFT analysis and speech synthesis
  4. To introduce linear predictive coding as well as different techniques to enhance speech quality
- 

**Course Outcomes:** At the end of the course, a student will be able to

1. Describe the mechanisms of human speech production and articulation mode of different classes of speech sounds determine their acoustic characteristics.
2. Represent the speech signal in time domain and frequency domain.
3. Describe and implement methods & systems for efficient quantization and coding of speech signals.
4. Analyze and synthesize speech using different methods.

5. Distinguish between different speech recognition modes.

## Contents

### Unit I [06 Hours]

#### Speech Production and Hearing

Anatomy & physiology of speech organs, articulatory, acoustic phonetics, acoustic theory of speech production, prosody, Anatomy & physiology of ear, sound perception, speech perception, vowel perception, consonant perception.

### Unit II [06 Hours]

#### Speech Analysis

Short time speech analysis, time domain parameters, frequency domain parameters, LPC analysis, cepstral analysis, pitches estimation.

### Unit III [06 Hours]

#### Coding of Speech Signals

Quantization, redundancies, Time domain, waveform coding Linear delta modulation, Adaptive delta modulation, adaptive differential pulse code modulation, Linear prediction based vocoders, phase vocoders channel vocoders and cepstral vocoders.

### Unit IV [06 Hours]

#### Speech Synthesis

Principles of speech synthesis, synthesis methods, text to speech synthesis, Synthesis by rule, applications.

### Unit V [06 Hours]

#### Speech Enhancement

Introduction, nature of interfering sounds speech enhancement techniques spectral subtraction & filtering, harmonic filtering, spectral subtraction, Adaptive noise cancellation.

### Unit VI [06 Hours]

#### Automatic Speech Recognition

Parametric representation of speech, evaluation of similarity of speech patterns, various modes of speech recognition like MFCC, DTW, HMM Application.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

#### List Tutorials/Experiments:

1. To study spectral analysis of a noisy signal using MATLAB.
2. To obtain LPC coefficients.

3. To study the spectrogram of an audio signal using MATLAB.
4. To study VQ for speech.
5. To perform text to speech synthesis using MATLAB.
6. Estimation of fundamental frequency using Cepstrum.
7. To find Cepstral pitch period using method of autocorrelation.
8. To plot Welch power spectral density estimates for vowels 'a' 'e'.
9. To find Cepstral coefficients of voiced signal.
10. Speech classification on basis of frequency.

### **List of Assignments:**

1. List out different speech processing applications.
2. Implement a Non-stationary nature of speech signal using Virtual laboratory.
3. Write a MATLAB program to find the envelope of the sound for the flute (Bansuri).
4. Describe any two speech recognition models.
5. Discuss different speech features like LPC, Cepstrum, MFCC, and Pitch.
6. Classify the different coders on the basis of waveform, parametric & transform domain coding of speech.
7. List out different applications of speech synthesis.
8. Different classifiers used in speech recognition.
9. Mention a real time application of speech technology.
10. Describe different types of software's used for speech processing.
11. Discuss different speech enhancement techniques.
12. Classify the different Audio File formats.

### **Text Books**

1. Doulgas O Shaughnessy "Speech Communication". Human and Machines Second Edition University Press.
2. Dr.Shaila D. Apte "Speech and Audio Processing," Wiley.

### **References**

1. Lawrence Rabiner & Biing-Hwang Juang "Fundamentals of Speech Recognition Englewood Cliffs NJ:" PTR Prentice Hall (Signal Processing Series), c1993, ISBN 0-13-015157-2
2. L.R. Rabiner and R.W. Schafer "Digital Processing of Speech Signals" Prentice Hall.

3. Sadoaki Furui. “Digital Speech Processing: Synthesis and Recognition” CRC Press.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics) Sem:-VIII**

**Subject: - Elective-II Fuzzy Logic & Neural Network**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

Engineering Mathematics-II, Engineering Mathematics-III, Signals & Systems.

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**Course Objectives:**

1. Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
  2. Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
  3. To create awareness of the application areas of neural network technique
  4. Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Design fuzzy system for Electronics applications.
2. Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations and Fuzzy Logic Controller.
3. Describe the various architectures of building an ANN and its applications.
4. Design and implement neural network systems to solve real-world problems

5. Develop models for different applications using fuzzy system.

**Contents:**

**Unit I**

**Fuzzy Logic -I**

**[05 Hours]**

Concept of Fuzzy number, fuzzy set theory (continuous, discrete), Operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm, T-conorm), Fuzzy if-then rules.

**Unit II**

**Fuzzy Logic -II**

**[07 Hours]**

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

**Unit III**

**Fuzzy Control Systems**

**[06 Hours]**

Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem, washing machine and vacuum cleaner.

**Unit IV**

**Artificial Neural Network -I**

**[05 Hours]**

Biological neuron, Artificial neuron model, concept of bias and threshold, Mc Culloch-Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy, gradient descent algorithm and application of linear neuron for linear regression, Activation functions : binary, bipolar (linear, signum, log sigmoid, tan-sigmoid) Learning mechanisms: Hebbian, Delta Rule or Perceptron and its limitations  
Draft.

## **Unit V**

### **Artificial Neural Network -II**

**[07 Hours]**

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions (Gaussian, Multiquadrics, Inverse multi quadrics), Application of RBFN for classification and regression, Hopfield network, associative memories.

## **Unit VI**

### **Adaptive Neuro-Fuzzy Inference Systems (ANFIS)**

**[06 Hours]**

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

#### **List of Tutorials/Experiments:**

1. Study of Fuzzy sets and operations.
2. Study of concepts of fuzzy sets core, support, alpha cuts..
3. Study of fuzzy relation, Max-min composition.
4. Analyze t-norms and t-conorms.
5. Analyze Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model.
6. Analyze architecture of a FLC: Mamdani Type with Example Aircraft landing control problem, washing machine and vacuum cleaner.
7. Study of learning mechanisms, approaches and activation functions in ANN.
8. Study of Multilayer perceptron (MLP) and back propagation algorithm.
9. Study of Radial Basis Function networks.
10. Study of ANFIS architecture and Hybrid Learning Algorithm.



### **List of Assignments:**

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model.
3. Implement and test MLP trained with backpropagation algorithm
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Perform fuzzy sets operations.
7. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian).
8. Implement defuzzification (Max-membership principle, Centroid method, Weighted average method)
9. Implement FIS with Mamdani inferencing mechanism.
10. Implement Simulink model for Vacuum cleaner, washing machine using Fuzzy Logic tools
11. Implement Fuzzy Logic Controller.
12. Implement perceptron learning, multilayer feed forward neural networks.

### **Text Books:**

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons, 2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007

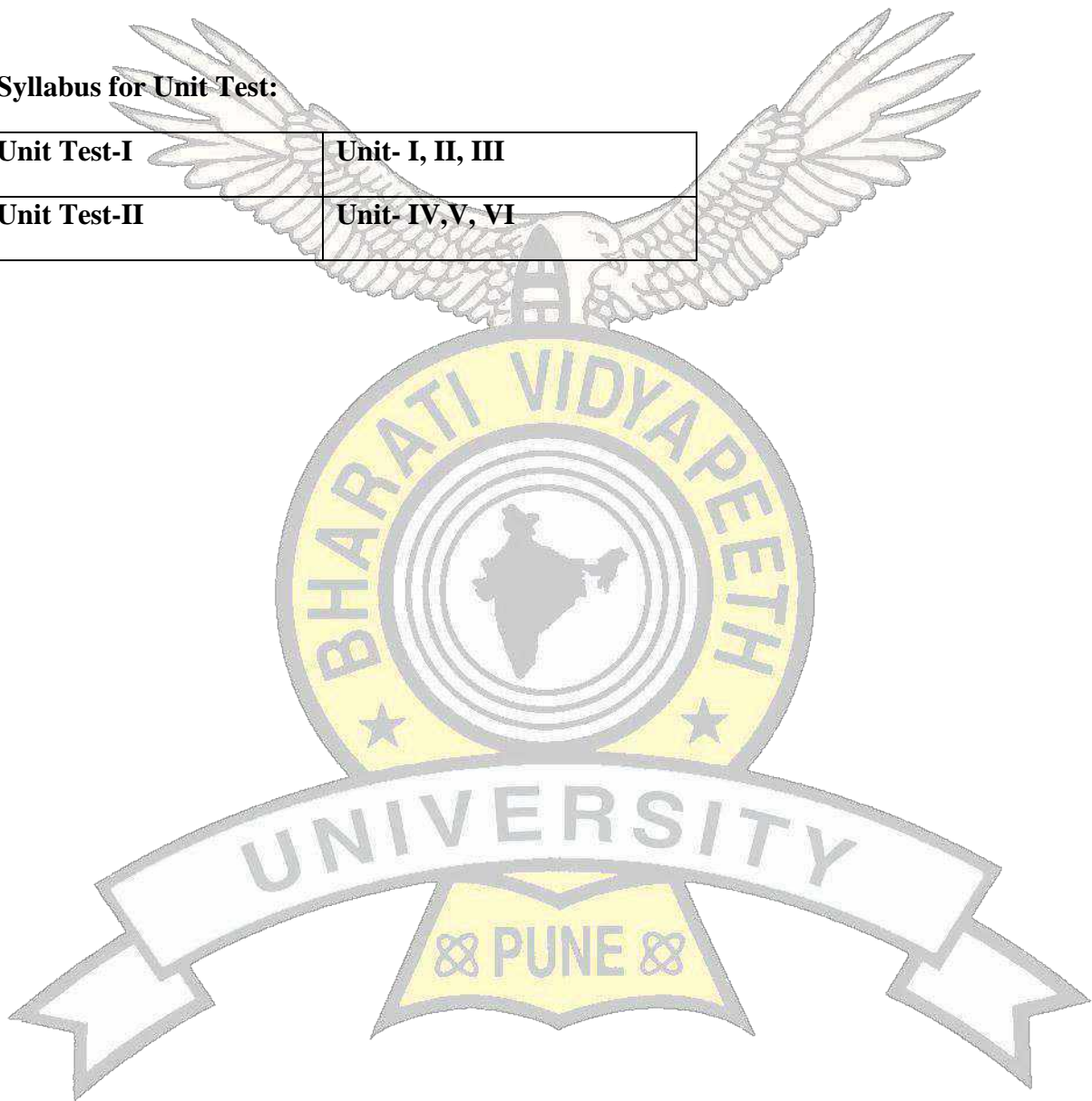
### **Reference Books:**

1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991
2. Neural Networks A comprehensive foundation,, Simon Haykin, Prentice Hall International Inc- 1999.
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda, Second Edition, 2000

5. Pattern Recognition, SergiosTheodoridis , Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B.Tech (Electronics) Sem:- VII**

**SUBJECT: - Seminar**

**Teaching Scheme**

**Practical: 02 Hours/week**

**Examination Scheme**

**TW & Oral: 50 marks**

**Total Credits: 01**

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**Course objective:**

1. To develop ability of thinking and motivation for seminar
  2. To expose the students to the state of the art
  3. To develop ability to perform literature survey
  4. To develop Seminar presentation and Technical Communication Skills
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Effectively communicate his technical idea or project
2. Learn master survey and literature survey techniques
3. Write Motivational Statement
4. Present the topic

**Seminar Documentation should include**

Cover Title page, plagiarism assessment, report Certificate from Guide, Abstract, list of Figures, List of Tables, Abstract, Presentation Slide using Microsoft power point including bibliography/references in IEEE standard format.

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned Guide and head of the department.



**Bharati Vidyapeeth Deemed University  
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**Class: B.Tech (Electronics) Sem:- VIII**

**SUBJECT: - Project stage - II**

**Teaching Scheme**

**Practical: 08 Hours/week**

**Examination Scheme**

**TW & Oral: 150 marks**

**Total Credits: 08**

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**Course prerequisites:**

Project Stage -I

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**Course objective:**

1. To familiarize the students with the product development cycle.
  2. To impart the importance of working as a team.
  3. To introduce the student to literature survey and documentation process.
  4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Implement solution for an Engineering problem.
  2. Test and troubleshoot the implemented design.
  3. Execute the project implementation & financial budget in a timely manner.
  4. Student will be able to contribute and work effectively as team member.
  5. Generate project report and present it effectively.
- 

Project Stage –II includes various steps such as:

1. System design
2. Testing
3. System documentation
4. Project report

**B. Tech. (Electronics & Telecommunication) – 2014 Course**

<b>Semester- I</b>					<b>Contact Hours: 30 Hrs/week</b>							
					<b>Total Credits: 25</b>							
					<b>Total Marks: 700</b>							
Sr. no.	Subject	Teaching Scheme(Hrs)			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
1	Engineering Mathematics-I	3	1	0	60	20	10	10	-	100	4	
2	Fundamentals of Civil Engineering	3	0	2	60	20	10	10	25	125	4	
3	Engineering Graphics	4	0	2	60	20	10	10	25	125	5	
4	Engineering Chemistry	4	0	2	60	20	10	10	25	125	5	
5	Elements of Electronics Engineering	3	0	2	60	20	10	10	25	125	4	
6	Professional Skill Development-I	2	0	0	30	0	20	0	0	50	2	
7	Workshop Technology	0	0	2	0	0	0	0	50	50	1	
	<b>Total</b>	<b>19</b>	<b>01</b>	<b>10</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>	

**Note:**

1. Sem-I & Sem-II are common to the branches (Electronics, Biomedical & E & T/C)
2. \* indicates subjects common to the branches (Electronics, Biomedical & E & T/C)
3. \*\* indicates subjects common to the branches (Electronics & E & T/C)
4. Engineering Mathematics –I, II, III are common to the branches (Electronics, Biomedical & E & T/C)
5. Internal assessment of 40 marks comprises of 20 marks average of two Unit tests,10 marks tutorials/assignments and 10 marks attendance

**B. Tech. (Electronics & Telecommunication) – 2014 Course**

Semester- II												
<b>Contact Hours: 30 Hrs/week</b>												
<b>Total Credits: 25</b>												
<b>Total Marks: 700</b>												
Subject Code	Subject	Teaching Scheme(Hrs )			Examination Scheme (Marks)						Total Marks	Total Credits
		L	T	P	End Semester Exam	Continuous Assessment			TW			
						Unit test	Tutorials / Assignments	Attendance				
8	Engineering Mathematics -II	3	1	0	60	20	10	10	-	100	4	
9	Fundamentals of Mechanical Engineering	3	0	2	60	20	10	10	25	125	4	
10	Fundamentals of Engineering Mechanics	4	0	2	60	20	10	10	25	125	5	
11	Engineering Physics	4	0	2	60	20	10	10	25	125	5	
12	Fundamentals of Electrical Engineering	3	0	2	60	20	10	10	25	125	4	
13	Professional Skill Development-II	2	0	0	30	0	20	0	0	50	2	
14	Fundamentals of Computing	0	0	2	0	0	0	0	50	50	1	
	<b>Total</b>	<b>19</b>	<b>01</b>	<b>10</b>	<b>330</b>	<b>100</b>	<b>70</b>	<b>50</b>	<b>150</b>	<b>700</b>	<b>25</b>	

## ENGINEERING MATHEMATICS-I

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

### Unit I

#### MATRICES

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

### Unit II

#### COMPLEX NUMBERS AND APPLICATIONS

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

### Unit III

#### DIFFERENTIAL CALCULUS

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

#### EXPANSION OF FUNCTIONS

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

### Unit IV

#### DIFFERENTIAL CALCULUS

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

#### INFINITE SERIES

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

### Unit V

#### PARTIAL DIFFERENTIATION AND APPLICATIONS

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

## Unit VI

### JACOBIAN

Jacobians and their applications, Chain Rule, Functional Dependence.

### MAXIMA AND MINIMA

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

### Assignments

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

### References / Text Books :

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

### Syllabus for Unit Test:

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**



## 02: Fundamentals of Civil Engineering

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>		
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits		
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks				
		Term Work: 25 Marks		01 Credit		
<b>Course Pre-requisites:</b>						
The Students should have						
1.	Concepts of units and conversions of units.					
2.	Basic knowledge of Chemistry					
3.	Basic knowledge of geography, concept of latitude and longitude.					
<b>Course Objectives:</b>						
	To make student understand the scope and application of Civil Engineering					
<b>Course Outcomes:</b>						
Students will be able to understand						
1.	Different building components and material					
2.	Classification of surveying					
3.	Levelling of the ground					
4.	Planning of building					
5.	Methods of irrigation and water supply					
6.	Different methods of transportation					
<b>UNIT - I</b>						
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>	
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.					
<b>UNIT - II</b>						
<b>UNIT - II</b>	<b>Surveying</b>				<b>(06 Hours)</b>	
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.					
<b>UNIT - III</b>						
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>				<b>(06 Hours)</b>	
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.					
<b>UNIT - IV</b>						
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>				<b>(06 Hours)</b>	
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.					

<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>	<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
<b>Reference Books:</b>		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	

<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

## ENGINEERING GRAPHICS

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

### Term work

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

### SHEETS

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes

4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

## ENGINEERING CHEMISTRY

Teaching Scheme:  
Lectures: 4Hrs/Week  
Practical: 2Hr/Week

Examination scheme:  
End Semester Examination: 60 marks  
Continuous Assessment: 40 marks

Credits Allotted:  
Theory: 04  
Practical: 01  
Term Work: 25marks

### Unit I

#### WATER

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

(08 Hours)

### Unit II

#### MATERIAL CHEMISTRY

**Crystallography** : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement** : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

(08 Hours)

### Unit III

#### FUELS

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

(08 Hours)

### Unit IV

#### CORROSION AND ITS PREVENTION

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

(08 Hours)

### Unit V

#### ELECTROCHEMISTRY

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions

Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

(08 Hours)

## Unit VI

### STEREOCHEMISTRY

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

(08 Hours)

### TERM WORK

#### Experiments

Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

#### Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

#### References / Text Books :

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

#### Syllabus for Unit Test:

Unit Test I :- Unit I,II,III

Unit Test II :- Unit IV,V,VI

**Course: ELEMENTS OF ELECTRONICS ENGINEERING**

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Lectures : 03 Hrs/week Practicals : 02 Hrs/week	End semester exam : 60 Marks Continuous Assessment : 40 Marks Term work : 25 Marks	03  01

**Course Prerequisite:**

Students have completed a course in Physics and have the knowledge of laws of Dynamics

**Course Objective:**

This course will introduce the concepts of electronic engineering . By the end of the course, student will be familiar with electronic components, semiconductor devices and their applications. The course emphasizes on Electronic devices, ICs and Digital systems.

**Course Outcomes:**

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

- 1 understand the basic semiconductor physics and semiconductor devices.
- 2 understand transport phenomenon of semiconductor devices through energy band diagrams.
3. to identify electronic components like, resistors, capacitors, inductors and to study characteristics of semiconductor devices.
4. apply the knowledge of diodes to the rectifier and filter circuits.
5. to represent numerical values in various number systems and perform number conversions between different number system and study applications of logic gates.

**Unit-I**

**(08 Hours)**

**Electron Dynamics:**

Motion of electron in electric, magnetic and combined electric and magnetic fields. Detection and focusing system of Oscilloscope tube-Television picture tube- LCD and Flat panel displays.

**Unit-II**

**(08 Hours)**

**Transport phenomenon in semiconductor:**

Mobility and conductivity - Drift and Diffusion currents – Continuity Equation – Minority carrier injection and recombination in Homogeneous semiconductor – Thermistors – Piezo Resistors – Hall Effect – Thermoelectric effect

**Unit-III**

**(08 Hours)**

**Electronic components:**

Resistors -Inductors and Capacitors and their types – Construction and characteristics of PN junction diode – Zener Diode – Tunnel diode - Bipolar junction transistors – CB,CC,CE circuits, Field Effect transistors .

**Unit-IV**

**(08 Hours)**

**Electronic Devices and Linear ICs:**

Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: FET - SCR - LED - VI characteristics – applications. Introduction to Op-Amp and Timers.



**Unit-V****(08 Hours)****Digital system:**

Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary –addition, subtraction, multiplication and division.

Logic gates: OR, AND, NOT, Exclusive-OR, NOR, NAND gates, Logic networks, Gate Standardization, Introduction to Logic Circuits –Combinational and Sequential Circuits.

**(08 Hours)****Unit-VI****Consumer Electronics:**

Basic study of various products such as radio receivers , television sets , MP3 players, video recorders , DVD players , digital cameras , microwaves , personal computers , video game consoles , telephones and mobile phones , laptops and palmtops and fax machines

**Term work: For term work assessment the students will have to perform minimum of eight practicals.**

- 1) To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.
- 2) To study CRO and different modes of operation and some application.
- 3) To plot V-I characteristics of PN junction diode.
- 4) To plot regulation characteristics of half wave rectifier with and without capacitor filter.
- 5) To plot regulation characteristics of Full wave rectifier with and without capacitor filter.
- 6) To plot input-output characteristics of CE configuration of BJT.
- 7) To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.
- 8) To realize the Boolean expression using basic gates.
- 9) To verify the De-Morgan's theorem.
- 10) To fabricate at least 5 electronics component on a PCB.

**TEXT BOOKS**

1. Mottershed Allen, Electronic Devices & Circuits, PHI
2. R. P. Jain, Modern Digital Electronics, Mc Graw Hill

**REFERENCE BOOKS**

1. Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)
2. Millman & Halkis, Electronic Devices & Circuits, PHI
3. Malvino Leach, Digital Principles & Applications, Mc Graw Hill
4. Millman & Halkis, Integrated Electronics, MGH

**Syllabus for Unit Test :**

Unit Test 1	Unit I ,II & III
Unit Test 2	Unit IV, V &VI

## **Workshop Technology**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.

## ENGINEERING MATHEMATICS-II

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment:40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

### Unit I

#### DIFFERENTIAL EQUATIONS (DE)

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

### Unit II

#### APPLICATIONS OF DIFFERENTIAL EQUATIONS

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

### Unit III

#### FOURIER SERIES

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

#### INTEGRAL CALCULUS

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

### Unit IV

#### INTEGRAL CALCULUS

Differentiation Under the Integral Sign, Error functions.

#### CURVE TRACING

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

### Unit V

#### SOLID GEOMETRY

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

## Unit VI

### MULTIPLE INTEGRALS AND THEIR APPLICATIONS

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

#### Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

#### References / Text Books :

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

#### Syllabus for Unit Test:

**Unit Test I :- Unit I, II, III**

**Unit Test II :- Unit IV, V, VI**

**FUNDAMENTALS OF MECHANICAL ENGINEERING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p><b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p><b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

### List of experiments-

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner

5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

### References-

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johnston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.



## 10: Engineering Mechanics

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

### Course Pre-requisites:

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

### Course Objectives:

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

### Course Outcomes:

**The student should be able to**

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

UNIT - I	Resultant and Equilibrium	(06 Hours)
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
UNIT - II	Truss and Friction	(06 Hours)
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
UNIT - III	Centroid and Moment of Inertia	(06 Hours)
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	

<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>		
A) The term-work shall consist of minimum <b>Five</b> experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.		
<b>Text Books:</b>		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
<b>Reference Books:</b>		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I to III	
Unit Test -2	UNIT – IV to VI	

## ENGINEERING PHYSICS

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

### UNIT – I

#### MODERN PHYSICS

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

#### NUCLEAR PHYSICS

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

### UNIT – II

#### SOLID STATE PHYSICS

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

#### SUPERCONDUCTIVITY

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

### UNIT – III

#### THERMODYNAMICS

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

#### NANOSCIENCE

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08hours)**

## UNIT-IV

### OPTICS - I

#### INTERFERENCE

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

#### DIFFRACTION

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

## UNIT-V

### OPTICS - II

#### POLARISATION

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

#### LASERS

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

## UNIT-VI

### ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

### QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

## TERM WORK

### Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Planck's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

### Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

### Unit Tests:

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

### Reference Books:

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

## 02: Fundamentals of Electrical Engineering

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>			
The Students should have			
1.	Mathematics		
2.	Physics		
<b>Course Objectives:</b>			
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.		
<b>Course Outcomes:</b>			
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems		
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks		
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries		
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer		
5.	Define basic terms of single phase and three phase ac circuits and supply systems		
6.	Know and use electrical safety rules		
<b>UNIT - I</b>	<b>Basic concepts</b>		<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems		
<b>UNIT - II</b>	<b>Network Theorems</b>		<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.		
<b>UNIT - III</b>	<b>Electrostatics</b>		<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute		

	permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

#### **Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$ ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

<b>Text Books:</b>	
1) B.L.Theraja- “A Textbook of Electrical Technology” Volume- I, S.Chand and Company Ltd.,New Delhi	
2) V. K. Mehta, - “Basic Electrical Engineering”, S. Chand and Company Ltd., New Delhi	
3) I. J. Nagrath and Kothari – “Theory and problems of Basic Electrical Engineering”, Prentice Hall of India Pvt. Ltd	
<b>Reference Books:</b>	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



## FUNDAMENTALS OF COMPUTING

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDITS</u>
Practical: 2 Hours/Week	Term Work: 50 Marks	01

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### Course Prerequisite:

Students must possess knowledge about basic fundamentals of computer and professional Microsoft office development tools.

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### Course Objective:

This course will introduce the concepts of C language software development and compiling tool. By the end of the course, student will be familiar with various fundamentals of C- language, software file system, computer graphics and its various multimedia applications.

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**Course Outcomes:** At the end of the course, a student will be able to

1. Write C programs using conditional statements and loops.
  2. Execute the logic using Arrays and strings and perform matrix operation using them.
  3. Perform logic operations using Structures & Unions and use them with pointers.
  4. Write C program for File manipulations and Dynamic memory allocation
  5. Understand the concept and application of Graphics & Multimedia.
- 

### Unit –I

(08 Hours)

**Introduction:** Computer systems, Hardware & software concepts.

Algorithm / pseudo code, flowchart, program development steps, Computer Languages: machine, symbolic, and high-level languages, Creating and running programs: Writing, editing, compiling, linking, and executing.

**Basic of C:** Structure of a C program, identifiers, basic data types and sizes. Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, assignment operators, bit-wise Operators expressions, type conversions, conditional expressions, precedence and order of evaluation, Managing input and output operations, Sample programs.

**Conditional Statements and Loops:** Decision making within a program, conditions, if statement, if-else statement, loops: while loop, do while, for loop. Nested loops, infinite loops, switch statement, sample programs

### Unit-II

(08 Hours)

#### Arrays & Strings

Arrays - concepts, declaration, definition, accessing elements, storing elements, Strings and string manipulations, 1-D arrays, 2-D arrays and character arrays, string manipulations, Multidimensional arrays , Array applications: Matrix Operations

## Unit –III

(08 Hours)

### Function & Pointers

**FUNCTIONS:** basics, parameter passing, storage classes- extern, auto, register, static, scope rules, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, Towers of Hanoi, header files, example c programs. Passing arrays & strings to functions.

**Pointers:** concepts, initialization of pointer variables, pointers and function arguments, passing by address, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays.

## Unit-IV

(08 Hours)

### Structures & Unions

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications.

## Unit-V

(08 Hours)

### Files and Dynamic Memory Allocation

Input and output – concept of a file, text files and binary files, Formatted I/o, file I/o operations, example programs.

Dynamic memory allocation, malloc, calloc, realloc ,free. Concepts of linked lists, Sample programs

## Unit-VI

(08 Hours)

### Graphics and Multimedia

**Introduction to Computer Graphics:** Overview of Computer Graphics, Computer Graphics Application, Description of graphics devices, Input Devices for Operator Interaction

**Introduction to Multimedia:**History, elements of multimedia – text, audio, video, image, animation, Multimedia applications different areas

### TEXT BOOKS

1. Programming in ANSI C – E Balagurusamy (5<sup>th</sup> Edition-TMH)
2. Computer Graphics: Principles and Practices in C – Andrea Von Dam, Steven K Fiener, F Hughes John [2<sup>nd</sup> Edition- Pearson]

### REFERENCE BOOKS

1. Let Us C- Yashwant Kanitkar
2. D. Hearn, M. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 - 7808 - 794 – 4
3. Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communication and Applications"
4. Judith Jeffcoate, " Multimedia Technique"

**Term work will consist of minimum of ten assignments based on C programming language.**

**List of Practicals**

1. a. Write a C program to take user Input and print it on the screen.  
b. Write a C program to perform addition or subtraction of two numbers.  
c. Write a C program to find whether the number is Odd or Even.
2. a. Write a C program to find out Prime numbers.  
b. Write a C program to find out Fibonacci series.
3. Write C programs to print different patterns
4. a. Write a C program to do factorial using recursion.  
b. Write a C program to find out Armstrong number.
5. Write a C program to sort the array in Ascending & Descending order.
6. Write C programs to perform operations on 2-D arrays
7. Write a C program to perform different operations on strings.
8. Use of Pointers
  - a. Write a C program to swap numbers using pointers
  - b. Write a C program to show the use of pointers in arrays.
  - c. Write a C program to use functions using pointers.
9. a. Write a C program to create student mark sheet using structures  
b. Write a C program to show the use of structure using pointers
10. Write a C program to perform different operations on Files.
11. Write a C program to create single Linked List.
- 12.** Application of Graphics and Multimedia

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electronics & Telecommunication) Sem – III (2014  
Course)**

Sr.No.	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Total Marks	Credits		
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR		Theory	TW	Total Credits
		L	P	T		Unit Test	Assignment	Attendance						
1	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	3	1	4
2	Electronic Devices and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5
3	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4
4	Digital Circuits & Applications	3	2	0	60	20	10	10	50	-	150	3	1	4
5	Network Theory	3	2	0	60	20	10	10	50	-	150	3	1	4
6	Professional Skill Development-III	4	0	0	100	--	--	--	--	-	100	4	0	4
	<b>Total</b>	<b>20</b>	<b>6</b>	<b>2</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>05</b>	<b>25</b>

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Electronics & Telecommunication) Sem – IV (2014  
Course)**

Sr. No	Name of the course	Teaching Scheme			Examination Scheme (Marks)						Credits			
		Hrs. / Week			End Semester Exam	Continuous Assessment			TW & PR	TW & OR				Total marks
		L	P	T		Unit test	Assignment	Attendance			Theory	TW	Total Credits	
7	Linear Integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
8	Applied Electronic circuits	4	2	0	60	20	10	10	50	-	150	4	1	5
9	Control System Engineering	3	2	1	60	20	10	10	-	-	100	3	2	5
10	Analog Communication System	3	2	0	60	20	10	10	-	50	150	3	1	4
11	Data Structures and Files	2	2	0	60	20	10	10	-	50	150	2	1	3
12	Professional Skill Development-IV	4	0	0	100	-	-	-	-	-	100	4	0	4
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>100</b>	<b>800</b>	<b>19</b>	<b>06</b>	<b>25</b>

**Total Credits Sem – III : 25**

**Total Credits Sem – IV : 25**

**Grant total : 50**

**B.Tech.(E&TC) Sem-III**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B. Tech (E & TC) Sem:- III**

**SUBJECT: - Engineering Mathematics-III**

**Lecture: 3 hours/week**

**Tutorial: 1 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**Course prerequisites:**

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

**Course objective:**

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

## **Contents:**

### **Unit-I**

#### **Linear Differential Equations (LDE) (08Hours)**

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

### **Unit-II**

#### **Complex Variables (08Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

### **Unit-III**

#### **Transforms (08Hours)**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

### **Unit-IV**

#### **Laplace Transform (LT) (08Hours)**

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

### **Unit -V**

#### **Vector Differential Calculus (08Hours)**

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.



## **Unit-VI**

### **Vector Integral Calculus**

**(08Hours)**

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

**Content Delivery Methods:** Chalk & talk, Power point presentation

#### **Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

#### **Assignments:**

1. Linear Differential Equations
2. Complex Variables
3. Transforms
4. Laplace Transform
5. Vector Differential Calculus
6. Vector Integral Calculus

#### **Text Books:**

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

#### **Reference Books:**

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar  
(Pune Vidyarthi Griha Prakashan, Pune).



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E & TC) Sem:- III**

**SUBJECT: - Electronic Devices and Applications  
Alternative Name  
(Electronic Devices & Applications)**

**Lecture: 4 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical.: 50 marks**

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**Course prerequisites:**

- Knowledge of EEE.

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**Course objective:**

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.

## **Contents:**

### **Unit-I**

#### **Transistor Biasing (08Hours)**

Need of biasing, DC load line analysis, operating point, Thermal runaway. Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Compensation techniques: Thermistor and diode compensation, Thermal Resistance

### **Unit-II**

#### **BJT Amplifiers (08Hours)**

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers, Application of Transistor as a Switch

### **Unit-III**

#### **Field Effect Transistor (FET) (08Hours)**

Types of FET viz. JFET, MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS, CD and CG amplifiers, Application of FET.

### **Unit-IV**

#### **MOSFETs (08Hours)**

Types of MOSFET viz. DMOSFET, EMOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters, non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction , breakdown effects and temperature effects, MOSFET biasing, MOSFET as VLSI device

### **Unit -V**

#### **Wave shaping and Multivibrator Circuits (08Hours)**

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations and transfer characteristics, Diode as a clamper, voltage multiplier circuits-voltage doubler,

tripler and quadruple configuration , Multivibrator circuits-astable and monostable multivibrator circuits using BJT

## Unit-VI

### Optoelectronics devices and PCB design

(08Hours)

Construction, V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optocoupler

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal

### List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration )and find its bandwidth
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To study Astable multivibrator using BJT
7. To study monostable multivibrator using BJT
8. To plot transfer characteristics of Optocoupler
9. To plot V-I and optical characteristics of LED and LDR
10. To plot V-I and optical characteristics of Photodiode and phototransistor
11. To design, built and test any electronic circuit based on above syllabus.

### Assignments:

1. Distinguish Biasing techniques of BJT- self bias, collector to base bias, fixed bias
2. Derive the equations for  $A_v, A_{vS}, A_c, A_{cS}, Z_i, Z_o$  for CE, CB and CC configurations of n-p-n transistor.
3. Draw the construction of JFET and explain operation of JFET in Fixed bias, Self bias and voltage divider bias.
4. Draw the construction of D-MOSFET, E-MOSFET and explain input, Output, transfer Characteristics
5. Draw the circuits for clipper, clamper, and voltage multiplier and explain their operations.

6. Design and test BJT amplifier/FET amplifier/Voltage multiplier/Multivibrators circuit on PCB
7. Visit to local Electronics Market

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

3. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
4. End term Examination

**Text Books:**

1. “Electronic Devices and Circuits” by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication
3. “Electronic Devices and Circuits “ by Millman ,Halkies,TMH publication

**Reference Books:**

4. “Electronic Devices and Circuits” by Allen Mottershed- PHI Publication
5. “Electronic Devices and Circuits” by J.B. Gupta-Katson educational series
6. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
7. “Printed Circuits Handbook “ by Clyde F. Coombs - McGraw Hill Handbooks
8. “Microelectronic Circuits Theory and applications “by Adel S. Sedra , Kenneth C. Smith- Oxford



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E&TC) Sem:- III**

**SUBJECT: - Signals and Systems**

**Lecture: 3 Hrs/week**

**Tutorial: 01 Hrs/Week**

**Theory: 60 marks**

**Unit Test: 20 Marks**

**Attendance: 10Marks**

**Assignments: 10Marks**

**TW & Oral: 50Marks**

**Course prerequisites:**

Knowledge of Engineering Mathematics-I, Engineering Mathematics-II and Engineering Mathematics-III course.

**Course objective:**

The course aims to introduce the basic concepts of signals and systems analysis and their tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Characterize and analyze the properties of signals.
2. Classify the systems and analyze in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

**Contents:**

**Unit-I**

**Introduction to signals**

**(06 Hours)**

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

## **Unit-II**

### **Classification of Discrete time systems (06 Hours)**

Definition, Classification of System, System Interconnections, state space analysis, Linear & non-linear, Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

## **Unit-III**

### **Continuous Time system Analysis: (06 Hours)**

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, application of Fourier series & Fourier transforms to the system analysis.

## **Unit-IV**

### **Laplace Transform and Applications (06 Hours)**

Laplace Transform: Definition and its properties, ROC and pole zero concept. Application of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

## **Unit-V**

### **Z-Transform and Applications (06 Hours)**

Z-Transform: Definition and its properties, The Region of Convergence for the Z-Transform, the Inverse z-Transform, Application of Z-Transform to the LTI system analysis

## **Unit VI:**

### **Correlation and Spectral Density (06 Hours)**

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation,

energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

**Assignments:**

1. Classify and explain any 5 signals that occur physical world.
2. Explain LTI system by giving a real world example.
3. Find the Fourier Transform using MATLAB.
4. Find the Laplace Transform using MATLAB.
5. Find the Z-Transform using MATLAB.
6. Find the autocorrelation of sine sequence  $x[n]$  with frequency 50Hz and sampling frequency 200Hz, using MATLAB. If the given signal  $x[n]$  is affected by noise signal  $z[n]$ , such that  $y[n] = x[n] + z[n]$ , find the cross correlation between  $x[n]$  and  $y[n]$ , using MATLAB.

**Content Delivery Methods:** Chalk & talk, Power point presentation, MATLAB

**Assessment Methods:**

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. Roberts M. J., Signals & Systems, TMH
2. Oppenheim, Wilsely & Nawab, Signals & Systems, MGH

**Reference Books:**

1. B.P.Lathi, Signal Processing & Linear Systems, Berkeley Cambridge, 1998 Edition





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E & TC) SEM: - III  
SUBJECT: - Digital Circuits and Applications**

**Lecture: 3 Hours/Week**

**Practical: 2 Hours/Week**

**Theory: 60 marks**

**Unit Test: 20 Marks**

**Attendance: 10Marks**

**Assignments: 10Marks**

**TW& Practical: 50 Marks**

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**Course Prerequisite:**

1. Fundamentals of Number Systems.

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**Course Objective:**

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, demultiplexers, encoder, decoder and arithmetic circuits.

4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of FSM.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

**Contents:**

**Unit –I**

**Binary Number Systems & Coding (6 Hours)**

Review of Binary number system: Binary addition and subtraction using 1's, 2's complement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

**Principles of combinational logic**

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

**Unit-II**

**Arithmetic modules (6 Hours)**

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

**Combinational Logic modules**

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

**Unit-III**

**Logic Families (6 Hours)**

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

**Unit-IV**

**Sequential Logic systems (7 Hours)**

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization. Designing state machine using ASM charts, using state diagram, sequence detector and design examples.

#### **Unit-V**

**(5 Hours)**

##### **Application of Flip flops**

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

#### **Unit-VI**

**(6 Hours)**

##### **PLDs & Semiconductor Memories: Programmable logic devices**

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

##### **Semiconductor memories**

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

#### **List of Experiments:**

##### **Hardware Experiments:**

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. Function implementation using Multiplexer and Demultiplexer
6. Sequence generator using MSJK flip flop IC's
7. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
8. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
9. BCD Adder/Subtractor with Decoder driver and 7 segment display

##### **Software Experiments:**

Perform following experiments using Xilinx ISE simulator

1. Full Adder using half adder
2. 2 bit comparator

**Assignments:**

1. Solve four examples of Boolean expressions using K-maps, Quine-McClusky method using both minterms and maxterms.
2. Design carry look Ahead adder for adding two 4-bit numbers.
3. Design sequence detector using FSM and implement using suitable flip flops.
4. Design 4-bit/ 5-bit ripple counters, synchronous counters for positive edge/negative edge triggered flip flops.
5. Study any CPLD/ FPGA board and make a report on the features of the board.
6. Study ISE of any platform( Xilinx, Quartus, Libero etc.) and make a report on working of the platform.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

**Text Books:**

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12<sup>th</sup> reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI

**Reference Books :**

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3<sup>rd</sup> edition, 4<sup>th</sup> reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics & Telecommunication  
Engineering**



**Class: B.Tech (E&TC) Sem:- III**

**SUBJECT: - Network Theory**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Practical: 50 marks**

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**Course prerequisites:**

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

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**Course objective:**

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

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**Course Outcomes:** On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.

3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.
4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

## **Contents:**

### **Unit I**

#### **Basic Circuit Analysis and Simplification Techniques (6 Hours)**

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State  
 Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

### **Unit II**

#### **Graph Theory (6 Hours)**

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive and non resistive networks, Principle of Duality

### **Unit III**

#### **Transient Analysis of Basic RC, RL, & RLC Circuits (6 Hours)**

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method and using Laplace Transform.

### **Unit IV**

#### **Resonance (6 Hours)**

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel

resonant circuits, Applications of resonant circuits, Analysis of some circuits in communication electronics.

## **Unit V**

### **Passive Filters**

**(6 Hours)**

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters, Applications of passive filters.

## **Unit VI**

### **Two Port Networks**

**(6 Hours)**

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions, Analysis of some circuits using two port network parameter theory.

### **Assignments:**

- i. Determine the currents, voltages and power absorbed in the given branches in any given network by applying mesh and node analysis.
- ii. Determine the currents, voltages and power absorbed in the given branches in any given network using the concepts of graph theory.
- iii. Carry out transient analysis and determine the voltage and current expressions for a given network containing R, L and C with non zero initial conditions.
- iv. Search for circuits which involve series and parallel resonant circuits in the literature on communication electronics and perform resonant circuit analysis.
- v. Design a passive LC filter circuit for use in a DC power supply.
- vi. Search for circuits involving electronic devices where theory of two port network parameters can be applied and carry out the analysis.

### **List of Experiments:**

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.

6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

**References Books:**

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E& TC) Sem:- III**

**SUBJECT: - Energy Studies**

**Lecture: 3 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

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**Course prerequisites:**

- Basic knowledge of types of sources.
- Basic knowledge of consumption, energy conservation & economic development

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**Course objective:**

This course provides in depth knowledge of energy sector and role of energy sector in nation development.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify potential use of energy sources and justify energy conservation.
2. Evaluate global and Indian energy scenarios.
3. Evaluate energy polices framework.

**Contents:**

**Unit-I**

**Energy Sources**

**(06 hours)**

Fossil fuels, nuclear fuels, hydel, solar, wind and bio fuels in India, Energy conservation, Nuclear energy through fission and fusion processes.

**Unit-II**

**Energy Conversion**

**(06 hours)**

Energy Conversion- Energy conversion from source to utility, Solar, Nuclear, Geothermal, Tide and Wind Energies.

### **Unit-III**

#### **Global Energy Scenario**

**(06 hours)**

Role of energy in economic development and social transformation, Overall energy demand, availability and consumption, Depletion of energy resources and its impact on economy, Non proliferation of nuclear energy. International energy policies of G-8, G-20, OPEC and European Union countries.

### **Unit-IV**

#### **Indian Energy Scenario**

**(06 hours)**

Commercial and noncommercial forms of energy, Utilization pattern in the past, present and also future prediction and Sector wise energy consumption.

### **Unit-V**

#### **Energy Policy**

**(06 hours)**

Energy policy issues at global level, national level and state level, Energy conservation act 2001, Electricity act 2003, Energy pricing and its impact on global variations. Energy policies and development – Case studies on the effect of Central and State policies on the consumption and wastage of energy – Critical analysis – Need for renewable energy policies in India.

### **Unit-VI**

#### **Energy and environment**

**(06 hours)**

Green house effect – Global warming – Global scenario – Indian Environmental degradation – environmental laws– Water (prevention & control of pollution) Act 1974 – The environmental protection act 1986 – Effluent standards and ambient air quality standards – Latest development in climate change policies & CDM.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. Jose Goldenberg, Thomas Johanson, and Reddy, A.K.N., Energy for Sustainable World, Wiley Eastern, 2005.
2. Charles E. Brown, World Energy Resources, Springer Publication, New York, 2002.
3. Culp, A.W., Principles of Energy Conversion, McGraw Hill New York, 2004.

**Reference Books:**

1. Bukhhotsow, B., Energy Policy and Planning, Prentice Hall of India, New Delhi, 2003.
2. TEDDY Year Book, The Energy Research Institute (TERI), 2011.
3. International Energy Outlook, EIA Annual Publication, 2011.

**B.Tech.(E&TC) Sem-IV**



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E & TC) Sem:- IV**

**SUBJECT: - Linear Integrated Circuits**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 marks**

**Course prerequisites:**

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

**Course objective:**

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

**Contents:**

**Unit-I**

**Introduction to op-amp**

**(06 hours)**

Block diagram representation of a typical op-amp, Schematic symbol for op-amp, Definition of integrated circuits, Types of Integrated Circuits, Manufacturers, Designation for IC, IC package types, PIN identification & temp ranges, Ordering information, Characteristics of an op-amp, Internal & external offset voltage compensation, Frequency Response of an op-amp.

## **Unit-II**

### **Linear applications of op-amp**

**(06 hours)**

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

## **Unit-III**

### **Non-linear applications of op-amp**

**(06 hours)**

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

## **Unit-IV**

### **Active filters and waveform generators**

**(06 hours)**

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function generator or IC 8038. *Design and analysis of RF filters.*

## **Unit-V**

### **Timer IC 555 and PLL IC 565**

**(06 hours)**

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

*Communication applications of PLL: Locking and tracking of frequency, Co-channel and adjacent channel rejection.*

## **Unit-VI**

### **Converters**

**(06 hours)**

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

### **List of Experiments:**

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

**Assignments:**

1. Design of integrator for given frequency and its practical implementation using IC741.
2. Design of Differentiator for given frequency and its practical implementation using IC741.
3. Design of Schmitt Trigger for given frequency and its practical implementation using IC741.
4. Design of LPF and HPF for given cutoff frequency and its practical implementation using IC741.
5. Design of Astable Multivibrator for given frequency and its practical implementation using IC555.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books: References Books:**

1. Ramakant Gayakwad, Op Amp & IC's, PHI
2. D. Roy Choudhari, Liner Integrated Circuits, PHI

**References Books:**

1. K. R. Botkar, Integrated Circuits, khanna Publishers.
2. Clayton, Integrated Circuits, MGH

Note: Topics added in Unit –IV and V and shown in Italian font



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E&TC) Sem:- IV**

**SUBJECT: - Applied Electronic Circuits**

**Lecture: 4 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW &Practical.: 50**

**marks**

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**Course prerequisites:**

- Knowledge of linear circuit theory
  - Basic concept of BJT
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**Course objective:**

1. To make student understand analysis of multistage transistor amplifier.
  2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
  3. To make student understand analysis and design of voltage regulators.
  4. To make student understand the behavior of high frequency BJT amplifiers
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

**Contents:**



## **Unit-I**

### **Cascade amplifiers**

**(08hours)**

Need of Multistage amplifiers, Parameter evaluation such as  $R_i$ ,  $R_o$ ,  $A_v$ ,  $A_i$  & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

## **Unit-II**

### **Negative Feedback amplifiers**

**(08 hours)**

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

## **Unit-III**

### **Power amplifiers**

**(08 hours)**

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

## **Unit-IV**

### **Oscillators**

**(08 hours)**

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

## **Unit-V**

### **Regulators**

**(08 hours)**

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator,

shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

## **Unit-VI**

### **High frequency amplifiers**

**(08hours)**

High frequency T model. Common base short circuit current frequency response ,alpha cut-off frequency ,CE short circuit current frequency response, high frequency hybrid  $\pi$  CE model, Amplifier response taking into account source and load resistances.

#### **List of Experiments:**

1. CE two-stage amplifier with capacitive coupling
2. Voltage series and current series feedback amplifiers
3. Voltage shunt and current shunt feedback amplifiers
4. Class A,B,C power amplifiers.
5. Class B/AB push – pull/ Complementary Symmetry power amplifier.
6. Class A transformer coupled amplifier
7. RC Oscillators - phase shift and wien bridge
8. LC oscillators – Hartley, Colpitt
9. Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
10. Fix voltage regulators using IC 78XX &79XX, Adjustable voltage regulators using IC LM317

#### **Assignments:**

1. Artwork & layout preparation for any one circuit from above mentioned experiment list.
2. Simulation of the same circuit using Multisim.
3. Design & assemble simulated circuit on the Cu clad PCB.
4. Physical verification of the performance parameters for the designed PCB.
5. Presentation based on comparative analysis of the simulated results and physically verified results for the same circuit.
6. Report submission on the same kit with special components datasheets.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. “Electronic devices and circuits” by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication
2. “Electronic devices and circuits “by Millaman Halkies ,TMH publication
3. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication

**Reference Books:**

1. “Electronic Devices and Circuits “by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits “by J.B. Gupta-KATSON educational series books
3. Microelectronic Circuits Theory and applications “by Adel S. Sedra, Kenneth C. Smith- Oxford
4. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. Electronic Principles by Albert Malvino and David J Bates, 7 edition, Tata McGraw Hill
6. Basic Electronics by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E&TC) Sem:- IV**

**SUBJECT: - Control System Engineering**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Tutorial : 1 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**Course prerequisites:**

- Basic knowledge of signals.
- Basic mathematical tools like Laplace transform.
- Basic knowledge of software like MATLAB.

**Course objective:**

This course provides in depth knowledge of the various control systems. Also it introduces the stability of system, transducers, controllers etc.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify various control systems and determine the 'Transfer Function' of a system using block diagram reduction technique and signal flow graph.
2. Measure various Non-electric quantities such as displacement, temperature, angular speed, acceleration etc using suitable transducer.
3. Determine the error in various control systems.
4. Evaluate the stability of a system using Routh's Stability Criterion, root locus and different graphical methods like Bode plot and polar plot.
5. Compare various control actions such as Proportional (P), Integral (I), Derivative (D), PI, PID.

## **Unit I**

### **Introduction to Control System (06 Hours)**

Classification of Control System, control problem, Feedback and Non-feedback Systems, Transfer Function, Block diagram and signal flow graph analysis, Mathematical models of physical system- Electrical & Mechanical System.

## **Unit II**

### **Transducers (06 Hours)**

Characteristics, types of transducers, RTD, Thermocouple, Thermister, capacitive transducer, LVDT, strain gauge, flow-meters and level measuring instruments.

## **Unit III**

### **Time Domain Analysis (06 Hours)**

Time response of first order & second order system using standard test signal, steady state errors and error constants, Root locus techniques- Basic concept, rules of root locus, application of root locus techniques for control system

## **Unit IV**

### **Stability (06 Hours)**

Concept of stability, necessary conditions for stability, Hurwitz and Routh stability criteria, and stability of system modeled in state variable form, root locus techniques Effect of Poles and Zeros on the System Stability.

## **Unit V**

### **Frequency Domain Analysis (06 Hours)**

Relationship between time & frequency response, Polar plots, Bode plot, stability in frequency domain, Nyquist stability criterion.

## **Unit VI**

## **Controllers and Compensators**

**(06 Hours)**

Control actions – On/Off, P, PI, PD, PID. PLC Architecture, Introduction to Ladder Diagram, Types of Compensators, Lead, Lag, Lead-Lag Compensators

### **List of Experiments:**

1. Unit Step and Impulse response of the Transfer function using MATLAB.
2. Transient response of second order system
3. To draw Root Locus theoretically and verify it using MATLAB.
4. To draw Bode plot theoretically and verify it using MATLAB.
5. Magnitude and phase plot of Lead network.
6. Magnitude and phase plot of Lag network.
7. To Study characteristics of temperature transducer.
8. To Study characteristics of LVDT for displacement measurement.
9. Study of Strain gauge.
10. To study architecture of PLC.

**Content Delivery Methods:** Chalk & talk, Power point presentation

### **Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

### **Text Books:**

1. I.J. Nagrath, M.Gopal “Control Systems Engineering”, 5th Edition, New Age International Publication
2. Schaum’s Series book “Feed back Control Systems”.
3. Les Fenical “Control Systems”, 1st Edition, Cengage Learning India.

4. R. Anandanatarajan, P. Ramesh Babu , “Control Systems Engineering”, Scitech Publications

**Reference Books:**

1. Norman S. Nise “Control Systems Engineering”, 4th edition, Wiley edition.
2. Samarjeet Ghosh, “Control Systems Theory & Applications”, 1st edition, Pearson education.
3. S.K. Bhattacharya, “Control Systems Engineering”, 1st edition, Pearson education.
4. Hackworth, “Programmable Logic Controller”, 1st edition, Pearson education.

**Assignments:**

- Collaboration and discussion is encouraged on home works.
- The submitted MATLAB projects and all take-home quizzes must be individual work.
- Late take-home quizzes/assignments will be accepted, but will be penalized. Some homework problems for each chapter will be assigned but not graded.
- Take-home quizzes, when assigned, will generally be handed out on given date.
- Questions can be directed to the instructor during the tutorial or during office hours.
- In total, some take-home quizzes and a few MATLAB assignments will be assigned.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E&TC) SEM:- IV**

**SUBJECT: - Analog Communication System**

**Lecture: 3 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 marks**

**Course prerequisites:**

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series & transform

**Course objective:**

- 1.To introduce to student essential components of communication system and emphasize need of modulation.
- 2.To make student recognize concept of noise and its effects.
- 3.To make student understand amplitude & frequency modulation and demodulation and its mathematical background.
- 4.To make student understand working of radio receivers.

**Course Outcomes:**On successful completion of this course, students will be able to

1. Describes basic components of communication system and explains need of modulation.
2. Describes concept of noise and also recognizes its effects.
3. Describes amplitude and frequency modulation and demodulation and can do analysis in Time and frequency domain.
4. Describes components of communication receiver system.



## **Contents:**

### **Unit-I**

#### **Introduction to Communication Systems (4 Hours)**

Review of signals and systems, Frequency domain of signals, Block schematic of communication system, types of communication channels, base band signals, RF bands, Necessity of modulation.

### **Unit-II**

#### **Noise (6 Hours)**

Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.

### **Unit-III**

#### **Amplitude Modulation (8 Hours)**

Amplitude Modulation, low level and high level transmitters, Frequency spectrum of AM wave, Representation of AM, power relations in AM, Generation of AM, DSB suppressed carrier (DSBSC)-modulator, Single Side Band (SSB):-Principle, Filter method, phase shift method and third method, Independent sideband (ISB) and Vestigial Side Band (VSB) principles and transmitters, Diode detector, practical diode detector, and square law detector. Demodulation of DSBSC, Demodulation of SSBSC.

### **Unit-IV**

#### **Angle Modulation (6 Hours)**

Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis. Amplitude limiting, FM demodulators.

## **Unit-V**

### **TRF and Super Heterodyne Radio Receiver**

**(6 Hours)**

Block diagram of AM and FM Receivers, TRF receiver, Super heterodyne Receiver, Performance characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection. IF Amplifiers. Tracking, AGC, Mixers.

## **Unit -VI**

### **Pulse Analog Modulation**

**(6 Hours)**

Pulse modulation. Sampling process, Sampling Theorem for low pass and band pass signals, Nyquist criteria ,

Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM.

#### **List of Experiments (Minimum 08):**

1. Study of Amplitude Modulation and Demodulation.
2. Study of Frequency Modulation and Demodulation
3. Study of SSB Modulation & Demodulation.
4. Analysis of standard signals (square and triangular) and Modulated signals (all types of AM, FM) using spectrum analyzer.
5. Sampling And Reconstruction.
6. Study of Pulse Amplitude Modulation (PAM.)
7. Study of Pulse Width Modulation.(PWM)
8. Study of Pulse Position Modulation.(PPM)
9. Study of PAM-TDM.
10. Study of Super heterodyne (AM) Receiver.

**Assignments:**

1. Discussion is encouraged on home works of Analog Signal Transmission.
2. Design PCB of Modulation and Detection KIT.
3. SSB, DSBSC & VSB Modulation and Detection using Hardware.
4. AM, FM & Superhetrodyne Receivers.
5. PAM, PWM, PPM Modulation and Detection.
6. Visit to Radio station.

(Late take-home quizzes/assignments will be accepted, but will be penalized. )

**Content Delivery Methods:**Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:-**

1. George Kennedy 'Electronics Communication System'- IVth Edition-Tata McGraw Hill Publication.
2. B.P.Lathi 'Modern Digital and analog Communication System' Oxford University press.

**Reference Books:-**

1. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill.
2. Dennis Roddy, John Coolen.'Electronics Communications 'IVth Edition- Pearson Education



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Department of Electronics and Telecommunication**

**Class: B.Tech (E&TC) Sem:- IV**

**SUBJECT: - Data structures and Files**

**Lecture: 2 hours/week**

**Practical: 2 hours/week**

**Theory: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 marks**

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**Course prerequisites:**

- Basic Knowledge in C programming.

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**Course objective:**

This course provides in depth knowledge of the various types of data structures and various algorithms. Also it introduces the concept of linked list, stack, queues, graph and tree.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Write a program involving pointers and structures.
2. Write a program involving search and sorting techniques.
3. Write a program using linked and double linked lists.
4. Implement stacks and queues involving linked list.
5. Perform operations on a tree using linked lists.
6. Find the shortest path in a given graph.

## **Contents:**

### **Unit-I**

#### **C Programming Revision (5 Hours)**

Pointers, Arrays, Single and Multi-Dimensional arrays, Row major and Column Major, Arrays and polynomials, Structures ,Unions, Call by Value ,Call by Reference , Passing arrays ,Passing a function to function, Pointer to function ,Pointers and Structures.

### **Unit-II**

#### **Data Structure and Analysis of algorithms. (4 Hours)**

Introduction to data structure, Data representation, Abstract Data types, Primitive data types, Data structure and data types, Differences between data types. Program design. Algorithms and different approaches to designing an algorithm, Complexity, Big O notation, algorithm analysis .Recursion. Sorting Bubble sort, Selection sort, Quick sort, Merge sort, Insertion sort.

### **Unit-III**

#### **Linked Lists (4 Hours)**

Definition, operations on linked list, Reversing the links, Merging of linked lists, Sorting the linked list, Circular Linked list, Recursive operation on linked list, Doubly linked list, Linked list and Polynomials,

### **Unit-IV**

#### **Stack and Queues (3 Hours)**

Operation on stacks, Stack as an array, Stack as a linked list, Application of stack, Infix to prefix conversion, Infix to postfix conversion, Postfix to prefix conversion, Postfix to infix conversion.

Representation of Queue as an array, Queue as an linked list, Circular Queue, Priority queue

## **Unit-V**

### **Tree**

**(3 Hours)**

Binary tree, Linked and array representation of Binary tree, Binary search tree, Operation: Searching of a Node in a Binary tree, Insertion of a node in binary tree, deletion from a binary tree. Threaded binary tree, Forest. AVL trees

## **Unit-VI**

### **Graphs**

**(3 hours)**

Definition ,Adjacent vertices and Incident edges, graph representation, adjacency list, depth first search ,breadth first search, Spanning tree, Kruskal.s Algorithm, Shortest path algorithm, Dijkstra.s algorithm.

#### **List of Experiments:**

1. Program to create & manipulate database using structure.
2. Program to add two polynomial using array of structure.
3. Program to implement primitive operation on Sequential file.
4. Program to search for record from a given list of records stored in array using
  - i) Linear search
  - ii) Binary search
5. Program to sort an array of names using
  - i) Bubble sort
  - ii) Insertion sort
  - iii) Quick sort
6. (a) Program to implement following operation on singly linked list:
  - i) Create
  - ii) Delete
  - iii) Insert
  - iv) Display
  - v) Search(b) Program to add two polynomials using linked list.
7. (a) Program to implement stack using:
  - i) Array

- ii) Linked list
  - (b) Program to convert an infix expression to postfix expression & evaluate the resultant expression.
8. Program to Implement Queue using: (i) Array (ii) linked list
9. Program to create a Binary search tree & Perform following primitive operation on it:
- i) Search
  - ii) Delete
  - iii) Traversals ( inorder, pre-order, post-order -recursive)
  - iv) Non-recursive in order traversal
10. Program to create a graph using adjacency list & traverse it using BFS & DFS methods

**Assignments:\***

1. write a c program to print a 100 year calendar.
2. Write a c program to find color code of a resistor.
3. case study of following topics
  - a> Chatting Applications (WhatsApp and true Caller)
  - b> Origin of programming languages
4. library assignments: Comparison of Object oriented programming.
5. Any of the lab experiments.
6. PPT presentation by students.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

**Text Books:**

1. "Data structure using C" ISRD group, TMH.
2. "Data Structure through C", Yashwant Kanetkar, BPB Publication.

**Reference Books:**

1. "Data structure using C" AM Tanenbaum, Y Langsam and MJ Augustein, Prentice Hall India.
2. "Data structure and Algorithm Analysis in C" Weiss, Mark Allen Addison Wesley.
3. "Data structure – A Pseudocode Approach with C", Richard F Gilberg Behrouz A. Forouzan, Thomson
4. "Let us C", Yashwant Kanetkar, BPB Publication.

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme: B.Tech (Electronics & Telecommunication) Sem – V (2014 Course)**

Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Theory
	L	P	T	End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
					Unit test	Assignment	Attendance				
Sensors and Transmitters	4	2	0	60	20	10	10	50	-	150	4
Instruments & Control System	3	2	0	60	20	10	10	-	50	150	3
Communication	3	2	0	60	20	10	10	-	50	150	3
Engines & Machines	3	2	0	60	20	10	10	-	50	150	3
Genetic Engineering	3	0	1	60	20	10	10	-	-	100	4
Skill Development- V	4	0	0	100	-	-	-	-	-	100	4
<b>Total</b>	<b>20</b>	<b>8</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	<b>21</b>

**Optional Subject**

Sr. No.	Name of Course	Teaching Scheme			Examination Scheme					
		L	P	T	ESE	Continuous Assessment			Practical	
						Unit Test	Attendance	Assignment	TW PR	TW OR
	Engineering Mathematics IV	4	--	--	60	20	10	10	--	--



**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme: B.Tech (Electronics & Telecommunication) Sem – VI (2014  
Course)**

Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Theory
				End Semester Exam	Continuous Assessment			TW& PR	TW& OR		
	L	P	T		Unit test	Assignment	Attendance				
Digital Processing	4	2	0	60	20	10	10	-	50	150	4
Systems	3	2	0	60	20	10	10	-	50	150	3
	3	2	0	60	20	10	10	50	-	150	3
Theory and Antennas	3	2	0	60	20	10	10	-	25	125	3
Theory and Coding	3	0	0	60	20	10	10	-	-	100	3
Circuit Design&	0	2	0	-	-	-	-	-	25	25	0
Skill Development-	4	0	0	100	-	-	-		-	100	4
	<b>20</b>	<b>09</b>	<b>0</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>800</b>	<b>20</b>

**Credits of Sem- V: 25**

**Credits of Sem- VI: 25**

**Total Credits:50**

**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**B.Tech (E&TC) Sem- V**

**SUBJECT: - Electronic Instruments and Measurement System**

**Teaching Scheme**

**Lecture: 3 Hours/Week**

**Marks**

**Practical: 2 Hours/ Week**

**Marks**

**Marks**

**Examination Scheme**

**End Semester Exam: 60**

**Continuous Assessment: 40**

**TW & OR: 50**

**Credits: 04**

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**Course Prerequisites:**

- Fundamentals of instrumentation
- Signal conditioning units such amplifier, attenuator.

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**Course Objectives:**

- Electronic Instruments and measurements include all type of instruments which will help direct measurement of electronic, electrical, and communication parameters.
- It is also useful for virtual implementation of electronic, electrical, and communication parameters using LABVIEW software. So the subject is useful for test and measurement industries to verify quality of product.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Describe fundamentals of instrumentation and measurements.
2. Classify different electronic instruments according to its usage.
3. Analyze Universal Counter for the measurement of time, frequency, ratio and period with high frequency measurement techniques.
4. Describe various types of Oscilloscope & their functions.
5. Specify and perform communication measurements using various analyzers.

6. Specify functioning, specifications, and applications of different signal analyzing instruments.
7. Describe the operations involved in computer controlled test measurement techniques.

## **UNIT I**

### **Fundamentals Of Instrumentation And Measurements (6 Hours)**

Necessity of Electronic Measurements, Block diagram of Electronic Measurement system, Concept of static and dynamic properties of measurements, Types of errors, Voltage, current, resistance measurement using DMM, Units and Standards, Calibration, Auto zeroing, Auto ranging.

## **UNIT II**

### **Basic Instruments (6 Hours)**

Working principle, types, methods & applications of following Instruments: True RMS Meter, Vector voltmeter, Vector impedance meter, LCR-Q meter with important specifications.

## **UNIT III**

### **Frequency Generation And Measurements (6 Hours)**

Standard frequency generators, Types of frequency generators, Frequency, Ratio, Time interval, Period & Multiple Period Averaging using digital universal frequency counter, High frequency measurements and its techniques.

## **UNIT IV**

### **Oscilloscope (6 Hours)**

Overview of analog CRO, Dual/Multi-trace CRO, Various CRO probes & its applications; Digital Storage Oscilloscope, DSO Design considerations and specifications, DSO functionalities / Measurements such as FFT; Math Functions; Automatic Measurements, Curve Tracer.

## **UNIT V**

### **Communication Measurements (6 Hours)**

Basics of Communication measurements at transmitter – receiver, sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc; Network analyzer- system element, measurement accuracy, Types of network analyzers, S-parameter measurement using network analyzer, EMI measurements and suppression techniques.

## **UNIT VI**

### **Signal Analyzers And Computer Controlled Test Measurements (6 Hours)**

Harmonic and wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, Logic analyzer, Protocol analyzer, Computer controlled test measurements, Virtual measurements and its applications, IEEE 488, PCI/PCI express, buses, Introduction of Lab view software.

**List of Experiments:** (Any 8 experiments should be conducted from following list.)

1. Voltage /current Measurements using CRO and DMM.
2. Voltage /current measurement of rectifier circuit using True RMS meter.
3. Measurement of resistance, inductance, capacitance and quality factor for any RLC circuit using LCR-Q Meter
4. Frequency, Period and frequency Ratio measurements using Digital Universal Frequency Counter.
5. Measurement and analysis of digital signals using Logic Analyzer.
6. Basic usage of Spectrum Analyzer for RF spectrum generation of sin, square and triangular wave.
7. Measurement of total harmonic distortion using Distortion Factor Meter.
8. Verification of diode and transistor characteristic using Curve Tracer.
9. Digital Storage Oscilloscope Measurements for FFT analysis, capturing transients, storing and retrieving different signals, and various operations like add, subtract and math functions.
10. Measurement of S parameters of transmitter and receiver using Network analyzers.

**List of Assignments:**

1. Preparation of basic block schematic of any instrument with design considerations and their justification. (Paper design)
2. Select any sensor or transducer. Find its important specifications. Select instrument for the measurement of those important specifications. (Case Study)
3. How quality or standard of any instrument is specified? Which are the important global parameters that can affect quality of measurement? (Presentation)
4. Search and enlist various testing methodologies, instruments and their important aspects. (Case Study)
5. Design any measurement system on Multisim, LABVIEW Software. (Report with design and result)
6. Design a code in C or C++ for any kind of electronic system. (Program with outcome)

• **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

• **Assessment Methods:**

- |                          |                         |
|--------------------------|-------------------------|
| 1. Unit Test             | 2. Assignments          |
| 3. Continuous Assessment | 4. End term Examination |

**Text Books:**

1. Cooper Helfric, "Electronic Instrumentation & Measurement Techniques", Prentice Hall Publication
2. H. S. Kalsi, "Digital Instrumentation", Tata McGraw Hill

**Reference Books:**

1. Oliver Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill
2. Clyde F. Coombs "Electronic Instrumentation Handbook" McGraw Hill



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class. B. TECH (E & TC) SEM.-V**

**SUBJECT: - Digital Communication**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>
<b>Lecture: 3 Hours/week</b>	<b>End Semester Exam: 60</b>
<b>Marks</b>	
<b>Practical: 2 Hours/week</b>	<b>Continuous Assessment: 40</b>
<b>Marks</b>	
	<b>TW &amp; OR: 50</b>
<b>Marks</b>	
	<b>Credits: 04</b>

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**Course Prerequisites:**

- Basic knowledge of signals and systems.
- Basic mathematical tools like fourier series, fourier transform probability theory

**Course Objectives:**

- To understand the building blocks of digital communication system.
- To prepare mathematical background for communication signal analysis.
- To understand and analyze the signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.
- To understand concept of spread spectrum communication system.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Classify analog to digital conversion techniques in communication system.
2. Apply mathematics knowledge to solve problems based on probability theory for Random Signals.

3. Understand bandwidth utilization schemes in digital communication systems.
4. study performance of communication system in presence of noise
5. Understand different multiplexing techniques.
6. understand detection and performance analysis of digital signals

## **UNIT-I**

### **Analog To Digital Conversion**

**(6 Hours)**

Pulse Modulation-Sampling process, Quantization, Pulse Code Modulation (PCM), Companding, Noise considerations in PCM Systems-Delta modulation, linear prediction, differential pulse code modulation, Adaptive Delta Modulation, LPC Speech synthesis.

## **UNIT-II**

### **Random Processes**

**(6 Hours)**

Introduction to Random Variables, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process, noise, Narrow band noise, Representation of narrowband noise in terms of in phase & quadrature components

## **UNIT-III**

### **Line Coding And Digital Multiplexing**

**(6 Hours)**

Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra. Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers, synchronization: Bit Synchronization, Scramblers, Frame Synchronization. Inter-symbol interference, Eye Patterns, Equalization.

## **UNIT-IV**

### **Digital Carrier Modulation & Demodulation Techniques**

**(6 Hours)**

Introduction, Amplitude Shift Keying (ASK), ASK Spectrum, ASK Modulator, Coherent ASK Detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), Frequency Spectrum of FSK, FSK Transmitter, Non-coherent FSK Detector, Coherent FSK Detector, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, Coherent PSK Detection, Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, M-Ary PSK, Quadrature Amplitude Modulation (QAM); MQAM transmitters and receivers, Band Width efficiency, Carrier Recovery; Differential PSK, DPSK transmitter and receiver, Minimum Shift Keying (MSK)

## **UNIT-V**

### **Data Transmission**

**(6 Hours)**

Base band signal receiver, probability of error, the optimum filter, and white noise-the matched filter, probability of error of the matched filter, coherent reception: correlation, application of coherent reception in PSK and FSK. Correlation receiver for QPSK.

## **UNIT-VI**

### **Spread Spectrum System**

**(6 Hours)**

Spread Spectrum Modulation- Pseudo- noise sequences, a notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space Dimensionality and processing gain , Probability of error , Frequency –hop spread spectrum ,Maximum length and Gold codes,TDMA,FDMA,CDMA.

**List of experiments** (Any 8 experiments should be conducted from following list.)

1. To perform Sampling and reconstruction of signal.
2. To perform Pulse Code Modulation (PCM).
3. To observe Delta modulated signal with staircase approximation.
4. To compare Delta Modulation (DM) System and Adaptive Delta Modulation (ADM) system
5. To perform Differential Pulse Code Modulation (DPCM).
6. To draw and observe practically Different Data Formats
7. To perform Amplitude Shift Keying (ASK) modulation and demodulation.
8. To perform Binary Phase Shift Keying (BPSK) modulation and demodulation.
9. To perform Binary frequency Shift Keying (BFSK) modulation and demodulation
10. To perform Quadrature Phase Shift Keying (QPSK) modulation and demodulation.
11. MATLAB simulation of digital modulation techniques.

### **List of Assignments**

1. To solve problems on statistical parameters of random variables
2. To study Pulse digital modulation techniques
3. To draw different Line coding formats for given data
4. To study Digital carrier modulation
5. Derive Probability of error
6. To study Spread spectrum techniques



- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
  2. Unit Test
  2. Assignments
  3. Continuous Assessment
  4. End term Examination

**Text Books:**

1. Simon Haykins, “Communication Systems” John Wiley, 4th Edition, 2001
2. Taub& Schilling, “Principles of Digital Communication “Tata McGraw-Hill” 28th reprint, 2003

**Reference books**

1. John G. Proakis, “*Digital Communication*”, McGraw Hill Inc 2001.
2. Simon Haykin, “Digital Communication Systems”, John Wiley & Sons, Fourth Edition.
3. A.B Carlson, P B Crully, J C Rutledge, “Communication Systems”, Fourth Edition, McGraw Hill Publication.

**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**B.Tech (E&TC) Sem- V**

**SUBJECT: Microprocessors and Microcontrollers**

**Teaching Scheme**

**Lecture: 4 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW & PR: 50 Marks**

**Credits: 05**

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**Course Prerequisites:**

- Students should have basic knowledge of 'Digital Electronics'.
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**Course Objectives:**

- To make students familiar with the basic blocks of microprocessor and microcontroller devices in general.
- To familiarize students with architecture and features of typical Microcontrollers.
- To learn interfacing of real world input and output devices and use assembly and high level languages to interface the microcontrollers to various applications

**Course Outcomes:** On successful completion of this course, students will be able to

1. Differentiate features of microprocessors and microcontrollers.
2. Use Hardware and software tools for microcontrollers.
3. Develop interfacing of microcontrollers with real world devices.

**UNIT 1**

**Introduction To Microprocessors**

**(8 Hours)**

Evolution of Microprocessors, comparison of Microprocessor & Micro controller. Difference between RISC & CISC microcontrollers, Harvard & Von Neumann architectures. Internal architecture of 8 bit Microprocessor 8085, Overview of instruction set, Addressing modes, instruction cycle, Stack and Subroutines, interrupts.

## **UNIT 2**

### **8051 Microcontroller**

**(8 Hours)**

MCS-51 architecture, family devices & its derivatives. Ports, registers, memory organization, Overview of Instruction set, Addressing modes, Machine cycles and bus timings, timers and its modes, Interrupt structure.

.

## **UNIT 3**

### **Peripheral Interfacing With 8051**

**(8 Hours)**

Serial Communication with RS232, 8051 based system design – Address decoding data memory space Interfacing & Applications –LED, LCD, Stepper motor, DAC/ADC, Sensors, Keyboard. Programming in Embedded C.

## **UNIT 4**

### **Pic Microcontroller**

**(7**

**Hours)**

Comparison of Features of different PIC series, PIC 18F architecture, registers, memory Organization, oscillator options, BOD, power down modes and configuration bit settings, Overview of instruction set, Addressing modes.

## **UNIT 5**

### **Peripheral Interfacing With Pic-I**

**( 8 Hours)**

Port structure, interrupts & timers of PIC18F. Interfacing of PIC18F with LED, Seven segment display, LCD and Keypad. Use of timers with interrupts, PWM generation. All programs in embedded C.

## **UNIT 6**

### **Peripheral Interfacing With Pic-Ii**

**(9 Hours)**

MSSP structure, CCP and ECCP, Study of UART, SPI, I2C, ADC. Interfacing serial port, ADC, RTC with I2C and EEPROM with SPI. Motor Control using PIC. All programs in embedded C.

**List of experiments:** Any 8 of below given list.

1. Find Largest/ Smallest number in an array in 8085.
2. Multiplication/ Division of 8-bit numbers in 8085.
3. Generate BCD up/ down counter in 8051.
4. Square wave generation using timers in 8051.
5. Serial Communication using 8051.
6. LCD interfacing with 8051.
7. Stepper motor interfacing with 8051.
8. Keyboard interfacing with 8051.
9. ADC/DAC interfacing with 8051.
10. Serial Communication using PIC.
11. LCD interfacing with PIC.
12. Stepper motor interfacing with PIC.
13. Keyboard interfacing with PIC.
14. Seven segment display interfacing with PIC.

**List of Assignments:**

1. Case study of any one of the latest processors.
2. Mini project using 8051/PIC microcontroller on topics such as design of Digital Multimeter, design of DAS system, DC Motor control using PWM, Frequency counter etc.(Simulation only)

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
  3. Unit Test
  2. Assignments
  3. Continuous Assessment
  4. End term Examination

**Text Books:**

1. Mazidi, “8051 microcontroller & embedded system” 3rd Edition ,Pearson
2. Mazidi, “PIC microcontroller & embedded system” 3rd Edition ,Pearson

**Reference Books:**

1. Ajay V. Deshmukh, “Micro-controllers - Theory and Applications”, Tata McGraw Hill.
2. Kenneth J. Ayala, “The 8051 Micro-controller – Architecture, Programming & Applications”, Penram International & Thomson Asia, Second Edition.
3. John B. Peatman, “Design with PIC Micro-controllers”, Pearson Education Asia, Low Price Edition.
4. 18F xxx reference manual



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**SUBJECT: - Electromagnetic Engineering**

**Teaching Scheme**

**Lecture: 3 Hours/Week**

**Marks**

**Tutorials: 1 Hour/Week**

**Examination Scheme**

**End Semester Exam: 60**

**Continuous Assessment: 40 Marks**

**Credits: 04**

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**Course Objectives**

- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

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**Course Outcomes**

After the successful completion of the course student should be able to:

1. Apply vector calculus to static electric-magnetic fields in different engineering situations.
2. Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
3. Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.

4. Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.

5.

#### **UNIT 1**

##### **Vector Analysis (06 Hours)**

Introduction and significance of electromagnetic fields, introductory vector analysis and coordinate systems, concepts of gradient, divergence, curl,

#### **UNIT 2**

##### **Electrostatic Field (06 Hours)**

coulomb's law & electric field, field due to distributed charges, flux density, gauss's law, divergence theorem, electrostatic potential, potential gradient, electric dipole, electrostatic energy density, boundary conditions for electrostatic field.

#### **UNIT 3**

##### **Steady Magnetic Field (06 Hours)**

Biot-Savart's law, Ampere's circuital law, Stroke's Theorem, Magnetic flux density & Vector magnetic potential, Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magneto static field.

#### **UNIT 4**

##### **Time Varying Fields and Maxwell's Equations (06 Hours)**

Continuity equations for static conditions, displacement current, Faraday's law, Inconsistency of Ampere's law, Maxwell's equations, Comparison of field & circuit theory. Energy stored in Electric and magnetic field time varying fields.

#### **UNIT 5**

##### **Propagation of Electromagnetic Waves (06 Hours)**

Wave propagation in dielectric & conducting media, wave equations for sinusoidal time variations, Characteristics of plane wave in pure dielectric media and conducting media. Reflection of electromagnetic wave for normal incidence, Polarization, Pointing theorem, Skin depth, phase velocity and group velocity, Boundary conditions

#### **UNIT 6**

##### **Transmission Lines and waves theory (06 Hours)**

Types of Transmission lines, Transmission line equation, Transmission line parameters, the terminated uniform transmission line, Reflection coefficient, VSWR, group velocity, phase velocity. Smith chart and impedance matching Technique, attenuation of waves, EMI- EMC.

#### **List of Assignments:**

1. Coordinate Systems.
2. Case Study of Electromagnetic fields.

3. Application note on- Electrostatic Discharge
4. Application note on- Electromagnetic interference and Compatibility
5. Analysis of transmission lines using Smith Chart.

### **List of Tutorials**

1. Vectors & coordinate systems
2. Application of Stoke's theorem.
3. Application of Gauss's law.
4. Energy stored in capacitor.
5. Application of Poission's and Laplace's equations.
6. Applications of Ampere's law
7. Boundary conditions for electrostatic fields.
8. Boundary conditions for magnetic fields.
9. Poynting theorem and their applications.
10. Applications of Smith Chart.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**
  4. Unit Test
  2. Assignments
  3. Continuous Assessment
  4. End term Examination

### **Text Books –**

1. Matthew N. O. Sadiku, "Principles of Electromagnetics", 4<sup>th</sup> Edition, Oxford University Press.
2. John D. Kraus "Electromagnetic", McGraw Hill.

### **Reference Books:**

1. William Hye "Electromagnetic Engineering", McGraw Hill.
2. Edminister J.A, Electromagnetics, Tata McGraw-Hill.
3. R.K Shevgaonkar, Electromagnetic waves, Tata McGraw-Hill.
4. S Salivahanan & S Karthie, "electromagnetic Field Theory" Vikas Publishing House Ltd.





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class: B. TECH (E & TC) SEM-IV**

**SUBJECT: - Power Devices and Machines**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Marks**

**Practical: 2 Hours/week**

**Marks**

**Marks**

**Examination Scheme**

**End Semester Exam: 60**

**Continuous Assessment: 40**

**TW & OR: 50**

**Credits: 04**

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**Course Prerequisites:**

- Basic knowledge of electronic devices, electrical technology.
- Basic mathematical tools like Integration and Derivatives, Partial Derivatives Fourier series.

**Course Objectives:**

- To introduce to students the theory and applications of power electronics systems for high efficiency, renewable and energy saving conversion systems,
- To prepare students to know the characteristics of different power electronics switches and selection of components for different applications.
- To develop students with an understanding of the switching behavior and design of power electronics circuits such as AC-DC, AC-AC and DC-DC converters.

**Course Outcomes:**

After successfully completing the course students will be able to:

1. Explain construction, switching characteristics and justify the selection of power devices and thyristors.

2. Explain operating principle and suggest protection circuit for power devices and thyristors.
3. Explain construction and operating principle of DC machines and AC machines (1 $\phi$  and 3 $\phi$ ).
4. Learn the role of Power Electronics in utility-related applications which are becoming extremely important.
5. Understand, simulate and design single-phase and three-phase thyristors converters.

### **UNIT I:**

#### **Power Diodes And Transistors**

**(6 Hours)**

Power Diodes: Construction, Switching characteristics, Line frequency diodes.

Power BJT: Construction, Operation, Steady state characteristics, switching characteristics.

Switching limits, Break down voltages, Second breakdown, Thermal runaway.

Power MOSFET: Construction, Operation, Static characteristics, Switching characteristics, Forward and reverse bias Safe Operating Area, Parallel operation.

IGBT: Construction, Operation, Steady state characteristics, Switching characteristics, Safe operating area.

Gate drive circuits for Power BJT, MOSFET & IGBT.

### **UNIT II:**

#### **Thyristors**

**(6 Hours)**

SCR: Construction, Operation, Transistor analogy, Static characteristics, Switching characteristics. SCR ratings, Gate Characteristics, Triggering requirements, Triggering techniques, Isolation techniques.

TRIAC: Construction, Operation, Steady state characteristics, triggering modes.

GTO: Construction, Operation, Turn off mechanism, Applications.

### **UNIT III:**

#### **Power Converters – I**

**(6**

**Hours)**

Controlled Rectifiers (AC – DC converters): Concept of line & forced commutation Single phase Semi & Full converters for R & R-L loads, Effect of free-wheeling diode,

Three phase Semi & Full converters for R load.

AC – AC converters: Single phase AC voltage controller for R & R-L loads, three phase AC voltage controller for R load.

(Qualitative analysis only)

#### **UNIT IV:**

##### **Power Converters – II**

**(6 Hours)**

DC - DC converters: DC Chopper: - Working principle of step down chopper, control strategies, step down chopper for R-L load, step up chopper; SMPS.

DC- AC converters: Inverter: - Working principle of single phase, Bridge inverter for R & R-L load, three phase bridge inverter for R load, Harmonic reduction using PWM technique.

(Qualitative analysis only)

#### **UNIT V:**

##### **Introduction to Motors**

**(6 Hours)**

DC motors, AC Motors, Special Purpose Motors,

Induction Motor, Universal Motor, Stepper Motor, Servomotors etc.

(Qualitative analysis only)

#### **UNIT VI:**

##### **Industrial Applications**

**(6 Hours)**

Introduction to drives, speed control techniques, illumination and lighting control protocol, Electric Heating, Electric Welding, High Voltage DC transmission, UPS- On line and off line, LED drives, Solar PV.

**List of Experiments:** Minimum 6 experiments to be performed from the following List.

1. SCR/TRIAC/ MOSFET/IGBT Characteristics.
2. Triggering circuits and phase control circuits for SCRs/MOSFET Driver Circuits
3. Single phase FW bridge converter feeding DC motor.
4. Three Phase Converter (HW and FW Bridge)
5. Single phase AC Voltage Regulator
6. Chopper (Step up and Step down)
7. Single phase / three phase Inverter with Resistive/Induction Motor load.
8. Simulation of Converter / Chopper using MATLAB/ Lab View/ Multisim.
9. Simulation of PWM Inverter using MATLAB/ Lab View/ Multisim.

**List of Assignments:**

1. Study of 1- phase AC to DC controlled converter (half controlled and full controlled).
2. Study of 3- phase AC to DC full controlled converter.
3. Study of Thyristor based dc to dc converter (dc chopper).
4. Study of a 3- phase PWM inverter with fixed (50Hz) output frequency and study of a non-PWM type inverter with 120-degree conduction of switches.
5. MOSFET based dc to dc converter (buck, boost and buck-boost types with non-isolated output voltage.)
6. Study of an industrial type fly-back dc to dc converter with isolated and regulated output voltage.
7. Case study of the real time application of electrical systems.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- |                          |                         |
|--------------------------|-------------------------|
| 5. Unit Test             | 2. Assignments          |
| 3. Continuous Assessment | 4. End term Examination |

**Text Books:**

1. M. H. Rashid, "Power Electronics circuits devices and applications", PHI 3rd edition, 2004 edition, New Delhi.
2. M. D. Singh & K B Khanchandani, "Power Electronics", TMH, New Delhi.

**Reference Books:**

1. P.C. Sen, "Modern Power Electronics", S Chand & Co New Delhi.
2. Ned Mohan, T. Undeland & W. Robbins, "Power Electronics Converters applications and design" 2nd edition, John Willey & sons.
3. B. L. Thareja & A. K. Tahreja, "Electrical Technology" Volume 1 & 2, S.Chand Publications.
4. H. Cotton, "Electrical Technology", CBS.
5. Nagrath Kothari, "Electrical Machines", TMH.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class: B. Tech (E & TC) Sem.-VI**

**SUBJECT: - Digital Signal Processing**

**Teaching Scheme**

**Lecture: 4 Hours/week**

**Practical: 2 Hours/week**

**Marks**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Continuous Assessment: 40**

**TW & OR: 50 Marks**

**Credits: 05**

**Course Prerequisite:**

- Signals and System

**Course Objective:**

- To introduce the student to a very broad and advanced topic of Digital Signal Processing (DSP) which is one of the core subjects in the curriculum.
- To teach the student the basic concepts and tools in the field of DSP
- To enable the student to apply knowledge of Digital Signal Processing (DSP) in the fields of Signal Processing, Communication, Speech Processing, Instrumentation, Medical Electronics and research

**Course Outcomes:** After the successful completion of the course the student will be able to

1. To enumerate the advantages of DSP over processing in analog domain.
2. To be able to find Discrete Fourier Transform of a digital signal.
3. To design a Finite Impulse Response (FIR) Filter given the specifications.
4. To design a Infinite Impulse Response (IIR) Filter given the specifications.
5. To quantify the finite word length effects in the field of DSP.
6. To enumerate the features of a DSP Processor.

**UNIT 1:**

**Introduction**

**(7 Hours)**

Basic elements of DSP and its requirement, Advantages of digital over analog signal processing, z-Transform and its application to the analysis of LTI systems, Discrete

Complex exponentials and their properties, Frequency domain analysis of LTI systems, Frequency response of LTI systems, LTI systems as Frequency selective filters

#### **UNIT 2:**

##### **Discrete Fourier Transform**

**(9 Hours)**

Overview of Frequency Analysis of signals, Discrete Time Fourier Transform(DTFT), Discrete Fourier Transform as Sampled DTFT, Properties of DFT, Linear filtering methods based on DFT and IDFT, Goertzel Algorithm, Frequency analysis using DFT. FFT algorithms, Saving in computation achieved by FFT algorithm, Decimation in time and decimation in frequency FFT algorithms, Butterfly computation.

#### **UNIT 3:**

##### **FIR Filter Design**

**(9 Hours)**

Advantages and overview of FIR filters, Symmetric & Anti-symmetric FIR filters, Design of FIR filters using windows, Frequency sampling method, Equiripple optimum Chebyshev FIR filter design, Alternation theorem, Design of some special FIR filters: FIR differentiators, Hilbert Transformers and Raised Cosine Filters. FIR filter structures - Direct form, Cascade form and Frequency-Sampling structures.

#### **UNIT 4:**

##### **IIR Filter Design**

**(9 Hours)**

Advantages and overview of IIR Filters, IIR Filter design methods - Approximation of derivatives, Impulse invariance, Bilinear transformation. Limitations of the design methods, Designing of Butterworth and Chebyshev Filters, Frequency transformations in analog and digital domain, IIR filter structures - Direct form, Cascade Form, Parallel form structures and Lattice & Lattice-ladder structures

#### **UNIT 5:**

##### **Finite Word Length Effects**

**(7 Hours)**

Overview of Finite Word Length Effects, Quantization process and errors, Coefficient quantization effects, Arithmetic round-off errors, Dynamic range scaling, Limit cycles in IIR digital filters, Round-off errors in FFT algorithms, Minimizing the Finite Word Length Effects

#### **UNIT 6:**

##### **DSP Processors And Applications Of DSP**

**(7 Hours)**

Need for special purpose DSP Processors, Features of DSP Processors: Harvard and Modified Harvard Architectures, Bus structure, Addressing Modes, Processing Units, Address Generators, Single Cycle Execution. Case study of TMS320C67x DSP processor. Major applications of DSP: DTMF, Spectral Analysis, Musical Sound Processing, Transmultiplexers, Oversampling A/D and D/A converters

#### **List of Experiments**

Assignments to be carried out using software such as MATLAB

1) To plot magnitude and phase Spectra of DFT of a given sequence.

- 2) To verify properties of DFT
- 3) To implement filter using overlap add and overlap save method
- 4) To design FIR Filter for given specifications.
- 5) To design IIR Filter for given specifications.
- 6) To observe Finite Word Length Effect in any one application in DSP
- 7) To do Spectral Analysis of a real signal
- 8) To implement Dual Tone Multi Frequency signal generation and detection.
- 9) To implement an FIR Filter on a DSP Processor

### **List of Assignments**

- 1) Write down what changes were brought due to the transition from analog processing to digital processing in any one field such as telephone system or a audio playback system.
- 2) Write down the significance of the contribution by Cooley and Tookey to the field of DSP.
- 3) Justify the need of window function in the design of FIR filter by windowing method.
- 4) What are the limitations of each of the IIR Filter design method?
- 5) Compare the structures used to implement digital filters with respect to Finite word length effects.
- 6) Write down the features of any one commercially available DSP Processor.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.
- **Assessment Methods:**

6. Unit Test	2. Assignments
3. Continuous Assessment	4. End term Examination

### **Text Books**

1. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing ", PHI
2. S. K. Mitra, "Digital Signal Processing", TMH

### **Reference Books**

1. D. G. Monolakis, V. K. Ingle, 'Applied Digital Signal Processing', Cambridge University Press

2. A. V. Oppenheim, R. W. Schaffer, "Discrete Time Signal Processing ", PHI
3. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors', TMH

  
**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**SUBJECT: - Embedded Systems**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Continuous Assessment: 40 Marks**

**TW & OR: 50 Marks**

**Credits: 04**

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## **Course Prerequisites:**

Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture.

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## **Course Objectives:**

- To understand need and application of ARM Microcontroller in embedded system.
  - To study the architecture of ARM series microcontroller
  - To understand architecture and features of typical ARM7 & ARM CORTEX-M3 Microcontroller.
  - To learn interfacing of real world input and output devices
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Develop Firmware Embedded Systems.
2. Interface the advanced peripherals to microcontrollers.
3. Design embedded system with available resources.

## **UNIT 1**

### **Introduction to Embedded Systems ( 4 Hours)**

Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Characteristics of Embedded Systems, Hardware and Software components of an Embedded System, Introduction to IDEs. Major Application Areas.

## **UNIT 2**

### **Introduction to embedded programming & RTOS (8 Hours )**

Introduction to embedded data types in embedded C, addressing memory & I/O, I/O functions of embedded C. Examples on Embedded C.

RTOS: Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem.

## **UNIT 3**

**ARM7 Based Microcontroller****(8 Hours)**

Introduction to ARM processors and its versions: ARM7, ARM9 & ARM11 features, ARM7 data flow model, programmer's model, modes of Operations, Overview of Instruction set.

ARM7 Based Microcontroller LPC2148: Features, Architecture (Block Diagram and Its Description), System Control Block ( PLL and VPB divider) , Memory Map, GPIO, Pin Connect Block, timer.

**UNIT 4****Interfacing with ARM7****(6 Hours)**

Interfacing the peripherals with LPC2148: LED, LCD, GLCD, KEYPAD, GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SDCARD using SPI, on-chip DAC for waveform generation.

**UNIT 5****ARM CORTEX Processors****(6 Hours)**

Introduction to ARM CORTEX series, improvement over classical series. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

ARM-CM3 Based Microcontroller LPC1768: Features, Architecture (Block Diagram & Its Description), System Control, Clock & Power Control, GPIO and Pin Connect Block.

**UNIT 6****Interfacing with ARM CORTEX M3****(4 Hours)**

Interfacing peripherals with LPC1768: RGB LED, Seven Segment, TFT Display, MOTOR control using PWM.

**List of experiments:** Any 8 of below given experiments.

1. Interfacing LPC2148 with LCD/GLCD
2. UART Interfacing LPC2148 in embedded system (GSM/GPS)
3. Interfacing LPC2148 for internal ADC on interrupt basis
4. Interfacing SD card with LPC2148
5. Interfacing EEPROM with LPC2148 using SPI protocol
6. SRAM interfacing with LPC2148/LPC1768.
7. Interfacing LPC1768 to Seven Segment / RGB LED
8. Generation of PWM signal for motor control using LPC1768

9. Interfacing TFT display to LPC1768
10. Implementing CAN protocol using LPC1768
11. Implementing ETHERNET protocol using LPC1768.
12. Semaphore as signaling and synchronizing in ARM7.
13. Mailbox implementation for message passing in ARM7

### **List of Assignments:**

1. Case study of any one of the latest ARM processors and Power point presentation of the same in class.
2. Survey of CORTEX M3 based controllers, its features and comparison.
3. Design of Firmware Embedded system using LPC 2148 (Simulation only).
4. Design of Firmware Embedded system using LLPC1768 (Simulation only).
5. Case study of any one of the RTOS with examples.

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- |                          |                         |
|--------------------------|-------------------------|
| 7. Unit Test             | 2. Assignments          |
| 3. Continuous Assessment | 4. End term Examination |

### **Text Books:**

3. Rajkaml, “Embedded system-Architecture, Programming and Design”, TMH Publications, Edition 2003
4. Andrew Sloss, Dominic Symes, Chris Wright, “ARM System Developer’s Guide – Designing and Optimizing System Software”, ELSEVIER
5. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M”, Newness, ELSEVIER

### **Reference Books:**

5. LPC 214x User manual (UM10139):- [www.nxp.com](http://www.nxp.com).
6. LPC 17xx User manual (UM10360) :- [www.nxp.com](http://www.nxp.com)
7. ARM architecture reference manual : - [www.arm.com](http://www.arm.com)
8. Trevor Martin,"AnEngineer"s Introduction to the LPC2100 series", Hitex (UK) Ltd.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class: B. Tech (E & TC) SEM:-VI**

**SUBJECT: VLSI Design**

**Teaching Scheme**

**Lecture: 3 Hours/Week**

**Marks**

**Practical: 2 Hours/Week**

**Marks**

**Marks**

**04**

**Examination Scheme**

**End Semester Exam: 60**

**Continuous Assessment: 40**

**TW& PR: 50**

**Credits:**

**Course Prerequisite**

Analog Electronics, Digital Electronics and Semiconductor Physics

**Course objectives:**

To introduce students to VLSI Design, Fabrication and Testability techniques.

**Course Outcomes:**

- Ability to design analog and digital VLSI circuits.
- Ability to study fabrication theory and to implement stick diagrams.
- Ability to design and simulate digital circuits using VHDL.
- Ability to learn low power CMOS VLSI design.
- Ability to understand the concepts of Design for Testability.

**Unit-I**

**(06 Hours)**

**Introduction to VLSI Design**– Introduction to VLSI, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity & Locality.

**Fabrication of MOSFETs**-Introduction, Fabrication Process flow: Basic steps, C-MOS n-Well Process, Layout Design rules, Stick Diagram of NAND, NOR, Inverter

## **UNIT-II**

**(06 Hours)**

**MOS Transistor-** The Metal Oxide Semiconductor (MOS) structure, The MOS System under external bias, Operation of MOS transistor, MOSFET Current-Voltage characteristics, MOSFET scaling & small-geometry effects, MOSFET capacitances.

**MOS Inverters** – CMOS Inverter Characteristics, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

## **UNIT-III**

### **Digital VLSI Design-1**

**(06 Hours)**

VHDL Entity-Architecture Concepts, Introduction to various modeling styles of VHDL (Behavioral, Dataflow and Structural), VHDL Basic Elements (Data types, Data objects and Operator), Dataflow Modeling: Example based on dataflow modeling, When-Else and With Select Statement, Structural modeling: Concept of Component .

## **UNIT-IV**

### **Digital VLSI Design-2**

**(06 Hours)**

Behavioral modeling for digital design, If-else, Loop, Case and Wait Statements. Moore and Mealy FSM Design using VHDL, Overview of PLDs, CPLD and FPGA architecture overview, Modes of configuration.

## **UNIT- V**

### **Low – Power CMOS Logic Circuits**

**(06 Hours)**

Introduction, Overview of Power Consumption, Low Power Design through Voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits.

## **UNIT- VI**

### **Design for Testability**

**(06 Hours)**

Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable design Techniques, Scan Based and BIST Techniques

**List of experiments:**

1. Introduction to Xilinx tools and design of various Gates.
2. Dataflow Modeling -1
  - A) Design Full-adder using dataflow modeling.
  - B) Design 3x8 Decoder using dataflow modeling.
3. Dataflow Modeling-2
  - A) Design 8x3 encoder using when else statement.
  - B) Design 4x1 Multiplexer using with select statement.
4. Structural Modeling-1
  - A) Design a Half adder using Structural modeling.
  - B) Design a 4bit adder using Full adder as component.
5. Structural Modeling-2  
Design 8-bit odd parity detector using Structural Modeling. Assume 2i/p X-OR as component.
6. Behavioral Modeling-1
  - A) Implementation of Positive edge triggered D-FF.
- B) Implementation of Positive edge triggered T-FF.
7. Behavioral Modeling-2
  - A) Design a 4bit buffer register.
  - B) Design a 4bit Ring counter using wait statement.
8. FSM Design-1  
Design a BCD counter using Moore FSM
9. FSM Design-2  
Implement sequence detector 1010 using Mealy machine.
10. Layout Design-1  
Introduction to Microwind and design of Inverter.
11. Layout Design-2  
Using Microwind, Design NAND and NOR.

**List of Assignments:**

1. Any one complex Digital VLSI Design Example using VHDL
2. Presentation based on any advanced topics of VLSI Design.
3. Layout design of Ring Oscillator using Microwind

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- |                          |                         |
|--------------------------|-------------------------|
| 8. Unit Test             | 2. Assignments          |
| 3. Continuous Assessment | 4. End term Examination |

**Text Books:**

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.
2. Douglas Perry, "VHDL: Programming by Example", McGraw Hill, Fourth Edition, 2002.

**Reference Books:**

1. Neil H.E. Weste, Davir Harris, "CMOS VLSI Design: A Circuits and system perspectives", Pearson Education 3rd Edition, 2004.
2. Charles Roth, Larry Kinney, "Fundamentals of Logic Design", Cengage Learning, Seventh edition, 2014.
3. J. Bhaskar "A VHDL Primer", PHI Learning, Third Edition, 1998.
4. V. Pedroni, "Circuit Design and Simulation with VHDL", MIT Press, Second Edition, 2010

**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class: B. Tech (E & TC) SEM:-VI**

**SUBJECT: - Microwave Theory and Antennas**

**Teaching Scheme**

**Lecture: 3 Hours/Week**

**Marks**

**Practical: 2 Hours/Week**

**Marks**

**Marks**

**Examination Scheme**

**End Semester Exam: 60**

**Continuous Assessment: 40**

**TW& OR: 25**

**Credits: 04**

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**Course Prerequisites:**

Students should have basic knowledge of:

- Electromagnetic engineering

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**Course objective:**



- To develop ability to design antenna and understanding of Microwave communication.

**Course Outcomes:** On successful completion of this course, students will be able

1. To perform wave propagation on a line and Use Smith chart.
2. To understand concepts of Modes and Calculate network parameters.
3. To understand Microwave devices and use them.
4. To calculate antenna parameters.
5. To design different Antenna arrays.
6. To Design Microstrip Antenna.

## **UNIT 1**

### **Introduction and Transmission Line Theory (6 Hours)**

Applications of Microwave Engineering, A Short History of Microwave Engineering, Wave Propagation on a Transmission Line, The Lossless Line, Transmission Line Parameters, Propagation Constant, Group Velocity, Power Flow for the Lossless Coaxial Line, The Combined Impedance–Admittance Smith Chart, The Quarter-Wave Transformer, Load Matched to Line, Conjugate Matching, The Terminated Lossy Line, Single-Stub Tuning, Shunt Stubs Series Stubs, Double-Stub Tuning, Smith Chart Solution

## **UNIT 2**

### **Waveguides and Network Parameters (6 Hours)**

Concept of Mode, Characteristics of TEM, TE and TM Modes, Losses associated with microwave transmission Concept of Impedance in Microwave transmission, Coaxial Line. Rectangular Waveguide, Circular waveguide, Equivalent Voltages and currents for non-TEM lines. Network parameters for microwave Circuits, Scattering Parameters

## **UNIT 3**

### **Microwave Devices( 6 Hours)**

Microwave Passive components: Directional Coupler, Power Divider, Microwave Passive components: Magic Tee, attenuator, resonator, Microwave Active components: Diodes, Transistors, Microwave Active components: oscillators, mixers, Microwave Semiconductor Devices: Gunn Diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron, klystron Amplifier

## **UNIT 4**

### **Antenna parameters (6 Hours)**

Introduction ,Types of Antennas ,Radiation Mechanism ,Radiation Pattern ,Radiation Power Density ,Radiation Intensity ,Beam width , Directivity, Numerical Techniques, Antenna Efficiency ,Gain , Beam Efficiency , Bandwidth, Polarization ,Input Impedance , Antenna Radiation Efficiency ,Antenna Vector Effective Length and Equivalent Areas ,Maximum Directivity and Maximum Effective Area , Friis Transmission Equation and Radar Range Equation , Antenna Temperature , Far-Field Radiation

## **UNIT 5**

### **Antennas and its array (6 Hours)**

Small Dipole, Finite Length Dipole, Half-Wavelength Dipole, Cylindrical Dipole, Folded Dipole ,Loop antennas, Circular Loop of Constant Current, Two-Element Array, N-Element Linear Array: Uniform Amplitude and Spacing, N-Element Linear Array: Uniform Spacing,

Non uniform Amplitude, Circular Array , Traveling Wave Antennas, Broadband Antennas, Log-Periodic Antennas, Fractal Antennas

## **UNIT 6**

### **Microstrip and Other antennas**

**(6 Hours)**

Field Equivalence Principle: Huygens' Principle, Babinet's Principle, Microstrip Antennas , Rectangular Patch, Circular Patch, Quality Factor, Bandwidth, and Efficiency, Input Impedance, Coupling, Arrays and Feed Networks, Horn Antennas, Conical Horn, Parabolic Reflector Antennas, Smart-Antenna, Signal Propagation in Smart antennas , Mobile Ad hoc Networks, Smart-Antenna System Design.

**List of Experiments:** Any of the 8 below Experiments.

1. Frequency & Wavelength measurement of Klystron tube.
2. Determination of VSWR & reflection Coefficient
3. I-V characteristics of Gunn diode.
4. Frequency & Wavelength Measurement
5. Study of Magic tree
6. Design of Microstrip antenna using Ansys HFSS
7. Design of Horn antenna using Ansys HFSS
8. Design of parabolic antenna using Ansys HFSS
9. Design of antenna with array using Ansys HFSS
10. Study of Smart antennas

### **List of Assignments:**

1. Case study of Research paper on Antenna.
2. Design and research Paper publication.
3. Advance applications in Microwave and Antenna.
4. PPT presentation on Subject Topic

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

9. Unit Test
2. Assignments
3. Continuous Assessment
4. End term Examination

**Text Books:**

1. Microwave Engineering by David M Pozzar (John willy& sons).
2. Antenna theory and Design C.A Balanis (John willy& sons.).

**Reference Books:**

1. R. E. Collin, "Antennas and Radio Wave Propagation", McGraw-Hill.,
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005
3. W. L. Stutzman, and G. A. Thiele, "Antenna Theory and Design", 2<sup>nd</sup> Ed., John Wiley & Sons. 1998.

**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**Class: B. Tech (E & TC) SEM:-VI**

**SUBJECT: - Information Theory & Coding**

**Teaching Scheme****Lecture: 3 Hours/week****Marks****Marks****Examination Scheme****End Semester Exam: 60****Continuous Assessment: 40****Credits: 03**-----  
---**Course Prerequisites:**

- Digital Communication
- Analog Communication
- Signals and Systems

**Course Objectives:**

- To introduce the student to the field of Information Theory.
- To introduce the student to the fundamental concepts in information theory
- To enable the students to apply the algorithms of source coding and channel coding.

**Course Outcomes:** On successful completion of this course, students will be able to

1. To find a source code for a given information source and calculate its efficiency.
2. To find the mutual information for a given source and a channel.
3. To find the channel capacity for a given channel
4. To find the error correcting capacity for a given linear block code
5. To find the encoding and decoding circuit for a given cyclic code.
6. To apply Viterbi decoding algorithm for a given received sequence

**UNIT - I****Source Coding****(6 Hours)**

Introduction, Historical Perspective of Information Theory, Information: Definition and physical significance, Properties of Information, Information Source, Discrete Memoryless Source, Binary Source, Entropy, Properties of Entropy, Some Source Coding Algorithms: Huffman Coding, Shannon-Fano Coding. Average Code length, Efficiency, Source Coding Theorem, Lempel-Ziv Coding.

## **UNIT – II**

### **Mutual Information And Channel Coding Theorem**

**(6 Hours)**

Discrete Memoryless Channel, Channel Matrix, Mutual information, Conditional Entropy, Joint Entropy. Physical Significance of Mutual Information, Properties of Mutual Information, Channel Capacity, Channel Coding Theorem, Error Free Communication, Verification of Channel Coding Theorem for Binary Symmetric Channel.

## **UNIT - III**

### **Channel Capacity Theorem**

**(6 Hours)**

Differential entropy and mutual information for continuous ensembles, Differential entropy for Gaussian distribution, Channel Capacity Theorem, Sphere Packing Problem, Implications of Channel Capacity Theorem, Rate Distortion Theory.

## **UNIT - IV**

### **Linear Block Codes**

**(6 Hours)**

Introduction: Need of Error Control Coding, Classification of Error Correcting Codes, Error Detection and Error Correction Techniques, Systematic and nonsystematic Codes, Code rate. Linear Block Codes, Generator and Parity Check Matrices, Hamming Codes, Syndrome: definition and properties, Syndrome decoding, Hamming Bound, Perfect Code.

## UNIT -V

### Cyclic Codes

(6 Hours)

Cyclic Codes: Properties and significance, Generator Polynomial and its properties, Parity Check Polynomial, Syndrome Polynomial and its properties, Encoding and Decoding of Cyclic Codes using shift register. Overview of BCH Codes, RS codes, Golay codes, Burst error correcting codes.

## UNIT-

VI

### Convolutional Codes

(6 Hours)

Introduction, Encoding of Convolutional Codes, Code Tree, State diagram and Trellis Diagram, Transform Domain Approach, Maximum Likelihood Decoding-Viterbi Algorithm, Sequential Decoding, Overview of Turbo Codes.

### List of Assignments:

1. To find Huffman code, average code length, coding efficiency for a given source.
2. To find mutual information for a given source and channel.
3. To find the channel capacity of a practical channel such as telephone line.
4. To find minimum distance for a given linear block code.
5. To find generator matrix representation for a given generator polynomial.
6. To decode a given received sequence of bits for a given convolutional code using Viterbi Algorithm

- **Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes.

- **Assessment Methods:**

- |                          |                         |
|--------------------------|-------------------------|
| 10. Unit Test            | 2. Assignments          |
| 3. Continuous Assessment | 4. End term Examination |

**Text Books:**

1. Simon Haykin, ‘ Communication Systems’ 4<sup>th</sup> edition, John Wiley & Sons
2. Ranjan Bose, “Information Theory Coding and Cryptography” Tata McGraw-Hill.

**Reference Books:**

- 1 K. Sam Shanmugam, “Digital and analog communication systems”, John Wiley.
- 2 Thomas M. Cover, Joy A. Thomas,” Elements of Information Theory, 2nd Edition”, Wiley Publication.
- 3 Roberto Togneri, Christopher J.S deSilva “Fundamentals of Information Theory and Coding Design”, CRC Press.
- 4 Steven Roman,” Introduction to Coding and Information Theory”, Springer New York.
- 5 N. T. Markad “Communication System”, I K International Publishing House Pvt. Ltd., New Delhi.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**

**Department of Electronics and Telecommunication**

**CLASS: B.TECH (E&TC) SEM. - VI**

**SUBJECT: - Electronic Circuit Design & Practices**

**Teaching Scheme**

**Examination Scheme**



**Practical: 2 Hours/Week  
marks**

**TW & OR: 25**

**Credits: 01**

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**Course prerequisites:**

- Knowledge of basic electronics components
- 

**Course objective:**

The aim is to enable the student to undertake an independent survey into a relevant area. This course is to familiarize the student with the analysis and design of Electronics circuits.

**Course Outcomes:** On successful completion of this course, students will be able to

- Design and implementation of small electronics systems
- Model and quantitatively analyze circuits with transistors and other nonlinear devices;
- Construct and test electronic circuits in the laboratory;
- Use software tools to simulate the behavior of electronic circuits

**Contents:**

- Tutorial and Laboratory work should consists of design and implementation of small electronics systems based on OP-AMP, Timer 555 IC, encoders, decoders, multiplexers, demultiplexers, switching regulators, PLL etc.
- A group consists of two students, who will work on one system for entire semester.
- The work includes design, implementation, validation and report writing of the system.

**Note:** Microcontroller based systems are strictly not allowed.

**List of Experiments:**

- Minimum 8 Experiments based on syllabus using simulation software.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. End term oral performance

**Text Books:**

- Millman J. and Halkias .C "Integrated Electronics ", 2nd Edition, Tata McGraw-Hill, 2001.

**Reference Books:**

4. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 8th Edition. PHI, 2002.
5. S.Salivahanan, et.al, "Electronic Devices and Circuits", TMH, 2008.
6. Floyd, Electronic Devices, Sixth edition, Pearson Education, 2003.
7. I.J. Nagrath, Electronics – Analog and Digital, PHI, 2009.

**Bharati Vidyapeeth University, Pune**  
**Faculty of Engineering & Technology**  
**Programme: B.Tech (E&TC) Sem – VII (2014 Course)**

<b>Semester- VII</b>												<b>Contact Hours: 23 Hrs/week</b>			
												<b>Total Credits: 25</b>			
												<b>Total Marks: 750</b>			
Sr.no	Subject	L	T	P	Examination Scheme (Marks)						Total Marks	Credits			
					Theory	Continuous Assessment			TW & PR	TW & OR		TH	TW	Total	
						Unit Test	Tutorials / Assignments	Attendance							
41	Computer Networks	3	0	2	60	20	10	10	-	50	150	3	1	4	
42	Project Management And Finance	3	0	0	60	20	10	10	-	-	100	3	0	3	
43	Mobile and Broadband Communication	3	0	2	60	20	10	10	50	-	150	3	1	4	
44	Radio Frequency Engineering	2	0	0	60	20	10	10	-	-	100	2	0	2	
45	ELECTIVE-I	3	1	0	60	20	10	10	-	50	150	3	1	4	
46	Project Stage-I	0	0	4	-	-	-	-	-	50	50	0	4	4	
47	In-plant Training	0	0	0	-	-	-	-	-	50	50	0	4	4	
<b>Total</b>		<b>14</b>	<b>01</b>	<b>08</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>750</b>	<b>14</b>	<b>11</b>	<b>25</b>	

**Elective-I:**

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| 1) Wireless Sensor Network            | 3) Digital Image Processing     |
| 2) Advanced Digital Signal Processing | 4) Advance Computer Programming |

**Bharati Vidyapeeth University, Pune**  
**Faculty of Engineering & Technology**  
**Programme: B.Tech (E&TC) Sem – VIII (2014 Course)**

<b>Semester- VIII</b>					<b>Contact Hours: 28 Hrs/week</b>									
					<b>Total Credits: 25</b>									
					<b>Total Marks: 750</b>									
Sr.no	Subject	L	T	P	Examination Scheme (Marks)						Total Marks	Credits		
					Theory	Continuous Assessment			TW & PR	TW & OR		TH	TW	Total
						Unit Test	Tutorials / Assignments	Attendance						
48	Optical Fiber Communication	3	0	2	60	20	10	10	50	-	150	3	1	4
49	Satellite Communication	3	0	2	60	20	10	10	-	50	150	3	1	4
50	Software Defined Radios	3	1	0	60	20	10	10	-	-	100	4	0	4
51	Elective-II	3	1	0	60	20	10	10	-	50	150	3	1	4
52	Project Stage-II	0	0	8	-	-	-	-	-	150	150	0	8	8
53	Seminar	0	0	2	-	-	-	-	-	50	50	0	1	1
<b>Total</b>		<b>12</b>	<b>2</b>	<b>14</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>300</b>	<b>750</b>	<b>13</b>	<b>12</b>	<b>25</b>

**Elective-II**

- |   |                                 |
|---|---------------------------------|
| 1) Speech & Audio Processing            | 3) System on Chip               |
| 2) Artificial Intelligence and Robotics | 4) Fuzzy Logic & Neural Network |



**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B.Tech (Electronics& Telecommunications) Sem:-VII**

**SUBJECT: - Computer Networks**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 02 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW& OR: 50 marks**

**Credits: 04**

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**Course Prerequisites:**

Analog and Digital Communications, Basic Embedded Systems, Probability Theory.

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**Course Objectives:**

1. To introduce various topologies and types of networks.
  2. To introduce the concepts of network architecture & network design
  3. To give know how of congestion control mechanism.
  4. Familiarize with Networking Protocols & Layers
  5. Introduce network security aspects.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the types of computer networks and topologies.
2. Identify the functions of network connectors, Hubs, Switches, Routers, Bridges, NIC& network layers.
3. Implement various algorithms used in computer networks.
4. Use TCP/IP protocol.
5. Apply the various Network security techniques.

## Contents

### Unit I

[06Hours]

#### Introduction to Computer Networks and Internet

Understanding of network hardware, network software and Internet, the network edge, the network core, understanding of Delay, loss and recovery in the circuit and packet switching network, TCP/IP Protocol Suite: The OSI Model, Comparison of the OSI and TCP/IP reference model.

### Unit II

[06Hours]

#### Physical Layer

Guided transmission media, wireless transmission media, EIA 232 D interface standard, Circuit, Packet and Message Switching in Computer Network, High Speed Digital Access, Multi Access Protocols – ALOHA and CSMA, Collision free protocols, Ethernet, Gigabit Ethernet, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, API, hubs, bridges, switches, routers, modems and gateways.

### Unit III

[06Hours]

**Data Link Layer** – LLC, MAC, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol, HDLC, modes of operation.

**Transport Layer** – Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS & WANS.

### Unit IV

[06Hours]

#### Network Layer

Introduction, Virtual and Datagram networks, IP protocol and addressing in the Internet Routing algorithms Broadcast and Multicast routing Network Layer Design issues Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Hierarchical Routing, Congestion generation and control algorithms, policies-leaky bucket algorithm, token bucket algorithm, virtual circuit subnet and choke packets, Resource Reservation Protocol.

### Unit V

[06Hours]

**TCP/IP Protocol suit** – RPC, Real Time Transport Protocols, The Internet Transport Protocols-The TCP Service Model, The Connection Establishment and in Release in TCP, The TCP Connection Management Modeling, TCP Congestion Control and Flow control.

**Application Layer**- Introduction, Applications layer paradigms, Client server model, Client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH, Protocols - PPP, ARP / RARP, ICMP, IGMP, UDP, IP, DHCP, DNS, EMAIL, Web and HTTP, IPV.4, IPV.6.

## Unit VI

[06Hours]

**Network security** – Cryptography Algorithms and Trust Models, Ciphers vs Codes, Symmetric-key algorithms (DES, AES), Public-key algorithms – RSA, Digital signatures, IPSec, Firewall, Managements of public keys, communications security, Authentication Protocols

**Content Delivery Methods:** Chalk & talk, Power point presentation.

### Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

### List of Experiments: Min 8 experiments to be performed

1. Study of Networking
2. Implementation of bus topology using Network Simulator
3. Implementation of star topology using Network Simulator
4. Connecting two computers using RJ45
5. Establish a Ethernet LAN between computers
6. Telephone switching circuit using EPBX
7. Carry networking between two or more computers
8. Configuring different network topologies using MATLAB & introduction to DHCP
9. i) Character transfer using Simplex method  
ii) Character transfer using Full-Duplex method
10. Simulation and implementation of bit stuffing
11. Simulation and implementation of CRC
12. Stop-and Wait protocol using MATLAB
13. Go-Back-N protocol using MATLAB
14. Selective repeat Protocol using MATLAB
15. Distance Vector Routing Algorithm using MATLAB
16. Link State Routing algorithm using MATLAB

### List of Assignments:

1. Explain different types of Networks and topologies.
2. Describe functions of OSI layers and its architecture.
3. What is TCP / IP protocol model.
4. Explain the connections of Physical Layer using different mediums
5. Explain the functionalities of Data Link Layer and error control
6. Describe techniques of encoding and decoding
7. Explain Network Layer and Data Recovery Methods
8. Describe congestion control mechanism and routing mechanism
9. Explain session layer, addressing and subnetting in OSI reference model.
10. Explain cryptography, symmetric-key algorithms.
11. Explain the concepts if IPSec, Firewall Design
12. Explain different network security mechanisms.

**Text Books**

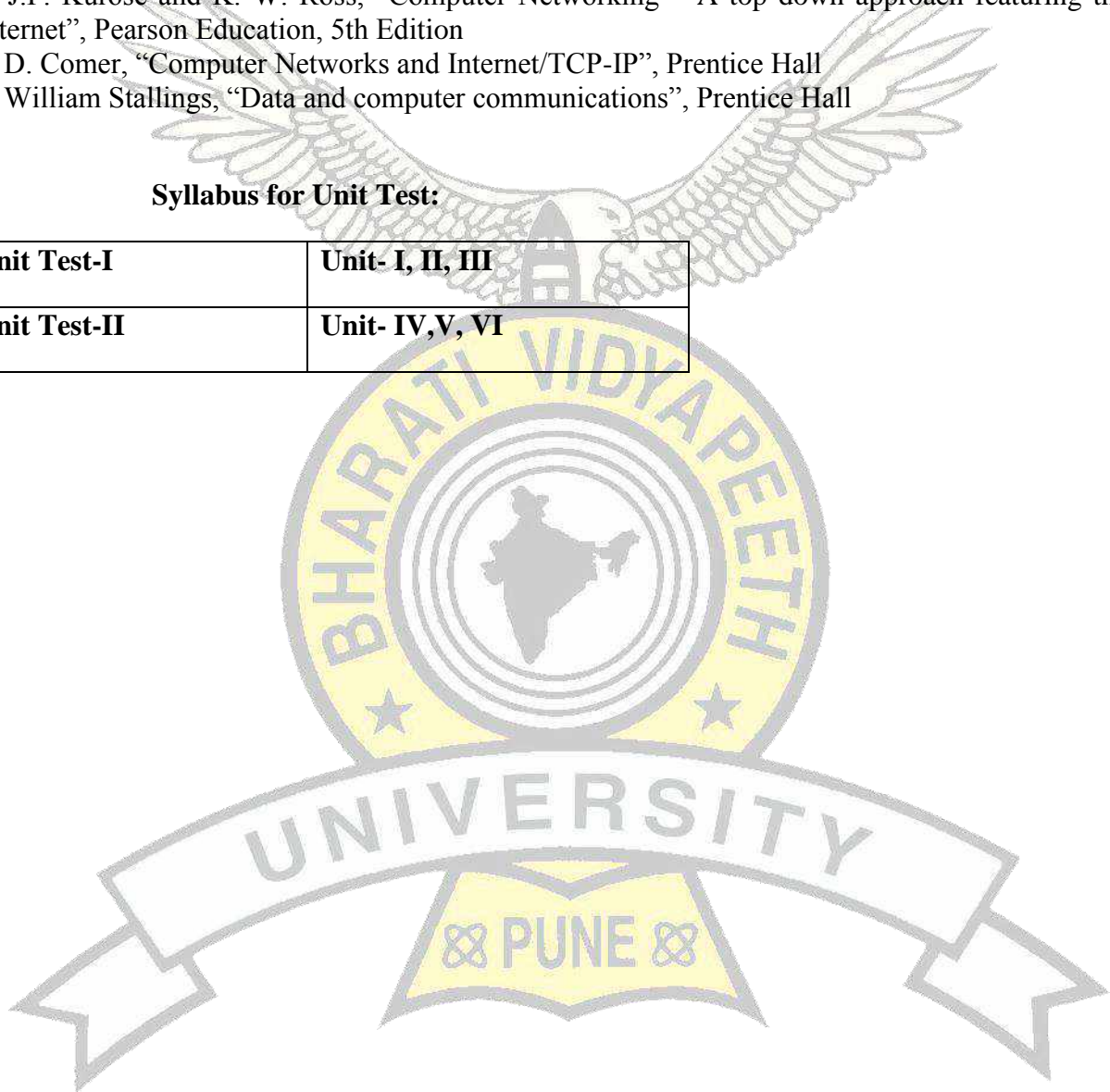
1. Andrew Tanenbaum, “Computer networks”, Prentice Hall
2. L. Peterson and B. Davie, “Computer Networks – A Systems Approach” Elsevier Morgan Kaufmann Publisher, 5<sup>th</sup> Edition.
3. T. Viswanathan, “Telecommunication Switching System and Networks”, Prentice Hall

**References**

1. S. Keshav, “An Engineering Approach to Computer Networking”, Pearson Education
2. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition
3. J.F. Kurose and K. W. Ross, “Computer Networking – A top down approach featuring the Internet”, Pearson Education, 5th Edition
4. D. Comer, “Computer Networks and Internet/TCP-IP”, Prentice Hall
5. William Stallings, “Data and computer communications”, Prentice Hall

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>







**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem: -VII**

**SUBJECT: - Project Management & Finance**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**Credits: 03**

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**Course Prerequisite:**

Mathematics, Economics, and Statistics.

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**Course Objectives:**

1. To realize basic principles/concepts of project management and finance.
  2. To describe the most well-known theories and perspectives on project managements.
- 

**Course Outcomes:** At the end of the course, a student will be able to

1. Define the Characteristics, Objectives, and Stages of Project management.
2. Conceptualize the importance of time and work estimation in Project management.
3. Analyze Management Concepts for Developing Project Plan.
4. Analyze and Understand Financial & Project Management.
5. Demonstrate Scope, Objectives and Importance of Financial Management.
6. Identify and understand the main responsibilities and tasks of Securities and Exchange Board of India (SEBI) in money market and capital Market.

**Contents**

**Unit I**

**[06 Hours]**

**Introduction to Project management:**

Characteristics of projects, Definition and objectives of Project Management, Stages of Project Management, Project Planning Process, Establishing Project organization.

**Unit II** [06 Hours]

**Work Definition:**

Defining work content, Time Estimation Method, Project Cost Estimation and budgeting, Project Documentation Introduction to CMM, Project Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, ,CPM/PERT Networks

**Unit III** [06 Hours]

**Management Concepts:**

Developing Project Plan (Baseline) , Project cash flow analysis, Project scheduling with resource constraints: Resource Levelling and Resource Allocation. Time Cost Trade off: Crashing Heuristic.

**Unit IV** [06 Hours]

**Project Implementation:**

Project Monitoring and Control with PERT/Cost, Computers applications in Project Management, Contract Management, Project Procurement Management.

**Unit V** [06 Hours]

**Financial Management:**

Introduction of Finance, Types of Finance, Financial Management, Scope & Objectives of Financial Management, function of finance manager, Importance of Financial Management, Sources of finance, Security Finance.

**Unit VI** [06 Hours]

**Working Capital Management:**

Capital Structure, Fixed & working capital, Role of Securities and Exchange Board of India (SEBI), function of money market and capital Market, sources of finance. Introduction to capital budgeting, Techniques of capital budgeting. Break even analysis - assumptions, importance, Cost-Benefit analysis, CVP graph.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

### List of Assignments:

1. Write characteristics of projects.
2. Define objectives of project management.
3. Discuss the relationship between financial objectives, corporate objectives and corporate strategy.
4. State the differences between PERT and CPM.
5. Discuss in brief: Project scheduling.
6. Explain project monitoring & control using PERT/Cost
7. Identify the nature and role of money and capital markets, both nationally and internationally.
8. Write in brief: Concepts & Importance of organization.
9. Discuss functions of finance manager.
10. Critically evaluate various approaches to the financial management
11. Discuss sources of finance.
12. Explain the functions of a stock market and a corporate bond market.

### Text Books

1. Shtub, Bard and Globerson, "Project Management: Engineering, Technology, and Implementation", Prentice Hall, India
2. C. Paramasivan and T. Subramanian, "Financial Management", New age international publishers.
3. John M Nicholas, "Project Management for Business and Technology: Principles and Practice", Prentice Hall, India, 2002.
4. Cleland and King, "VNR Project Management Handbook".
5. Wiest and Levy, "Management guide to PERT/CPM", Prentice Hall. India.

### Reference Books

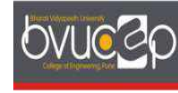
1. Horald Kerzner, "Project Management: A Systemic Approach to Planning, Scheduling and Controlling", CBS Publishers, 2002.
2. S. Choudhury, "Project Scheduling and Monitoring in Practice".
3. P. K. Joy, "Total Project Management: The Indian Context", Macmillan India Ltd.

### Syllabus for Unit Test:

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV, V, VI</b>



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B.Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: - Mobile & Broadband Communication**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Practical: 02 Hours/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & PR: 50 Marks**

**Credits: 04**

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**Course prerequisites:**

Analog Communication System, Digital Communication System, Information Theory & Coding

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**Course objectives:**

1. To make students familiar with fundamentals of mobile communication systems
  2. To choose system (TDMA/FDMA/CDMA) according to the complexity, installation cost, speed of transmission, channel properties etc.
  3. To identify the requirements of mobile communication as compared to static communication
  4. To understand the three primary components of a fiber-optic communication system.
  5. To understand the system design issues and the role of WDM components in advanced light wave systems.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Understand with various generations of mobile communications
2. Understand the concept of cellular communication
3. Understand the basics of wireless communication
4. Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.
5. Carry out Satellite Link design for Up Link and Down Link

## Contents

### Unit I

#### Introduction to Mobile Communication

[06 Hours]

Mobile and Personal Communication, mobile and wireless devices, Specialized packet and mobile radio networks, circuit switched data services on cellular networks, packet switched data services on cellular networks

### Unit II

#### Wireless LAN

[06 Hours]

Introduction, Infrared radio transmission infrastructure and adhoc networks, Detailed study of IEEE 802.11, HIPER LAN, Bluetooth, Wireless ATM

### Unit III

#### Mobile Network Layer & Transport Layer

[06 Hours]

Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile adhoc networks, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery

### Unit IV

#### ISDN

[06 Hours]

Switching Techniques, Principles of ISDN, Architecture, ISDN standards, I-series Recommendations, Transmission structure, User network interface, ISDN protocol architecture, ISDN connections, Addressing, Interworking,

### Unit V

#### B-ISDN architecture and standards, B-ISDN Services

[06 Hours]

Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements.

### Unit VI

#### B-ISDN protocols

[06 Hours]

User plane, Control plane, Physical layer, Line coding, Transmission structure, SONET Requirement, Signal Hierarchy, System Hierarchy.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Experiments:**

1. To understand and carryout fault finding of Pulse & Tone DTMF Telephone Trainer.
2. To Carryout telephone signal switching system using EPBX Trainer.
3. To install and configure PSTN switch configuration using T/S/T Switch.
4. To install and understand ISDN EPBX system.
5. To transfer voice between two computers using ISDN terminal Adaptors.
6. To transfer data between two computers using ISDN terminal adaptor modem.
7. To transfer video between two computers using ISDN system.
8. To study hardware section and carryout fault finding of Mobile handset trainer.
9. To carryout AT commands mobile communication using GSM trainer.
10. To carryout GPRS Internet data transfer using GPRS trainer.
11. To understand two user CDMA trainer using DSSS technology.
12. To carryout internet data transfer using CDMA trainer.
13. To send and receive DTMF signal using DTMF encoder and decoder circuit.
14. To carryout Voice Packet signal switching system using IP Protocol Trainer
15. To carryout Data Packet signal switching system using IP Protocol Trainer
16. To carryout Video Packet signal switching system using IP Protocol Trainer

**List of Assignments:**

1. How the Mobile and Personal Communication can works?
2. Distinguish Circuit Switching and Packet Switching with diagrams
3. Explain in detail of IEEE 802.11.
4. Write down the important features of HIPER LAN with its applications.
5. Write short note on DHCP (Dynamic Host Control Protocol)
6. What are prerequisites of Mobile ad hoc networks?
7. List the ISDN standards & explain any one of them.
8. What is mean by Interworking? Explain in detail.

9. List out the Business and Residential requirements. Explain in detail.
10. What are the services provided under B-ISDN?
11. Write a note on SONET.
12. List all the ISDN protocols, and explain the importance of them.

**Text Books:**

1. J. E. Flood , “Telecommunications Switching, Traffic and Networks”, Pearson Education
2. Krzysztof Wesolowski, “Mobile Communication Systems”, Wiley Student Edition.
3. Balaji Kumar,” A professional guide to ATM, Frame relay, SMDS, SONET,B-ISDN”, Tata McGraw-Hill Publications.
4. Robert Newman,” Broadband Communication”, PHI Publications.

**Reference Books**

1. Mobile Communications: Jachen Schiller ( Addison Westy)
2. Wireless Networks by P. Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S. Pomportsis ; Wiley Pub.
3. ISDN and Broadband ISDN with Frame Relay and ATM William Stallings, Prentice-Hall, 4th edition
- 4.Govind P. Agrawal, Fiber-Optic Communication Systems, Wiley, 3rd edition.
5. Dennis Roody, “Satellite Communications”, McGraw Hill

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>



**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: Radio Frequency Engineering**

**Teaching Scheme**

**Lecture: 02 Hours/Week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**Credits: 02**

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**Course Prerequisites:**

Electromagnetic Engineering, Microwave Theory and Antennas

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**Course objectives:**

1. To introduce RF issues related to active and passive components.
  2. To introduce RF circuit design.
  3. To introduce modeling of RF circuits.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Understand behavior of passive components at high frequency and modeling of HF circuit.
  2. Design HF amplifiers with gain bandwidth parameters.
  3. Identify Mixer types and their characteristics.
  4. Gain the knowledge of PLLs and Oscillators with respect to circuit topologies.
- 

**Contents**

**Unit I**

**RF Behavior of Passive Components**

**[04 Hours]**

HF Resistors, HF Capacitors, HF Inductors, Chip Components. Circuit Board Considerations: Chip Resistors, Chip Capacitors, Surface Mounted Inductors.

**Unit II**

**RF Measurement & Bandwidth Estimation**

**[04Hours]**



Network Analyzer, Spectrum Analyzer and RF Generator. Open Circuit Time Constant Method: Observations & Interpretations, Accuracy of OCts, Considerations, Short Circuit Time Constant Method.

### Unit III

#### High Frequency Amplifier Design

[04 Hours]

Shunt Peaked Amplifier, Shunt Series peak Amplifier, Two port bandwidth enhancement, Design example. Bandwidth enhancement techniques. Tuned Amplifier: Common Source Amplifier with Single Tuned Load.

### Unit IV

#### Low Noise Amplifier Design

[04 Hours]

MOSFET two port noise parameters, LNA topologies, Power-constrained noise optimization. Design examples: Thermal Noise, Shot Noise, Signal to Noise Ratio and Noise Figure.

### Unit V

#### RF Oscillators

[04 Hours]

Oscillators Using a Common Emitter BJT, Oscillators Using a Common Gate FET, Crystal Oscillators. Colpitts Oscillator: Describing Function Model and Start-up Model of Colpitts Oscillator.

### Unit VI

#### Mixers

[04 Hours]

Mixer fundamentals, Significant Characteristics of Mixer: Single-Ended Diode Mixer, Single-Ended FET Mixer, Balanced Mixer, Image Reject Mixer.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### Assessment Methods:

1. Unit Test
2. Continuous Assessment
3. End semester Examination

#### List of Assignments:

- 1) To study of Frequency measurement of Klystron tube.
- 2) Design a lumped element 'LC' network for matching  $Z_L = 10 + j10 \Omega$  to a  $50\Omega$  transmission line at 1 GHz.

- 3) To plot the resonant frequency behavior of parallel LC circuit, as a function of resistance.
- 4) To determine stability regions of the device and sketch them in the Smith Chart. Assume suitable parameters.
- 5) Determination of VSWR & reflection coefficient Smart antennas using HFSS.
- 6) With neat diagram, explain the working principle of Gunn diode.
- 7) Explain characteristics of Gunn diode.
- 8) Derive the equation for the scattering matrix of magic Tee.
- 9) Study of Smart antennas using HFSS.
- 10) Explain difference between RF circulator and isolator.
- 11) Design of any one type oscillator.
- 12) Design of Single-Ended Diode Mixer.

**Text Books:**

1. Reinhold Ludwig, Pavel Bretchko, "RF Circuit Design Theory and Applications", Pearson Education.
2. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Second Edition, Cambridge Publications.
3. David M. Pozar, "Microwave Engineering", Fourth Edition John Wiley & Sons, Inc.

**Reference Books:**

1. T. Yettrdal, Yunhg Cheng, "Devices modeling for analog and RF COMS circuits design", John Wiley publication.
2. Calvin Plett, "Radio frequency Integrated Circuits Design", Artech house

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B.Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: Elective-I Wireless Sensor Network**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

Engineering Mathematics I, Engineering Mathematics II, Engineering Mathematics III,  
Analog communication and digital communication

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**Course objectives:**

1. To introduce the concept of sensor network establishment, tasking- control and analysis of sensors using wireless medium.
  2. To provide knowledge of mathematical functions associated with sensor network.
  3. Familiarize the student with various routing algorithms
  4. Introduce the idea of Internet of Things and its future scope.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Define, characterize and analyze concept and need of wireless sensor network.
2. Design theoretical localization and tracking algorithms of wireless sensor network.
3. Analyze the effects of various types of routing in wireless sensor network.

4. Apply Mathematical tools to wireless sensor network establishment.
5. Define wireless sensor network tasking and controlling to fulfill the requirement of application area.
6. Categorize the databases of sensor networks and understand design challenges and handling of the huge database.

## **Contents**

### **Unit I**

#### **Introduction [03 Hours]**

Unique constraints & challenges, Advantages of sensor networks, Sensor network application, Collaborative processing, Key definitions of sensor network

### **Unit II**

#### **Localization & Tracking [03 Hours]**

A tracking scenario, Problem formulation, distributed representation and interface of states, tracking multiple objects, sensor models, Performance, Comparison & Matrices

### **Unit III**

#### **Networking Sensors [03 Hours]**

Key assumption, Medium access control, General issues, Geographic & Energy-aware routing, Attribute-based routing, IDSQR, Directed diffusion, Rumor routing.

### **Unit IV**

#### **Infrastructure Establishment [03 Hours]**

Topology control, Clustering, Time Synchronization, Interval Methods, Reference broadcasts, Localization services, Ranging Techniques, Range Based localization algorithms

### **Unit V**

#### **Sensor Tasking and Control [03 Hours]**

Task driven sensing, Roles of sensor nodes & utilities, Information-based sensor tasking, cluster leader based, Joint routing & Information aggregation, moving center of aggregation sensor GROUP MANAGEMENT

### **Unit VI**

#### **Sensor Network Databases and introduction of IOT [03 Hours]**

Sensor database challenges, Querslater forces, Cougar sensor database, Abstract data types, In-Network aggregation, Tiny DB Query Processing, data indices & range queries, Temporal data, ,IOT, Cloud computing

**Content Delivery Methods:** The course will be delivered through lectures, class room interaction, group discussion, exercises and quizzes

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Tutorials/Experiments:**

1. Implement geographic routing for the application of human body health parameters using MATLAB.
2. To transmit and receive Weather parameters using energy aware routing in MATLAB.
3. To transmit and receive Raining water data using Rumor routing.
4. Write programme for automate Home or Industrial day to day needs using collaborative processing.
5. To direct power source controller using wireless sensor network in MATLAB establish its evaluation metric.
6. To control movement of unmanned vehicle using attribute routing in MATLAB.
7. To localize stationaryspot using wireless sensor network.
8. To trackand do time synchronization of high alert areas using wireless sensor network.
9. To monitor and control traffic on high intensity city-road.
10. To track and control greenhouse using wireless sensor network.
11. To control movement of unmanned vehicle using wireless sensor network in NS2 OR NS3.
12. To direct power controller using wireless sensor network in NS2 OR NS3.

**List of Assignments:**

1. Compare traditional telemetry and wireless sensor network.
2. Enlist and study various basic terminologies of wireless sensor network.
3. Case study of research papers on wireless sensor network for any application.
4. Write a survey paper based on assignment no.3.

5. Choose any wireless sensor application and for that enlist requirements of devices.
6. For the assignment no.5, count total number sensors and define functioning of each.
7. For the assignment no.5, decide priority of parameters such as response time, sensitivity, accuracy and cost of establishment.
8. For the assignment no.5, select best routing algorithm and do its MATLAB simulation or NS3 simulation.
9. Write programme using MATLAB to show failure detection in any wireless sensor application.
10. Enlist various control systems used with wireless sensor network.
11. Explain future applications of wireless sensor network with IOTs.
12. Enlist various disadvantages of wireless sensor network and write solutions to resolve them.

### **Text Books**

1. "Wireless Sensor Networks: An Information Processing Approach" by Feng Zhao and Leonidas J. Guibas, 2007
2. "Information Processing in Sensor Networks," by Feng Zhao, and Leonidas J. Guibas (Eds)
3. "Designing the Internet of Things" by Adrian McEwen, Hakim Cassimally
4. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, And Applications", John Wiley, 2007.

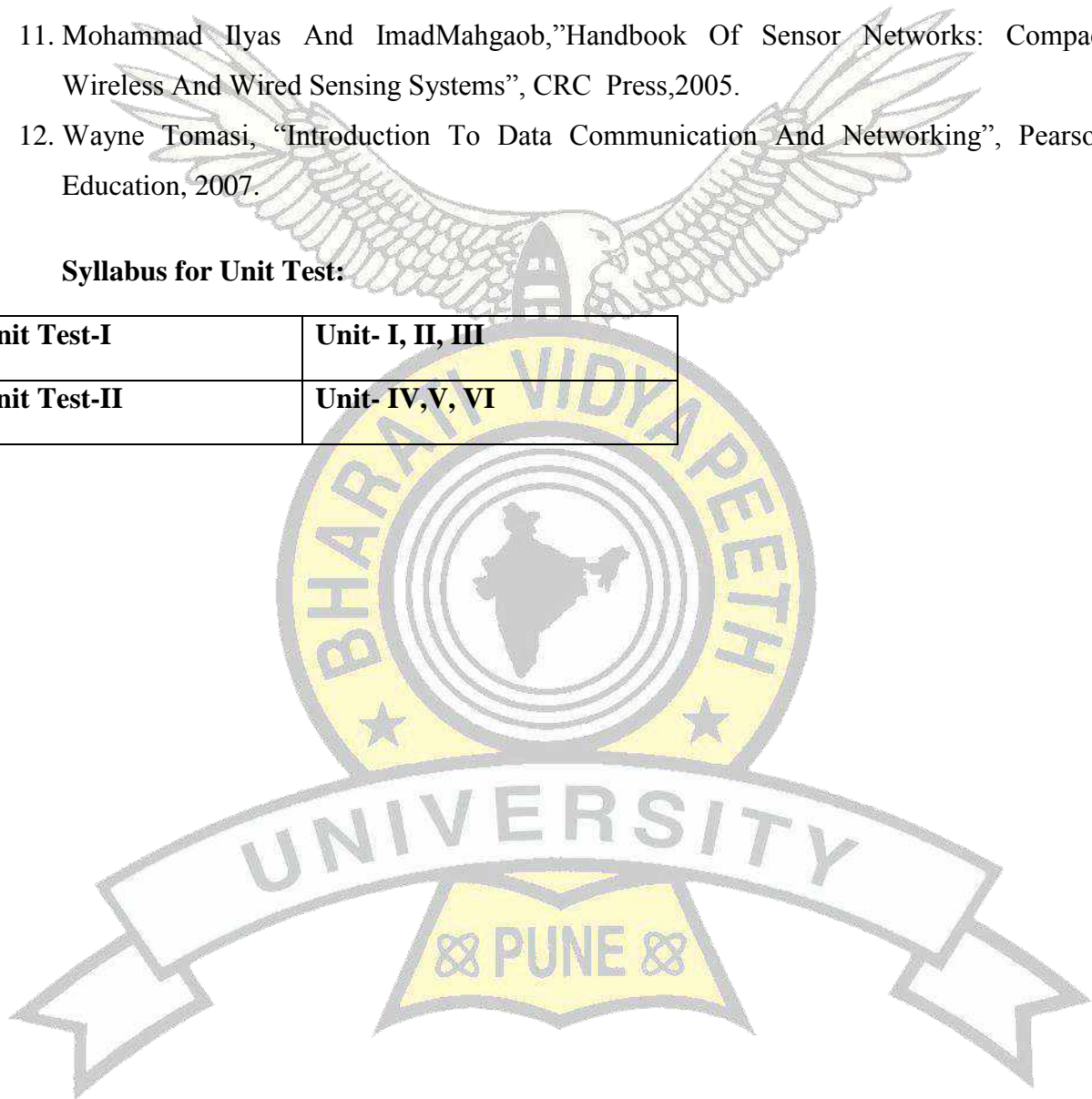
### **Reference Books**

1. "Wireless sensor networks technology, Protocols, and Application" by KazemSohraby, Daniel Minoli, TaiebZnati
2. Anna Hac, "Wireless Sensor Network Designs," John Wiley & Sons.
3. Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols," CRC Press.
4. Victor Lesser, Charles L. Ortiz, and MilindTambe, "Distributed Sensor Networks: A Multiagent Perspective," Kluwer.
5. "Getting Started with the Internet of Things" by CunoPfister
6. Shad Roundy, Paul Kenneth Wright, and Jan M. Rabaey, "Energy Scavenging for Wireless Sensor Networks: With Special Focus on Vibrations," Kluwer,

7. Jose A. Gutierrez, Edgar H. Callaway, Raymond Barrett, "IEEE 802.15.4 Low-Rate Wireless Personal Area Networks: Enabling Wireless Sensor Networks," .
8. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
9. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
10. BhaskarKrishnamachari, "Networking Wireless Sensors", Cambridge Press,2005.
11. Mohammad Ilyas And ImadMahgaob,"Handbook Of Sensor Networks: Compact Wireless And Wired Sensing Systems", CRC Press,2005.
12. Wayne Tomasi, "Introduction To Data Communication And Networking", Pearson Education, 2007.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: - Elective I Advanced Digital Signal Processing**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

Signals & systems, Digital Signal Processing

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**Course Objectives:**

1. To make student familiar with basic principles of spectral estimation methods.
2. To introduce the advanced concepts and techniques of digital signal processing.
3. To create awareness about the practical applications in the field of Digital Signal Processing.
4. To introduce DSP processor architecture.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Apply parametric and non-parametric techniques for estimating the power spectral density.
2. Design and implement multistage sampling rate converter.
3. Design appropriate adaptive filter in communication applications.
4. Perform multi-resolution analysis using wavelet transform.
5. To implement the signal processing application using DSP processor.



## Contents

### Unit I

[06 Hours]

#### DSP Processor Characteristics

Features of DSP Processors, Harvard and modified Harvard Architecture, Multiply-Accumulate operation, Single Cycle Execution, Multiple on chip buses, ALU, MAC, Shifter Processing Units, Address Generation units, Modulo addressing, Bit reversed addressing, Efficient Looping Mechanisms, Examples of DSP Processors, Applications of DSP Processors

### Unit II

[06 Hours]

#### Linear Prediction

Random Processes, Stationary Random Process, Ergodic Random Process, AR process, MA process and ARMA process, AR lattice and ARMA lattice Ladder Filters, Forward and backward linear prediction, Solution of Normal Equations, Levinson-Durbin Algorithm, Properties of Linear Prediction Error Filters.

### Unit III

[06 Hours]

#### Power Spectrum Estimation

Estimate definition, Nonparametric methods-Periodogram, modified periodogram, Bartlett's method, Blackman-Tukey Method, Performance Comparisons of nonparametric methods, Parametric methods, Methods for estimating parameters of AR, MA and ARMA models

### Unit IV

[06 Hours]

#### Multirate DSP fundamentals

Need for Multi-rate DSP, Decimation by factor  $D$ , Interpolation by factor  $I$ , Sampling rate conversion by rational factor  $I/D$ , software implementation of sampling rate converters (Decimators and Interpolators), sample rate conversion using poly-phase filter structures

### Unit V

[06 Hours]

#### Adaptive filters

FIR adaptive filters – the MMSE criterion and LMS and RLS algorithms, Adaptive Lattice-Ladder Filters - Recursive Least Squares Lattice Ladder Algorithms, Applications of Adaptive Filters

### Unit VI

[06 Hours]

#### Time Frequency Representation of signals

Time Frequency description of signals, Concept of Instantaneous frequency and Complex signal, Uncertainty principle, need for joint time frequency representation, tiling diagrams. Short Time Fourier Transform, Wigner Ville distribution, Continuous Wavelet Transform, Discretization of STFT & CWT, Spectrogram.

**Content Delivery Methods:** Chalk & talk, Power point presentation

### **Assessment Methods:**

1. Unit Test
2. Continuous assessment
3. End semester Examination

### **List of Tutorials/Experiments:**

1. Study of various addressing modes of DSP.
2. Describe the power spectrum estimation using Blackman and Tukey method.
3. Describe the role of Adaptive filters in Communication.
4. A brief survey of DSP applications in speech processing.
5. Implementation of Multi-rate application in digital audio processing.
6. Implementation of sub band coding for speech signal.
7. Discuss in detail various applications of wavelet transforms.
8. Explain the process of digital FM stereo signal generation.
9. Demonstration of Hardware and Software utilities for DSP starter kits.

### **List of Assignments:**

1. Present a comparative study of DSP processors based on their features and applications.
2. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods.
3. Estimation of PSD of two sinusoids plus noise using Welch method
4. Find linear prediction coefficients and reflection coefficients using Levinson Durbin Algorithm.
5. Implement program to convert CD data into DVD data
6. Implement LMS algorithm using MATLAB.
7. Record a speech file in your own voice. Find pitch period for a voiced part of the segment.
8. Perform continuous and discrete wavelet analysis of a signal.
9. Implementation of Linear / Circular convolution on DSP processor.
10. Implementation of FIR filter using DSP processor
11. Design an Adaptive filter using LMS algorithm.
12. Mini-project based on the Matlab/Scilab.

### **Text books:**

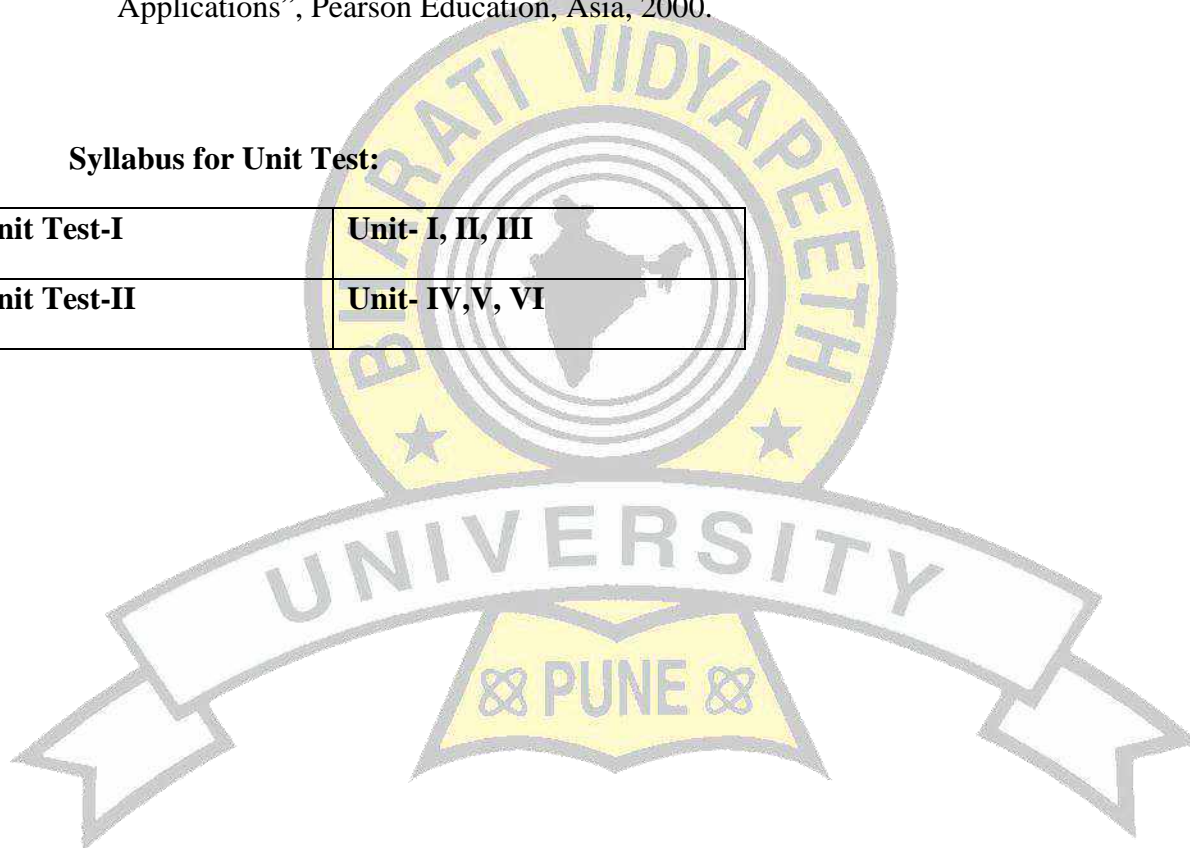
1. John G. Proakis, Manolakis, "Digital Signal Processing, Principles, Algorithms and Applications", Pearson education, Fourth Edition, 2007.
1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors", TMH

### Reference Books:

1. E. C. Ifeachor and B. W. Jervis, "Digital Signal Processing- A Practical Approach", 2nd Edition, Pearson education. 2007.
2. Widrow, B. and Stearns, S.D., "Adaptive Signal Processing", Pearson Education. 1985
2. Manolakis, D.G., Ingle, V.K. and Kogon, M.S., "Statistical and Adaptive Signal Processing", Artech House. 2005.
3. Diniz, P.S.R., "Adaptive Filtering: Algorithms and Practical Implementation", Kluwer. 1997
4. S. D. Apte, "Advanced Digital Signal Processing," Wiley Publications, 2014.
5. Leon Cohen, "Time-Frequency Analysis", Prentice Hall, 1995.
6. K.P Soman, K.I Ramchandran, N.G.Reshmi, "Insight into Wavelets- from theory to Practice," PHI Learning Private Limited, Third Edition, 2010.
7. Rao R M and A S Bopardikar, "Wavelet Transforms Introduction to theory and Applications", Pearson Education, Asia, 2000.

### Syllabus for Unit Test:

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





**Class: B. Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: Elective-I Digital Image Processing**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 04**

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**Course prerequisites:**

Signals and System

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**Course objectives:**

1. To understand the image fundamentals and mathematical transforms for image processing.
  2. To analyze the image enhancement techniques
  3. To introduce the concepts of image registration and image fusion.
  4. To identify different features of image by using segmentation.
  5. To perform measurement operations on extracted features of image.
  6. To analyze 3D Image Processing and Visualization
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. To introduce fundamentals of digital image processing and Color transformation.
2. Design image enhancement and filters.
3. Analyze morphological operations and its effects on image.
4. Image resolution and compression method for image.
5. Determine features of various images by using segmentation method.

6. To learn different applications and gain experience in applying image processing algorithms to real problems.

## **Contents**

### **Unit I**

#### **Fundamentals Digital Image Processing [06 Hours]**

Introduction, Fundamental steps in digital image processing and components, Elements of visual perception, Image sensing and acquisition, sampling and quantization, An Introduction to the mathematical tools used in digital image processing, Digital image representation, Color models, Noise in color images, Image conversion – RBG to Gray, RGB to Binary.

### **Unit II**

#### **Image Enhancement [06 Hours]**

Spatial domain, Gray level transformations, Intensity transformation functions, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filtering, Frequency domain, Introduction to Fourier Transform, One-Dimensional Fourier Transform and Inverse of Fourier Transform, Smoothing and sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters.

### **Unit III**

#### **Multi Resolution Analysis and Compressions [06 Hours]**

Wavelet Transforms , Multi resolution analysis, Image pyramids, Multi resolution expansion, Image compression, Image compression Model, Shannon's Theorem, Elements of Information Theory, Error free Compression, Lossy Compression, Image format - TIFF, BMP,GIF, PNG, JPEG, JPEG-2000,HDV, Compression Methods – Huffman Coding, Arithmetic Coding, Run length Coding, Bit-plan coding and predictive coding.

### **Unit IV**

#### **Morphological Operations in Image Processing [06 Hours]**

Dilation and erosion, Opening and Closing, Hit or Miss Transformation, Morphological algorithms, Extensions to grey scale images, Image Watermarking.

### **Unit V**

#### **Image Segmentation and Feature Extraction [06 Hours]**

Thresholding, Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds, First and second order edge detection operators, Hough transform, Types of Hough transform, shape features, Boundary descriptors, Localized feature extraction detecting image curvature.

### **Unit VI**

#### **Applications of Digital Image Processing [06 Hours]**

Image Classification, Image Recognition, Image Understanding, Working principle of Video Motion Analysis (GIF), Introduction to Iris Recognition, Difference between 2D and 3D image,

Sources of 3D Data sets, 3D Image Processing and Visualization, Measurements on 3D images.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Tutorials/ Experiments:**

1. Displaying Image in different File Format in MATLAB.
2. Transformation of Simple Binary and Gray Level.
3. Explain Histogram effects in image.
4. Perform Histogram Equalization on Image.
5. Study of Smoothing of Image in Special Domain using Averaging.
6. Study of Smoothing of Image in Special Domain using Medium Method.
7. Analyze Edge Detection Techniques.
8. Study of Morphological Operations.
9. How to perform Segmentation using Thresholding.
10. Study operation of Hough transforms and Feature Detection.

**List of Assignments:**

1. Discuss Digital image representation.
2. Discuss Color Model.
3. Explain Gray level transformations and Intensity transformation functions.
4. Show working of Butterworth and Gaussian filters.
5. Explain and differentiate Image format
6. Write different Image compression Techniques.
7. Discuss in detail Image Watermarking
8. Write role of Dilation and erosion in image processing
9. What are different types of Edge detection
10. How Hough transform works for detecting varies shapes
11. What is Image Recognition
12. Explain Working principle of Video Motion Analysis (GIF).

**Text Books:**

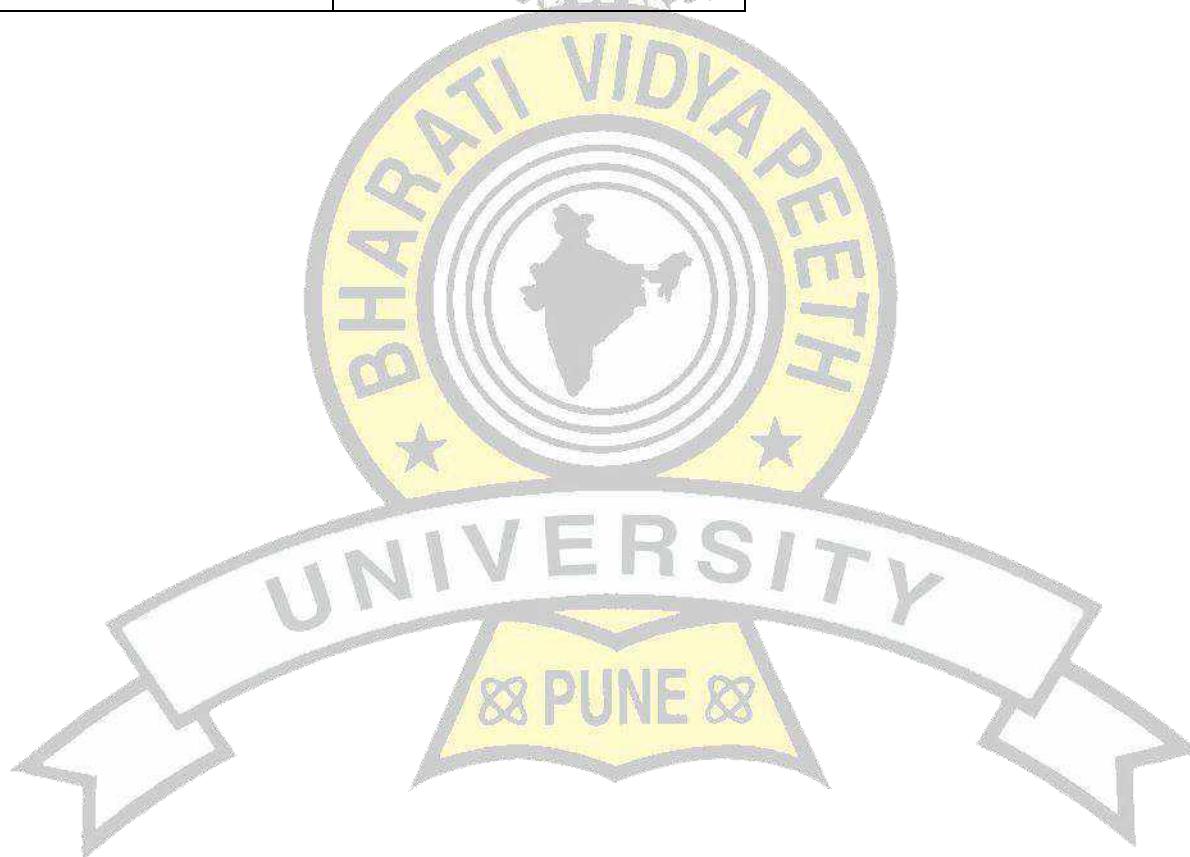
1. Gonzalez, Rafael C. and Woods, Richard E., "Digital Image Processing", Second Edition, Prentice Hall, 2006.
2. Ardeshir Goshtasby, "2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons, 2005.

**Reference Books:**

1. Rosenfield, Azriel and Kak, Avinash C., "Digital Picture Processing", Academic Press Inc, New York, 1982.
2. Salomon, David., "Data Compression: The Complete Reference", Second Edition, Springer Verlag, New York, 2001.
3. Pratt, William K., "Digital Image Processing", John Wiley & Sons, New York, 2003.
4. Jain, Anil K., "Fundamentals of Digital Image Processing", Prentice Hall of India, New Delhi.
5. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.

**Syllabus for Unit Test:**

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV,V, VI





**Class: B.Tech (Electronics & Telecommunications) Sem:- VII**

**SUBJECT: Elective-I Advanced Computer Programming**

**Teaching scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination scheme**

**End Semester Exam: 60 marks**

**Unit Test: 20 marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & Oral: 50 marks**

**Credits: 04**

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**Course prerequisites:**

Fundamentals of computing

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**Course objective:**

1. To introduce object oriented programming concepts.
  2. To develop programming ability by learning advanced coding techniques.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Demonstrate basic knowledge of object oriented programming concepts.
2. Write simple programs in Java.
3. Apply Java for HTML and Applet applications.
4. Use SQL for database manipulation

**Contents**

**Unit I**

**[06 Hours]**

**Object Oriented Programming:**

Programming fundamentals, Basic Concepts, Different Programming Paradigms, Evolution of Different Programming Languages and their Characteristics, Object-Oriented Paradigm,



Objects and Classes, Data Abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Communication, Benefits of OOP, Applications of OOP, Java Language as an OOP Language.

**Unit II** **[06 Hours]**

**Introduction to Java:**

Introduction to Java, Different Characteristics of Java, C++ and Java: Feature Comparisons, Improvements, Detailed Overview, Constants, Variables and Data Types, Operators and Expressions, Decision Making and Branching and Decision Making and Looping, Classes Objects and Methods, Arrays, Strings and Vectors, Interfaces.

**Unit III** **[06 Hours]**

**Threads:**

Packages in Java, Multithreaded Programming concepts and applications, Managing Errors and Exceptions, Managing Input/Output Files in JAVA.

**Unit IV** **[06 Hours]**

**HTML and Java Applets:**

History, W3C Standards, Standard HTML Tags for Image and Text Formatting, Tables, Lists, Frames. Introduction to dynamic HTML. Java Applets: History, Introduction, HTML and Java Applet. Basic Applet programming, Applets on Web. Applet applications for Web.

**Unit V** **[06 Hours]**

**SQL and Java:**

Introduction to databases, Data Models, Concepts, Schema, Relational Query. Detailed Overview of SQL Language, Basic SELECT Query, WHERE Clause, ORDER BY Clause, Merging Data from Multiple Tables: INNER JOIN, INSERT Statement, UPDATE Statement, DELETE Statement, and Installation of MySQL or PL SQL. Setting MySQL / PL SQL User Account.

**Unit VI** **[06 Hours]**

**Database Connectivity:**

Introduction to JDBC, JDBC Architecture, Types of JDBC drivers, Result Set, Metadata, Stored Procedure, Callable Procedure, Connection Procedure.

**Content Delivery Methods:** Chalk & talk, Power point presentation

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End semester Examination

**List of Tutorials/Experiments**

1. Write a Java program to implement Class and Inheritance Concept.
2. Write a Java program to differentiate between method overloading and method overriding.
3. Write a Java program to understand the use of String class and string buffer class
4. Write a Java program to implement the concept of Package.
5. Write a Java program to implement concept of Exception Handling.
6. Write a program to implement Frame and different graphics objects.
7. Write a program to implement Java Applet.
8. Write a SQL Program for implementation of DDL, DML, and DCL.

**List of Assignments:**

1. Write a C++ or Java Program to demonstrate the use of OOP features.
2. Write a Java Program to display pattern (Triangle, Pyramid) using different loops.
3. Implementation of different string functions by using switch case.
4. Write a Java Program implement multiple inheritances by using Interface.
5. Write a Java Program to perform different file operations.
6. Write a program to implement multithreading.
7. Design a College website containing detailed information using HTML Tags.
8. Write a program to implement a Java Applet.
9. Write a Java program to demonstrate JDBC connectivity.
10. Comparison of different database
11. Justify the role of SQL for database manipulation
12. A mini project on Java and SQL.

**Text Books:**

**Text Books:**

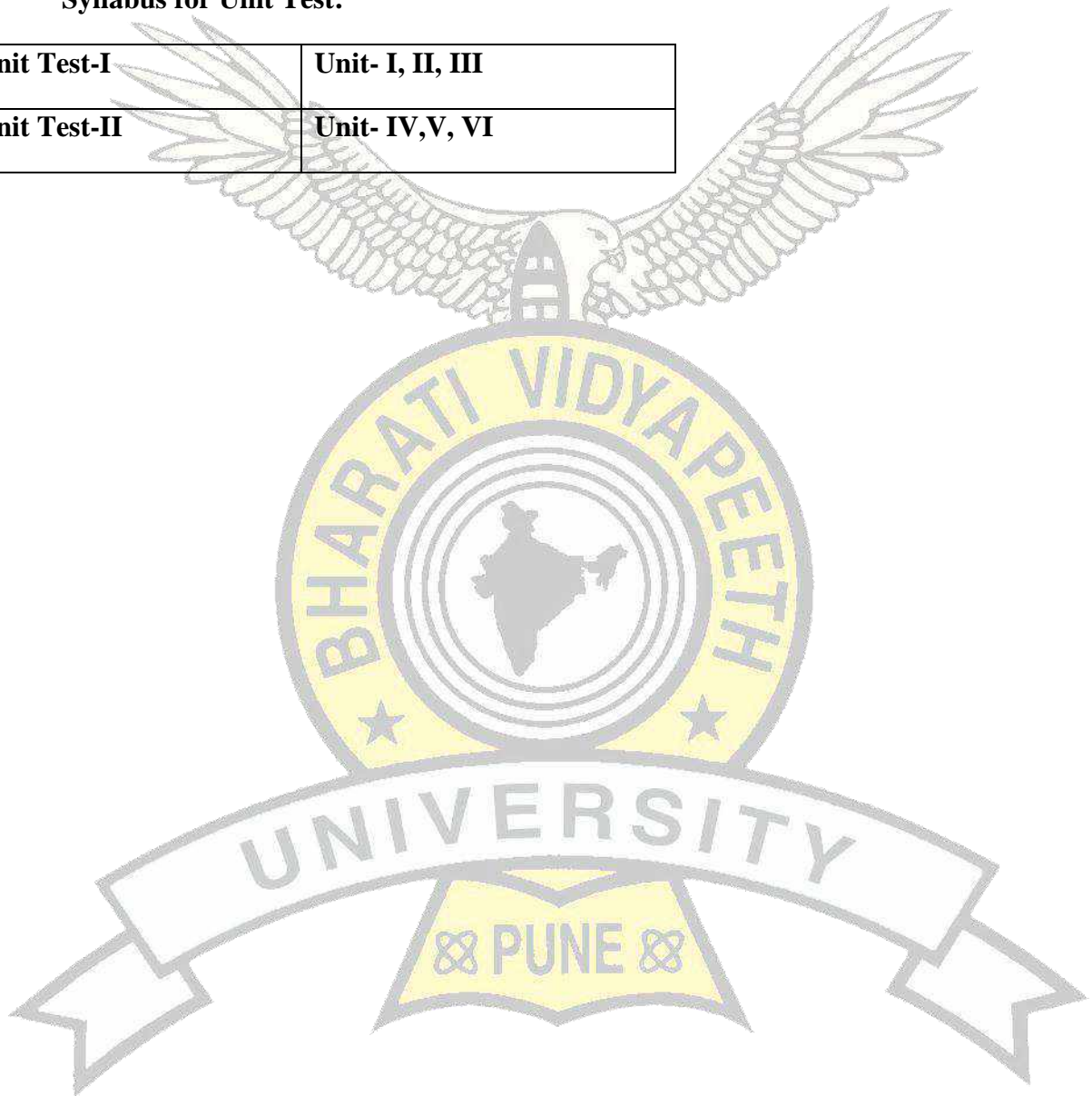
1. Programming with Java: A Primer, 3E by E Balagurusamy, Tata McGraw Hill Publishing Company.
2. Database System Concepts, Sixth Edition by Henry Korth, McGraw Hill Publishing Company
3. Java Complete Reference, Herbert Schildt, McGraw Hill Publishing Company
4. Java: How to Program by Deitel and Deitel

**Reference Books:**

1. Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, DHTML, JavaScript, Perl – CGI”, BPB Publication.
2. Korth, “Database System Concepts”, MGH Publication.
3. Ivan Bayross, “Programming with SQL”, Sybase Publication.

**Syllabus for Unit Test:**

<b>Unit Test-I</b>	<b>Unit- I, II, III</b>
<b>Unit Test-II</b>	<b>Unit- IV,V, VI</b>





**Class: B.Tech (Electronics & Telecommunications) Sem:- VII**

**SUBJECT: Project stage –I**

**Teaching Scheme**

**Practical: 04 Hours/week**

**Examination scheme**

**TW & Oral: 50 marks**

**Total Credits: 04**

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**Course objective:**

1. To familiarize the students with the product development cycle
  2. To impart the importance of working as a team.
  3. To introduce the student to literature survey and documentation process.
  4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Identify the problem for practical Engineering application
2. Formulate and design appropriate solution
3. Write specifications and identify constraints
4. Work as an effective team member
5. Effectively plan the financial budget for the project.

Project Stage –I includes various steps such as :

1. Problem Identification
2. Information gathering
3. Feasibility study
4. Synopsis
5. System analysis
6. Requirement analysis



**Bharati Vidyapeeth Deemed University  
College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem:-VII**

**SUBJECT: - In-plant Training**

**Teaching Scheme**

**Examination Scheme**

**TW& OR: 50 marks**

**Credits: 04**

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**Course Objectives:**

1. To familiarize the students to industrial work processes.
2. To work as an effective team member.
3. To develop the communication and presentation skills.
4. To introduce the student to work ethics in industry.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Work effectively in an industrial environment.
2. Effectively communicate and present himself/herself.
3. Identify the various sections in the industry.
4. Work in a team.

**In-plant Training:**

Every student has to undergo training on site or in office of some company in June & July for one and half month to get the exposure and practical experience. He has to submit the detailed report of training, on the basis of which the term work and oral marks should be awarded.

**Note:** Student should complete in-plant industrial training after semester-VI for a period of six weeks. Evaluation will be done in semester-VII.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem: -VIII**

**SUBJECT: - Optical Fiber Communication**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & PR: 50 Marks**

**Total Credits:04**

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**Course Prerequisites:**

- Electromagnetic Engineering
- Analog Communication System

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**Course Objectives:**

1. To introduce optical fiber modes and signal degradations associated with optical fiber.
2. To introduce optical sources, optical detectors and their use in the optical communication system.
3. To expose the student to digital transmission and its associated parameters on system performance.

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Analyze the basic elements of optical fiber, fiber modes configurations and structures.
2. Design optimization of SM fibers, RI profile and cut-off wave length.
3. Analyze the different kind of losses, signal distortion in optical wave guides and other signal degradation factors Also to analyze the fiber splicing and connectors

4. Analyze the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers. To analyze about different Detectors, PIN and APD and their noise performance.
5. Design the receiver operation and configuration. noise effects on system performance
6. Analyze the SONET, WDM optical networks
7. Analyze the operational principles WDM, solitons and optical CDMA

## **Contents:**

### **UNIT-I**

#### **Introduction**

**[6 Hrs]**

Introduction to Ray theory transmission: Total internal reflection; Acceptance angle; Numerical aperture, Types of Fiber, Electromagnetic mode theory of optical propagation: modes in planar guide, phase and group velocity, modes in cylindrical fibers.

### **UNIT-II**

**[6 Hrs]**

#### **Sources and Detectors**

Optical sources: Light Emitting Diodes; LED structures; internal quantum efficiency; injection laser diode structures; comparison of LED and ILD, Optical Detectors: PIN Photo detectors, Avalanche photo diodes, construction, characteristics and properties, Comparison of performance, Photo detector noise – Noise sources, Signal to Noise ratio, Detector response time.

### **UNIT-III**

**[6 Hrs]**

#### **Transmission Characteristics of Optical Fiber**

Attenuation: Absorption, Scattering; Fiber Bend losses; Dispersion, Optical fiber connectors, Fiber alignment and Joint Losses, Fiber Splices, Fiber connectors and Couplers.

### **UNIT-IV**

**[6 Hrs]**

#### **Fiber Optic Receiver and Measurements**

Fundamental receiver operation, Pre amplifiers, Error sources, Receiver Configuration, Probability of Error, Quantum limit, Fiber Attenuation measurements, Dispersion measurements, Fiber Refractive index profile measurements , Fiber cut- off Wave length Measurements, Fiber numerical Aperture Measurements, Fiber diameter measurements, OTDR

#### **UNIT-V**

**[6 Hrs]**

#### **Optical Networks**

Basic Networks, SONET / SDH, Broadcast and select WDM Networks, Wavelength Routed Networks, Non-linear effects on Network performance.

#### **UNIT-VI**

#### **Advance Optical Communication**

**[6 Hrs]**

Performance of WDM with EDFA system, Solitons, Optical CDMA, Ultra High Capacity Networks.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

#### **List of Experiments:**

1. Study the characteristics of optical source LED, Laser Diode.
2. Determination of Numerical Aperture of optical fiber.
3. Determination propagation loss and bending loss in optical fiber.
4. Design the analog/digital link using fiber optic cable.
5. Simulation of power budget presentation for basic optical network using optisystem software.
6. Simulation of 16 channel WDM system design.
7. Design and Simulation the channel switching based on MEMS.



8. Design and Simulation a ring switch using optispice software.
9. Setting of Fiber optic voice link using AM, FM& PWM.
10. Characteristics of photodetector.

### **List of Assignments**

1. Classification of types of fibers and study of basic principle of optical fiber and its parameters.
2. Study of Electromagnetic mode theory of optical propagation.
3. Discuss the degradation of optical fiber.
4. Classify the types of optical connectors and couplers.
5. Study of characteristics of optical source like LED, LASER.
6. Study of characteristics of optical detector like PIN, APD.
7. Measurement of different parameters of optical fiber.
8. Study of receiver configuration, probability of error, quantum limit of optical receiver.
9. Study of SONET / SDH, Broadcast and WDM networks.
10. Discuss the non-linear effects on network performance.
11. Study of performance of WDM with EDFA system, Solitons.
12. Study of Optical CDMA, Ultra High Capacity Networks.

### **Text Books:**

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000

### **Reference books:**

1. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.
2. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001
3. Rajiv Ramaswami, “Optical Networks “, Second Edition, Elsevier, 2004.
4. Govind P. Agrawal, “Fiber-optic communication systems”, third edition, John Wiley & sons, 2004



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**

**Class: B. Tech (E & TC) Sem:-VIII**

**SUBJECT: - Satellite Communication**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Practical: 2 Hours/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & PR: 50 Marks**

**Credits: 04**

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**Course Prerequisite:** Analog Communication, Digital Communication

**Course Objectives**

- 1 To introduce the fundamental concept in the field of satellite communication.
- 2 To enable the student to understand how to place satellite in orbit.
- 3 To teach the concept of space subsystem.
- 4 To introduce design, analysis & evaluation of satellite communication subsystem.

**Course Outcomes:**On successful completion of this course, students will be able to

- 1 Understand Orbital aspects involved in satellite communication.
- 2 Calculate Power budget.
- 3 Identify Satellite system and services provided.
- 4 Analyze the performance of satellite communication system.

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**UNIT 1: Introduction of Satellite Communication**

**[6Hrs]**

Introduction, basic concept of satellite communication, Orbital Mechanics, Look angle determination, Orbital perturbation, Orbital determination, Launchers and Launch vehicles, Orbital effects in communication system performance.

**UNIT 2: Satellite subsystem** **[6Hrs]**

Satellite Subsystem, Attitude and control system(AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification.

**UNIT 3: Satellite Link Design** **[6Hrs]**

Introduction, Basic transmission Theory, System Noise Temperature and G/T Ration, Design of Downlinks, Satellite System using Small Earth Stations, Uplink Design, Design of specified C/N : Combining C/N and C/I values in Satellite Links.

**UNIT 4: Satellite Networks** **[6Hrs]**

Reference architecture for satellite networks, basic characteristics of satellite networks, Onboard connectivity with transparent processing, analogue transparent switching, Frame organization, Window organization, On board connectivity with beam scanning.

**UNIT 5: Low Earth Orbit and Non Geo-Stationary satellite system** **[6Hrs]**

Introduction, Orbit considerations, Coverage and Frequency Consideration, Delay and Throughput Consideration, Operational NGSO constellation design: Iridium, Teledesic.

**UNIT 6: Satellite Radio and GPS** **[6Hrs]**

C-Band and Ku- Band Home satellite TV, Digital DBS TV, Satellite Radio Broadcasting, Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and codes.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment

3. End Semester Examination

**List of Experiments:**

1. To study Direct satellite broadcasting receiver
2. To study Low Noise Block converter
3. To study SAW filter
4. To study Ceramic filter
5. To study Satellite antenna
6. To study Microstrip patch antenna
7. To study Satellite transponder
8. To study Video IF amplifier
9. To study video power amplifier
10. To study Communication receiver

**Text Books:**

1. Satellite Communications-Timothy Pratt, Charles Bostian, Jeremy Allnut John Wiley & Sons (II Edition)
2. Satellite Communications-Anil k. Maine and Varsha Agaraval, Wiley Publications

**Reference Books:**

1. Satellite Communications, by Dennis Roddy(Fourth edition),McGraw Hill.
2. Satellite Communication Systems Engineering, by Wilbur L. Pritchard, Henri G. Suyderhoud, Robert A. Nelson ( Second Edition ), Pearson
3. Satellite Communication, by Timothy Pratt, Charles Bostian, Jeremy Allnutt(Second Edition), John Wiley & Sons.
4. Satellite Technology, Principles and Applications, by Anil K. Maini, Varsha Agarwal (Second Edition ), Wiley.

**List of Assignments**

1. Explain in detail introduction to satellite communication
2. Explain Kepler's first, second and third law in detail
3. Explain in detail satellite antenna.
4. Write about radio wave propagation.
5. Explain in detail various layers existing in radio propagation
6. Explain in detail various polarisation existing in satellite antenna
7. Describe telemetry, tracking and orbital control existing in satellite communication.
8. Explain in detail multiplexer and demultiplexes existing in satellite communication
9. Explain working of satellite transponder
- 10 Explain working of satellite receiver



**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem:-VIII**  
**SUBJECT: - Software Defined Radio**

### **Teaching Scheme**

**Lecture: 3 Hours/week**  
**Tutorial: 1 Hours/week**

### **Examination Scheme**

**End semester exam: 60 Marks**  
**Unit Test: 20marks**  
**Attendance: 10 marks**  
**Assignment: 10 marks**  
**Credits:04**

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### **Course Prerequisites:**

- Digital Communication, RF Engineering, DSP, Microwave and Antenna theory
- 

### **Course objective:**

1. To provide the student with solid fundamental tools used for Software defined radio.
  2. To introduce the design of antenna systems to accommodate the need of a software defined radio (i.e. smart antenna algorithms)
  3. To develop ability to understand and implement structure of Software defined radio.
  4. To provide understanding of analog and digital technologies used for software-defined radio.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Understand the basic concepts of SDR.
2. To design algorithms for smart antenna.
3. Use DSP concepts for SDR.
4. Understand the architecture of SDR.
5. Understand different Applications of SDR and smart antennas.

## **Contents:**

### **Unit 1**

#### **Introduction to Software Defined Radio**

**[6 Hrs]**

Introduction to Software Defined Radio, Software Radio Applications, A Traditional Hardware Radio Architecture, An Ideal Software Defined Radio Architecture, Signal Processing Hardware History, Software Defined Radio Project Complexity, Radio Architectures, Hybrid Radio Architecture, Basic Software Defined Radio Block Diagram, System-Level Functional Partitioning, Digital Frequency Conversion Partitioning

### **Unit 2**

#### **RF design for SDR devices**

**[7 Hrs]**

3G RF Performance Requirements, Receiver Requirements 3G Transmitter Requirements, ,14-Bit Software Radio ADC, DACs ,DAC Noise Budget ,ADC Noise Budget , Decimation, Interpolation, and Multirate Processing, Cascading Digital Converters and Digital, Frequency Converters

### **Unit 3**

#### **Signal Processing Hardware Components**

**[5 Hrs]**

SDR Requirements for Processing Power, DSPs, DSP Devices, DSP Performance Summary, DSP Compilers, Reconfigurable Processors, Chameleon Reconfigurable Communications Processor (RCP), Adaptive Computing Machine FPGAs, Symbol Rate and Chip-Rate Partitioning

### **Unit 4**

#### **Software Architecture and Components**

**[6 Hrs]**

Introduction Major Software Architectural Choices, Hardware-Specific Software Architecture, Abstracted Open Software Architecture, Software Standards for Software Radio, JTRS Software Communications Architecture Specification, SDRF Distributed Object Computing

Software Radio Architecture, The OMG, Software Design Patterns, Component Choices

## **Unit 5**

### **Application & Smart antennas**

**[6 Hrs]**

Software Defined Radio Examples Frameworks and Platforms, 3G SDR Testbeds, Applying Software Radio Principles to Smart Antenna Systems, Smart Antenna Architectures Switched Beam Array, A Software Radio Smart Antenna Architecture, Smart Antenna Performance,

## **Unit 6**

### **Low-Cost Experimental Software Radio Platform**

**[6 Hrs]**

Platform Requirements, System Architecture, Analog RF Interface, TMS320C62x EVM Daughterboard Interface, PCI Interface, Line-Level Audio Output Interface, System Design, DSP Clock Frequency, ADC Clock Source, Matching Sampling Rate, Functional Design, Low-Level Implementation Details, THS12082 Hardware, THS12082 Software, DSP BIOS Configuration, Potential Applications

**Content Delivery Methods:** Chalk & talk, Power point presentation.

### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

### **List of Tutorials/ Experiments.**

1. Implement SDR transmission/Modulation using MATLAB.
2. Implement SDR reception/Demodulation using MATLAB.
3. Parameter estimation for adaptation of wireless communication systems (learning environment and other factors)



4. Incorporate cognitive features in the upcoming standards (like 802.16m, LTE advanced, 802.11n, adaptive frequency hopping in Bluetooth) and in the 3G (2.5G) standards.
5. List down the Challenges and issues regarding the implementation of SDR?
6. Implement SDR in LabVIEW.
7. Implementing Software-Defined Radio: 4-QAM Modem in LabVIEW
8. Develop a model of a Software Defined Radio using SIMULINK tool to implement the IEEE 802.11 standard and the Bluetooth standard.
9. Implementing Single tone in NI-USRP using LabVIEW.
10. Implementing audio file modulation in NI-USRP using LabVIEW.

### **List of Assignments:**

1. Draw hybrid radio architecture and explain each of its block.
2. Define Interpolation and Decimation & their Importance in digital communication?
3. List the advance applications in SDR?
4. Explain Symbol Rate and Chip-Rate Partitioning with examples?
5. Cognitive radio is related to SDR. Explain
6. List down the different FPGAs and differentiate between them.
7. List down the Software Standards for Software Radio.
8. Explain the salient features of Texas T1 DSP processors
9. Define Smart antennas and its importance.
10. Explain 3G SDR Testbeds.
11. List down the requirements of low level implementation of SDR
12. Differentiate between 3G,4G &5G

### **Text Books:**

1. Software defined Radio for 3G by Joe Burns (Artech house).
2. Software defined radio by Walter Tuttlebee (Wiley.).

### **Reference Books:**

1. Huseyinarslan, "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems ", Springer 2007
2. F. B. Gross, "Smart Antennas for Wireless Communications", McGraw-Hill., 2005



**Bharati Vidyapeeth Deemed University**

**College of Engineering, Pune**



**Class: B. Tech (Electronics and Telecommunication) Sem: - VIII**

**SUBJECT: - Elective - II Speech & Audio Processing**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits:04**

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**Course prerequisites:**

Engineering Mathematics-III , Signals and Systems, Digital Signal processing

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**Course objective:**

- 1.To introduce speech & audio processing theory and time domain models
  2. To introduce the coding techniques for speech & audio signals.
  3. To enable students to apply STFT analysis and speech synthesis
  4. To introduce linear predictive coding as well as different techniques to enhance speech quality
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Qualitatively describe the mechanisms of human speech production and how the articulation mode of different classes of speech sounds determines their acoustic characteristics.
2. Apply programming tools (such as MATLAB, Lab VIEW) to analyze speech and audio signals in time and frequency domains, and in terms of the parameters of a source-filter production model and harmonic models.

3. Critically analyze, compare, and implement methods and systems for coding of speech and audio signals, and finally engineer efficient coding solutions.
4. Analyze, compare, and implement methods and systems for enhancement of speech and audio signals in environmental noisy conditions.

**Contents:**

**Unit-I**

**[6 Hrs]**

**Fundamentals of Speech**

The Human Speech Production Mechanism, LTI Model for Speech Production, Nature of the Speech Signal, Linear Time-Varying Model, Phonetics, Types of Speech, Voiced and Unvoiced Decision Making, Audio File Formats: Nature of the WAV File.

**Unit-II**

**[6 Hrs]**

**Parameters of Speech: Pitch and Formants**

Fundamental Frequency or Pitch Frequency, Parallel Processing Approach for Calculation of Pitch Frequency, Pitch Period Measurement Using Spectral Domain, Cepstral Domain, Formants and Their Relation With LPC, Evaluation of Formants Using Cepstrum, Evaluation of Formants Using Log Spectrum, Evaluation of Formants Using Power Spectral Density Estimate, Estimation of Formants: Other Methods.

**Unit-III**

**[6 Hrs]**

**Spectral Parameters of Speech**

Homomorphic Processing, Cepstral Analysis of Speech: Cepstral Coefficients, The Auditory System as a Filter Bank, Mel Frequency Cepstral Coefficients (MFCCs), Perceptual Linear Prediction (PLP), Log Frequency Power Coefficients (LFPCs), Relative Spectral Perceptual Linear Prediction (Rasta-PLP): Strategies for Robustness, Short-Time Spectral Analysis of Speech: Short-Time Fourier Transform (STFT), Wavelet Transform Analysis of Speech

**Unit-IV**

**[6Hrs]**

**Linear Prediction of Speech**

Lattice Structure Realization, Forward Linear Prediction, Autocorrelation Method, Covariance Method, Lattice Methods, Selection of Order of the Predictor, Line Spectral Frequencies/Line Spectral Pair Frequencies.

## **Unit -V**

**[6 Hrs]**

### **Speech Quantization and Coding**

Uniform and Non-Uniform Quantizers and Coder, Companded Quantizers, Uniform Quantization of Non-Uniform Sources: Adaptive Quantizers, Waveform Coding of Speech, Comparison of Different Waveform Coding Techniques, Parametric Speech Coding Techniques, Sinusoidal Speech Coding Techniques, Mixed Excitation Linear Prediction Coder, Multi-Mode Speech Coding (Hybrid Coder), Transform Domain Coding of Speech

## **Unit-VI**

**[6 Hrs]**

### **Speech Processing Applications**

Speech Recognition Systems, Architecture of a Large Vocabulary Continuous Speech Recognition System, Deterministic Sequence Recognition for ASR, Statistical Sequence Recognition for ASR, Statistical Pattern Recognition and Parameter Estimation, VQ-HMM-Based Speech Recognition, Discriminant Acoustic Probability Estimation, Word Spotting/Keyword Spotting, Speech Recognition and Understanding, Speaker Recognition, Distortion Measures: Mathematical and Perceptual, Speech Enhancement, Adaptive Echo Cancellation.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

### **List of Tutorials/Practicals:**

1. Record speech signal and find Energy and ZCR for different frame rates and comment on the result.

2. Record different vowels as /a/, /e/, /i/, /o/ etc. and extract the pitch as well as first three formant frequencies. Perform similar analysis for different types of unvoiced sounds and comment on the result.
3. Write a program to identify voiced, unvoiced and silence regions of the speech signal.
4. Record a speech signal and perform the spectrographic analysis of the signal using wideband and narrowband spectrogram. Comment on narrowband and wide band spectrogram.
5. Write a program for extracting pitch period for a voiced part of the speech signal using autocorrelation.
6. Write a program to design a Mel filter bank and using this filter bank write a program to extract MFCC features.
7. Write a program to perform the cepstral analysis of speech signal and detect the pitch from the voiced part using cepstrum analysis.
8. Write a program to find LPC coefficients using Levinson Durbin algorithm.
9. Write a program to enhance the noisy speech signal using spectral subtraction method.
10. Write a program to extract frequency domain audio features like SC, SF and Spectral roll off.

**List of Assignments:**

1. Provide the details of human speech production mechanism
2. Explain Types of Speech
3. Explain voiced and unvoiced signal decision making techniques
4. Describe Pitch and Formants of speech signal
5. Explain linear predictive coding (LPC).
6. Write a note on 'Autocorrelation Method for speech processing'
7. Explain Mel Frequency Cepstral Coefficients (MFCCs).
8. Study of Line Spectral Frequencies/Line Spectral Pair Frequencies.
9. Write a note on 'Speech Recognition Systems'
10. Compare VQ and HMM based Speech Recognition on various parameters
11. Study of Uniform and Non-Uniform Quantizers and Coder
12. Study of Log Frequency Power Coefficients (LFPCs)



**BharatiVidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B. Tech (Electronics & Telecommunications) Sem:-VIII**  
**SUBJECT: - Elective - II Artificial Intelligence and Robotics**

### **Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hours/week**

### **Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 4**

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### **Course Prerequisites:**

- Programming languages, Microcontrollers.

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### **Course Objectives:**

1. To introduce basic concepts of Artificial Intelligence.
2. To familiarize the students with methods of solving problems using Artificial Intelligence.
3. To introduce the basic configuration of Robotics and various types of Robots.

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### **Course Outcomes:** On successful completion of this course, students will be able to

1. Identify problems that are amenable to solution by AI methods.
2. Identify appropriate AI methods to solve a given problem.
3. Formalize a given problem in the language/framework of different AI methods.
4. Implement basic AI algorithms in design of Robots

### **Content**

#### **UNIT 1**

**Scope of AI****[6 Hrs]**

Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.

**UNIT 2****Problem solving****[6 Hrs]**

State space search; Production systems, search space control: depth-first, breadth-first search, heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis.

**UNIT 3****Knowledge Representation****[6 Hrs]**

Predicate Logic: Unification, modus ponens, resolution, dependency directed backtracking. Rule based Systems: Forward reasoning, conflict resolution, backward reasoning, use of no backtrack. Structured Knowledge Representation: Semantic Nets, slots, exceptions and default frames, conceptual dependency, scripts.

**UNIT 4****Handling uncertainty and learning****[6 Hrs]**

Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets.

**UNIT 5****Robotics****[6 Hrs]**

Automation and Robotics, Definition, Basic Structure of Robots, Robot Classification, Robot Specification, notation, Present trends and future trends in robotics, Overview of robot subsystems.

**UNIT 6****Direct and Inverse Kinematics****[6 Hrs]**

Co-ordinates Frames, Rotations, Homogeneous Coordinates, Arm Equation of four Axis SCARA Robot, TCV, Inverse Kinematics of Four Axis SCARA Robot.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Tutorials / Experiments:**

1. Program to find truth and probability in evolutionary game.
2. Program for optimal search and graph heuristics
3. Forward and backward Chaining.
4. K-nearest neighbors.
5. Implement Predicate logic
6. Write a program for face detection.
7. Implement knowledge representation
8. Constraint satisfaction problems
9. Breadth-first search
10. Hill climbing algorithm
11. Depth-first search

**List of Assignments:**

1. Write a note on different AI techniques.
2. Explain Optimal search and graph heuristics.
3. What are problem solving, search and control strategies?
4. Define Mean-end analysis.
5. Discuss Forward chaining and backward chaining with an example.
6. Explain modus ponens with formal notation
7. Write a note on artificial neural network.



8. Explain fuzzy logic with examples.
9. Define basic structure of robot and its classification.
10. Write the Present trends and future trends in robotics
11. Discuss SCARA ROBOT with neat diagram.
12. Explain Inverse Kinematics of Four Axis SCARA Robot

**Text Books:**

1. E. Rich and K. Knight, “Artificial intelligence”, TMH, 2nd ed., 1992.
2. Robin R Murphy, Introduction to AI Robotics PHI Publication, 2000
3. Fundamentals of Robotics: Analysis and Control – Robert J Schilling, PHI, New Delhi
4. Robotic Engineering – Klafter, Thomas, Negin, PHI, New Delhi

**Reference Books:**

1. D.W. Patterson, “Introduction to AI and Expert Systems”, PHI, 1992.
2. R.J. Schalkoff, “Artificial Intelligence - an Engineering Approach”, McGraw Hill Int. Ed., Singapore, 1992.
3. George Lugar, .AI-Structures and Strategies for and Strategies for Complex Problem solving., 4/e, 2002, Pearson Educations.
4. Robotics for Engineers – YoramKoren, McGraw Hill



**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune**



**Class: B.Tech (Electronics & Telecommunications) SEM: -VIII**

**SUBJECT: - Elective-II System on Chip**

**Teaching Scheme**

**Lecture: 3 Hours/week**

**Tutorial: 1 Hour/week**

**Examination Scheme**

**End Semester Exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignment: 10 marks**

**TW & OR: 50 Marks**

**Credits: 4**

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**Course Prerequisites:** Processor Design, Digital Electronics

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**Course objective:**

- 1) To make students familiar with fundamentals of SOC design methodology.
- 2) To categorize requirements of SOC design.
- 3) To recognize essentials of SOC design.
- 4) To comprehend applications of SOC.

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**Course Outcomes:** On successful completion of this course, students will be able to

- 1) Conceptualize SOC design methodology
- 2) Understand SOC design flow
- 3) Design complex SOC
- 4) Intellectualize future trends in SOC design

**Unit-I**

**The Case for a New SOC Design Methodology**

**[6 Hrs]**

The age of Megagate SOCs, The fundamental trends of SOC design, An improved design methodology for SOC design.

## **Unit-II**

### **SOC Design Today**

**[6 Hrs]**

Hardware System Structure, Software trends, Current SOC Design Flow, Six Major Issues in SOC Design.

## **Unit-III**

### **A New Look at SOC Design**

**[6 Hrs]**

The basics of Processor-Centric SOC architecture, Accelerating Processors for Traditional Software Tasks, System Design with Multiple Processors, New Essentials of SOC Design Methodology

## **Unit-IV**

### **System-Level Design of Complex SOCs**

**[6 Hrs]**

Complex SOC System Architecture Opportunities, Major Decisions in Processor-Centric SOC Organization, Communication Design = Software Mode + Hardware Interconnect, Hardware Interconnect Mechanisms, The SOC Design Flow

## **Unit -V**

### **Advanced Topics in SOC Design**

**[6 Hrs]**

Pipelining for Processor Performance, Inside Processor Pipeline Stalls, Optimizing Processors to Match Hardware, Multiple Processor Debug and Trace, Issues in Memory Systems

## **Unit-VI**

### **The future of SOC Design**

**[6 Hrs]**

What's happening to SOC design, The designer's dilemma, The SOC design transition, Looking into future of SOC design, Future applications of complex SOC.

**Content Delivery Methods:** Chalk & talk, Power point presentation.

**Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination

**List of Tutorials/Experiments:**

- 1) Study of SOC Components
- 2) Study of Integration Technology in SOC with standard CMOS process.
- 3) Study of Technology challenges in SOC design.
- 4) Study of SOC design requirements
- 5) Study of SOC architecture
- 6) Study of SOC test methodology
- 7) Application of SOC in Communication
- 8) Application of SOC in Computer
- 9) Application of SOC in Consumer
- 10) Case study: Complex SOC

**List of Assignments:**

- 1) What are the challenges in SOC design? Describe in brief.
- 2) List various design elements, tools and methodologies playing an important role in SOC Design.
- 3) Using diagram, explain SOC design flow.
- 4) Which are the important issues in SOC design? Explain in detail.
- 5) Discuss the basics of processor -centric SOC design.
- 6) Write essentials of SOC design methodology.
- 7) Define complex SOC system architecture opportunities.

- 8) Explain major decisions in processor-centric SOC organizations.
- 9) Discuss pipelining and exceptions.
- 10) Explain issues in memory system.
- 11) Describe designer's dilemma wrt SOC.
- 12) List future applications of complex SOC.

**Text book:**

- 1) Chris Rowen, Engineering the Complex SOC, Prentice Hall, 2004.

**Reference books:**

- 1) Rainer Leupers, Olivier Temam, Processor and System-on-Chip Simulation, Springer, 2010
- 2) Michael J. Flynn, Wayne Luk, Computer System Design System on Chip, Wiley, 2011
- 3) Bashir M. Al-Hashimi, System-on-Chip: Next Generation Electronics, IET, 2006
- 4) Steve Furber, ARM System on Chip Architecture, Pearson India, 2000
- 5) Wayne Wolf, Ahmed Amine Jerraya, Multiprocessor Systems-on-Chips, Elsevier, 2005.
- 6) Sudeep Pasricha and Nikil Dutt, On-Chip Communication Architectures System on Chip Interconnect, Elsevier, 2008



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**Class: B. Tech (Electronics & Telecommunication) Sem:-VIII**

**Subject: - Elective-II Fuzzy Logic & Neural Network**

**Teaching Scheme**

**Lecture: 03 Hours/week**

**Tutorial: 01 Hour/week**

**Examination Scheme**

**End semester exam: 60 Marks**

**Unit Test: 20marks**

**Attendance: 10 marks**

**Assignments: 10 marks**

**TW & Oral: 50 Marks**

**Credits: 04**

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**Course Prerequisites:**

Engineering Mathematics-II, Engineering Mathematics-III, Signals & Systems.

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**Course Objectives:**

1. Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
  2. Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.
  3. To create awareness of the application areas of neural network technique
  4. Provide alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system.
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**Course Outcomes:** On successful completion of this course, students will be able to

1. Design fuzzy system for Electronics applications.
2. Describe the fundamentals of Crisp sets, Fuzzy sets, Fuzzy Relations and Fuzzy Logic Controller.

3. Describe the various architectures of building an ANN and its applications.
4. Design and implement neural network systems to solve real-world problems
5. Develop models for different applications using fuzzy system.

## **Contents:**

### **Unit I**

#### **Fuzzy Logic -I**

**[05 Hours]**

Concept of Fuzzy number, fuzzy set theory (continuous, discrete), Operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), primary and composite linguistic terms, Concept of fuzzy relation, composition operation (T-norm, T-conorm), Fuzzy if-then rules.

### **Unit II**

#### **Fuzzy Logic -II**

**[07 Hours]**

Fuzzification, Membership Value Assignment techniques, De-fuzzification (Max membership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules- Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

### **Unit III**

#### **Fuzzy Control Systems**

**[06 Hours]**

Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem, washing machine and vacuum cleaner.

### **Unit IV**

#### **Artificial Neural Network -I**

**[05 Hours]**

Biological neuron, Artificial neuron model, concept of bias and threshold , Mc Culloch-Pits Neuron Model, implementation of logical AND, OR, XOR functions Soft Topologies of neural networks, learning paradigms: supervised, unsupervised, reinforcement, Linear neuron model : concept of error energy , gradient descent algorithm and application of linear neuron for linear

regression, Activation functions : binary , bipolar (linear, signum, log sigmoid, tan-sigmoid)  
Learning mechanisms: Hebbian, Delta Rule o Perceptron and its limitations Draft.

## **Unit V**

### **Artificial Neural Network -II**

**[07 Hours]**

Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression, Self-organizing Feature Maps, k-means clustering, Learning vector quantization Radial Basis Function networks: Cover's theorem, mapping functions (Gaussian, Multiquadrics, Inverse multi quadrics), Application of RBFN for classification and regression, Hopfield network, associative memories.

## **Unit VI**

### **Adaptive Neuro-Fuzzy Inference Systems (ANFIS)**

**[06 Hours]**

ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS  
Application of ANFIS/CANFIS for regression

**Content Delivery Methods:** Chalk & talk, Power point presentation.

#### **Assessment Methods:**

1. Unit Test
2. Continuous Assessment
3. End Semester Examination.

#### **List of Tutorials/Experiments:**

1. Study of Fuzzy sets and operations.
2. Study of concepts of fuzzy sets core, support, alpha cuts..
3. Study of fuzzy relation, Max-min composition.
4. Analyze t-norms and t-conorms.
5. Analyze Fuzzy Inference systems -Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model.
6. Analyze architecture of a FLC: Mamdani Type with Example Aircraft landing control problem, washing machine and vacuum cleaner.
7. Study of learning mechanisms, approaches and activation functions in ANN.
8. Study of Multilayer perceptron (MLP) and back propagation algorithm.



9. Study of Radial Basis Function networks.
10. Study of ANFIS architecture and Hybrid Learning Algorithm.

### **List of Assignments:**

1. Implement simple logic network using MP neuron model
2. Implement a simple linear regressor with a single neuron model.
3. Implement and test MLP trained with backpropagation algorithm
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Perform fuzzy sets operations.
7. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian).
8. Implement defuzzification (Max-membership principle, Centroid method, Weighted average method)
9. Implement FIS with Mamdani inferencing mechanism.
10. Implement Simulink model for Vacuum cleaner, washing machine using Fuzzy Logic tools
11. Implement Fuzzy Logic Controller.
12. Implement perceptron learning, multilayer feed forward neural networks.

### **Text Books:**

1. Fundamentals of Neural Networks: Architectures, Algorithms and Applications, Laurene Fausett, Pearson Education, Inc, 2008.
2. Fuzzy Logic with Engineering Applications, Third Edition Thomas, Timothy Ross, John Wiley & Sons, 2010.
3. Neuro- Fuzzy and Soft Computing, J.S. Jang, C.T. Sun, E. Mizutani, PHI Learning Private Limited.
4. Principles of Soft Computing , S. N. Sivanandam, S. N. Deepa, John Wiley & Sons, 2007

### **Reference Books:**

1. Introduction to the theory of neural computation, John Hertz, Anders Krogh, Richard Palmer, Addison –Wesley Publishing Company, 1991

2. Neural Networks A comprehensive foundation,, Simon Haykin,Prentice Hall International Inc- 1999.
3. Neural and Adaptive Systems: Fundamentals through Simulations, José C. Principe Neil R. Euliano , W. Curt Lefebvre, John-Wiley & Sons, 2000
4. Pattern Classification, Peter E. Hart, David G. Stork Richard O.Duda,Second Edition,2000
5. Pattern Recognition, SergiosTheodoridis , Konstantinos Koutroumbas, Fourth Edition, Academic Press, 2008
6. A First Course in Fuzzy Logic, Third Edition, Hung T. Nguyen, Elbert A. Walker, Taylor & Francis Group, LLC, 2008
7. Introduction to Fuzzy Logic using MATLAB, S. N. Sivanandam ,S.Sumathi, S. N. Deepa, Springer Verlag, 2007



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**Class: B.Tech ( Electronics& Telecommunications ) Sem:- VIII**

**SUBJECT: - Project stage - II**

**Teaching Scheme**

**Practical: 08 Hours/week**

**Examination Scheme**

**TW & Oral: 150 marks**

**Total Credits: 08**

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**Course prerequisites:**

Project Stage -I

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**Course objective:**

1. To familiarize the students with the product development cycle
  2. To impart the importance of working as a team.
  3. To introduce the student to literature survey and documentation process.
  4. To encourage the students to visualize and formulate a viable solution to practical engineering problems.
- 

**Course Outcomes:** On successful completion of this course, students will be able to

1. Implement solution for an Engineering problem.
2. Test and troubleshoot the implemented design.
3. Execute the project implementation & financial budget in a timely manner.
4. Student will be able to contribute and work effectively as team member.
5. Generate project report and present it effectively.

Project Stage –II includes various steps such as:

1. System design
2. Testing
3. System documentation
4. Project report



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**Class: B.Tech (Electronics& Telecommunications) Sem:- VII**

**SUBJECT: - Seminar**

**Teaching Scheme**

**Practical: 02 Hours/week**

**Examination Scheme**

**TW & Oral: 50 marks**

**Total Credits: 01**

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**Course prerequisites:** Electronics Engineering, Telecommunication Engineering

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**Course objective:**

1. To develop ability of thinking and motivation for seminar
  2. To expose the students to the state of the art
  3. To develop ability to perform literature survey
  4. To develop Seminar presentation and Technical Communication Skills
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**Course Outcomes:** On successful completion of this course, students will be able to

- Effectively communicate his technical idea or project
- Learn master survey and literature survey techniques
- Write Motivational Statement
- Present the topic

**Seminar Documentation should include**

Cover Title page, plagiarism assessment, report Certificate from Guide, Abstract, list of Figures, List of Tables, Abstract, Presentation Slide using Microsoft power point including bibliography/references in IEEE standard format.

The student shall submit the seminar report in standard format, duly certified for satisfactory completion of the work by the concerned Guide and head of the department.

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**B. Tech. (I. T.) - 2014 Course  
Semester –I**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
		L	P/D	T	End Semester Examination	Continuous Assessment			TW	Total	Th	TW
						Unit Test	Attendance	Assignments				
1	Engineering Mathematics - I	3	--	1	60	20	10	10	--	100	4	--
2	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1
3	Engineering Graphics	4	2	-	60	20	10	10	25	125	4	1
4	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1
5	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1
6	Professional Skill Development - I	2	--	-	30	--	--	20	--	50	2	--
7	Programming Principles and Paradigms	--	2	-	--	--	--	--	50	50	--	1
<b>Total</b>		<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

Teaching Scheme			Examination Scheme-Marks						Credits	
Lectures	Practical	Tutorials	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

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**B. Tech. (I. T.) - 2014 Course  
Semester –II**

Sr. No	Subject	Teaching Scheme			Examination Scheme-Marks						Credits	
					End Semester Exam.	Continuous Assessment			TW	Total		
		L	P/D	T		Unit Test	Attendance	Assignments			Th	TW
8	Engineering Mathematics-II	3	--	1	60	20	10	10	--	100	4	--
9	Fundamentals of Mechanical Engineering	3	2	--	60	20	10	10	25	125	3	1
10	Engineering Mechanics	4	2	--	60	20	10	10	25	125	4	1
11	Engineering Physics	4	2	--	60	20	10	10	25	125	4	1
12	Object Oriented Programming	3	2	--	60	20	10	10	25	125	3	1
13	Professional Skill Development - II	2	--	--	30	--	--	20	--	50	2	--
14	Workshop Technology	--	2	--	--	--	--	--	50	50	--	1
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

Teaching Scheme			Examination Scheme-Marks						Credits	
Lecture	Practical	Tutorial	End Semester Examination	Unit Test	Attendance	Assignments	TW	Total	Theory	TW
<b>19</b>	<b>10</b>	<b>1</b>	<b>330</b>	<b>100</b>	<b>50</b>	<b>70</b>	<b>150</b>	<b>700</b>	<b>20</b>	<b>5</b>

**Total Marks of Semester –I and Semester-II = 1400**

**Total Credits of Semester –I and Semester-II = 50**

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**ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

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**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**



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**02: Fundamentals of Civil Engineering**

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 03 Hours / Week		End Semester Examination: 60 Marks		03 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>Course Pre-requisites:</b>					
The Students should have					
1.	Concepts of units and conversions of units.				
2.	Basic knowledge of Chemistry				
3.	Basic knowledge of geography, concept of latitude and longitude.				
<b>Course Objectives:</b>					
	To make student understand the scope and application of Civil Engineering				
<b>Course Outcomes:</b>					
Students will be able to understand					
1.	Different building components and material				
2.	Classification of surveying				
3.	Levelling of the ground				
4.	Planning of building				
5.	Methods of irrigation and water supply				
6.	Different methods of transportation				
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>				<b>(06 Hours)</b>
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading, material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood, glass and aluminum.				
<b>UNIT - II</b>	<b>Surveying</b>				<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.				
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>				<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights, open space requirements, set back distance, ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings; Concept of Eco friendly structures and Intelligent buildings.				
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>				<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.				
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>				<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures; Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.				
<b>UNIT - VI</b>	<b>Infrastructure</b>				<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of				

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	<p>terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads.</p> <p>Railways- Types of gauges, section of railway track, components of railway track, advantages.</p> <p>Bridges: Components - Foundation, Piers, Bearings, Deck.</p> <p>Airways- Components -Runway, Taxiway and Hangers.</p>	
<b>Term Work:</b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		
1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.	
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication	
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication	
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi	
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.	
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.	
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication	
<b>Reference Books:</b>		
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

**ENGINEERING GRAPHICS**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views

6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India,  
New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International  
Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria  
and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

**BHARATI VIDYAPEETH  
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**ENGINEERING CHEMISTRY**

**Teaching Scheme:**  
**Lectures: 4Hrs/Week**  
**Practical: 2Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory: 04**  
**Practical: 01**  
**Term Work: 25marks**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process  
**(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography** : Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement** : Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.  
**(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.  
Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.  
**(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.  
Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.  
**(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions  
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.  
Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.  
**(08 Hours)**

**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers  
Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,  
Conformations :- conformations of ethane, conformations of n-butane  
**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

**References / Text Books :**

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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<b>02: Fundamentals of Electrical Engineering</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Mathematics	
2.	Physics	
<b>Course Objectives:</b>		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
<b>Course Outcomes:</b>		
1.	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
2.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
3.	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
4.	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
5.	Define basic terms of single phase and three phase ac circuits and supply systems	
6.	Know and use electrical safety rules	
<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.	
<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>

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	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency &amp; Regulation by direct load test.</p>	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.	

**Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$  ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

**Text Books:**

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of India Pvt. Ltd

**Reference Books:**

1. Edward Hughes – "Electrical Technology"- Seventh Edition, Pearson Education Publication
2. H. Cotton – "Elements of Electrical Technology", C.B.S. Publications
3. John Omalley Shawn – "Basic circuits analysis" Mc Graw Hill Publications



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<b>4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications</b>	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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**ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**  
**Lectures: 3Hrs/Week**  
**Tutorials: 1Hr/Week**

**Examination scheme:**  
**End Semester Examination: 60 marks**  
**Continuous Assessment: 40 marks**

**Credits Allotted:**  
**Theory : 03**  
**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

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**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition(1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

**FUNDAMENTALS OF MECHANICAL ENGINEERING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)
UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p>	(08)

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	<p><b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	
UNIT-VI	<p><b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines
7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

**References-**

- 1 “Thermodynamics An Engineering Approach” Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. “Applied Thermodynamics for Engineering Technologists” T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. “I.C. Engines Fundamentals” J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. “Internal Combustion Engine “: V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 “Strength of Materials” H. Ryder, Macmillians, London, 1969, 3rd edition.
6. “Mechanics of Materials” Johston and Beer TMH, 5th edition
- 7 “Mechanisms and Machine Theory” Ambekar A.G., Prentice-Hall of India, 2007.
8. “Theory of Machines” S.S. Rattan, Tata McGraw- Hill, 2nd edition.

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9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication,  
New Delhi, 2nd edition.

10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th  
edition

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**10: Engineering Mechanics**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit

**Course Pre-requisites:**

The Students should have knowledge of

1. Scalar and Vector
2. Newton's law of motion
3. Law of friction
4. Concept of physical quantities, their units and conversion of units
5. Concept of differentiation and integration

**Course Objectives:**

To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.

**Course Outcomes:**

**The student should be able to**

1. calculate resultant and apply conditions of equilibrium.
2. analyze the truss and calculate friction force.
3. calculate centroid and moment of inertia.
4. solve problem on rectilinear motion.
5. solve problems on curvilinear motion.
6. use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.

<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	
<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum	

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Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>	
A) The term-work shall consist of minimum <b>Five</b> experiments from list below.	
1. Determination of reactions of Simple and Compound beam.	
2. Study of equilibrium of concurrent force system in a plane.	
3. Determination of coefficient of friction for Flat Belt.	
4. Determination of coefficient of friction for Rope.	
5. Study of Curvilinear motion.	
6. Determination of Coefficient of Restitution.	
B) The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.	
<b>Text Books:</b>	
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.	
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.	
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.	
<b>Reference Books:</b>	
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.	
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.	
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.	
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.	
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.	
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI



**ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

## UNIT-VI

### ARCHITECTURAL ACOUSTICS

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

### QUANTUM MECHANICS

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

(08hours)

### TERM WORK

#### Experiments

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

#### Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

***Reference Books:***

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

**Object-Oriented Programming in 'C++'**

**TEACHING SCHEME**

Lectures : 2 Hrs/week

Practicals : 2 Hrs/week

**EXAMINATION SCHEME**

ESE (End Semester Examination) : 60 Marks

Continuous Assessment: 40 Marks

Term Work : 25 Marks

Credits : 3 Credits

**Course Pre-requisite:**

Programming Principles and Paradigms, "C" programming language.

**Course Objectives:**

- To familiarize with the universal concepts of computer programming.
- To present the syntax and semantics of the "C++" language as well as basic data types offered by the language
- To discuss the principles of the object-oriented model and its implementation in the "C++" language
- To demonstrate the means useful in resolving typical implementation problems with the help of standard "C++" language libraries

**Course Outcomes:**

*At the end of this course students will able to :*

- Understand basic concepts of Object Oriented Programming and applications of OOP.
- Use basic, user-defined and derived data types, Operator precedence.
- Apply Decision Structure, Loops and Functions
- Write, Debug and Compile Programs of C++
- Implement OOP concepts like – Inheritance using C++ programming.

**UNIT I**

**(3 Hours)**

**Principles of Object Oriented Programming:**

Object Oriented Programming Paradigm, Basic concepts of Object Oriented Programming, Benefits of OOP, Object Oriented Languages, Applications of OOP.

## **UNIT II**

**(5 Hours)**

### **Beginning with C++:**

Overview of C++, Sample C++ Program, C++ statements, Structure of C++ program, Creating source file , compiling and Linking, Tokens, Keywords , Identifiers and Constants, Basic data types, User-defined data types, Derived data types, Declaration of variables, Dynamic initialization of variables, Scope Resolution Operator, Operator Overloading, Operator precedence, Control Structures.

## **UNIT III**

**(5Hours)**

### **Functions in C++:**

The Main Function, Function Prototyping, Call by Reference, Inline functions, Default arguments, Function Overloading , Friend and Virtual Functions .

### **Classes and Objects:**

Class specification , Class Objects , Scope resolution operator, Accessspecifiers- Public, Private, Protected, Defining member Functions, Nesting of Member Functions, Private Member Functions, Static Data Members , Static Member Functions, Data hiding.

## **UNIT IV**

**(6 Hours)**

### **Inheritance: Extending Classes:**

Defining Derived Classes, Single Inheritance, Making a Private member inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual Base Class, Abstract class. Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors , Passing parameters to base class constructors, virtual base classes. STL: An overview, containers, vectors, lists, maps.

## **UNIT V**

**(6 Hours)**

### **Constructors and Destructors:**

Constructors, Parameterized constructors, Default Constructors, Copy constructor, Dynamic Initialization of Objects, Destructors.

### **Polymorphism:**

Base class, Virtual Functions, Pure Virtual Functions, Calling a virtual function through a base class reference, Early and Late Binding.

## **UNIT VI**

**(3 Hours)**

### **Managing Console I/O operations:**

C++ Stream Classes, Unformatted I/O Operations, Working with Files, Opening and Closing a file, Formatted I/O.

### **Text Books/References:**

- *Herbert Schildt, "The Complete Reference C++", 4<sup>th</sup> Edition, Mc Graw Hill, 2003.*
- *Stanley.B.Lippmann, Josee Lajoie, Barbara.E.Moo, "C++ Primer", 5th Edition, Pearson Education, 2013.*
- *Scott Meyers: "Effective C++", Third Edition, Addison-Wesley, 2005.*

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- *E. Balaguruswamy, "Object Oriented Programming using C++", 4th Edition, Mc Graw Hill, 2010.*

**Syllabus for Unit Test**

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI

**Workshop Technology**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.



**BHARATI VIDYAPEETH UNIVERSITY, PUNE**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (I.T.) – SEM III – 2014 Course**

Sr. No.	Subject	Teaching Scheme (Hrs/Week)			Examination Scheme (Marks)							Credits			
		L	P/D	T	End Semester Examination	Continuous Assessment			TW & Oral	Total	Theory	TW & Pr	TW & Or	Total	
						Unit Test	Attendance	Assignments							
1	Fundamentals of Software Engineering	3	--	1	60	20	10	10	--	--	100	4	--	--	4
2	Discrete Mathematics	3	2	--	60	20	10	10	50	--	150	3	1	--	4
3	Software Project Management	3	--	--	60	20	10	10	--	--	100	3	--	--	3
4	Data Structures and Files	3	2	--	60	20	10	10	50	--	150	3	1	--	4
5	Platform Independent Programming Paradigms	3	2	--	60	20	10	10	--	50	150	3	--	1	4
6	Professional skill Development-III	4	--	--	100	--	--	--	--	--	100	4	-	--	4
7	IT Lab-I	--	4	--	-	--	--	--	50	--	50	--	2	--	2
	<b>TOTAL</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>04</b>	<b>01</b>	<b>25</b>

**BHARATI VIDYAPEETH UNIVERSITY, PUNE**

**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Programme: B. Tech. (I.T.) – SEM IV – 2014 Course**

Sr.no	Subject	Examination Scheme (Marks)							Credits			
		P/D	T	End Semester Examination	Continuous Assessment	TW & Practical		TW & Oral	Theory	Tw & Or		Total
						Unit Test	Attendance			Assignments		
1	Advanced Data Structure	2	-	60	20	10	10	--	3	1	--	4
2	Digital Electronics and Logic Design	--	--	60	20	10	10	--	3	-	--	3
3	Database Management System	2	--	60	20	10	10	50	3	-	1	4
4	Engineering Mathematics III	--	1	60	20	10	10	--	4	-	-	4
5	Computer Graphics	2	--	60	20	10	10	--	3	1	--	4
6	Professional skill Development--IV	--	--	100	-	-	-	-	4	-	--	4
7	IT Lab-II	4	-	--	--	-	-	-	-	2	--	2
	<b>TOTAL</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>20</b>	<b>04</b>	<b>01</b>	<b>25</b>

**Total CreditsSemester - III = 25**

**Total CreditsSemester - IV = 25**

**Grand Credits = 50**

## **Fundamentals of Software Engineering**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Tutorial : 1Hr/Week</b>	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

To enable students to work in teams and use the latest software technologies to develop and implement creative solutions to complex problems.

### **Course Prerequisites:**

**Students should have knowledge of**

- 1) Developing well-structured, modular programs
- 2) Mathematical knowledge of computer science, including discrete structures, algorithms design and analysis.

### **Course Outcome:**

**Students will be able to:**

- 1) learn appropriateness of software development model for given software system.
- 2) document user requirement using different communication techniques.
- 3) create the analysis model of the system under consideration .
- 4) gain knowledge of data, control and function design concepts
- 5) understand software quality concepts
- 6) Formulate a testing strategy for a software system,

### **UNIT-I Introduction to Software Engineering : ( 6 Hours)**

Definition of Software Engineering, Software characteristics, Applications, Software myths, Software Development Process models: The Waterfall model, Incremental process models, Evolutionary Process models, Component based development process model, The Formal Method Model, Aspect–Oriented software Development, Unified Process, Agile Processes Models.

### **UNIT-II System Engineering Practices: ( 6 Hours)**

Analysis Modeling Principles, Design Modeling Principles, Coding Principles, Testing Principles, Computer based system, System Modeling, System Simulation, System Modeling  
**Requirement Engineering:** Requirements Engineering Tasks, Initiating Requirement engineering Process, Eliciting requirement, Introduction to SRS format, creating SRS.

**UNIT-III**      **Analysis and modeling:** Elements of Analysis Model, Analysis modeling approaches: Data modeling, Scenario based modeling, Flow oriented modeling.      **( 6 Hours)**

**UNIT-IV**      **Design Engineering:**      **(6 Hours)**  
**System Design:** Design Concepts, The Design model architecture, cohesion and coupling, Data Design, Architectural Styles and Patterns, Architectural Design, Mapping Data flow into Software Architecture ,User Interface design.  
**Coding:** TOP-DOWN and BOTTOM-UP structure programming, Information Hiding, Programming Style.

**UNIT-V**      **Software Change Management :**      **( 6 Hours)**  
Software configuration management (SCM), Elements of SCM, Base lines, Software configuration items, SCM Repository, SCM process: Version Control, Change Control, Configuration Audit, Status Reporting.

**UNIT-VI**      **Testing Strategies:**      **( 6 Hours)**  
Levels of Testing, Functional Testing, Structural Testing, Test Plan, Test Case Specification, Test case design, A strategic approach to software Testing: Verification and Validation Testing, Organizing for software Testing, Software Testing Strategy for conventional Architecture: Unit Testing Integration Testing, Validation Testing, System Testing, Debugging, White-box, Black-box testing, Basis path Testing, Control structure testing.

**Assignments:** Implement Study assignments assigned by course faculty .

**Text Books:**

- 1) Roger S. Pressman, Software Engineering: A Practitioner's Approach (6/e.) McGraw Hill, 2011.

- 2) James F. Peter, Software Engineering - An Engineering Approach, John Wiley (2004).
- 3) Pankaj Jalote, Software Engineering: A Precise Approach , Wiley India, 2010.
- 4) Ian Sommerville, Software Engineering, Addison-Wesley Publishing Company, (2006) 8th ed.

**Reference Books:**

- 1) *A Shalloway and J Trott, Design Patterns Explained: A new perspective on object oriented design (2/e), Pearson, 2004.*
- 2) *Rajib Mall, Fundamentals Of Software Engineering ,PHI Learning Pvt. Ltd 2009*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**  
**Unit Test -2    Unit IV, V and VI**

**Discrete Mathematics**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical : 2 Hrs/Week</b>	<b>Continuous Assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

**Course Objectives:**

1. To apply and relate knowledge of mathematics in computer science.

2. To learn proof theory with propositional calculus and induction.
3. To map and express network problem with trees and graphs

**Course Prerequisites:** Students should have fundamental mathematical knowledge.

**Course Outcome:**

Students will be able to:

1. Formulate real world problems into statement forms using sets and relations which can be solved or proved mathematically using set theory and logic.
2. Find and map relation between mathematical statements.
3. Design mathematical model from theoretical statements.
4. Find optimum solution using theory of probability.
5. Apply knowledge graphs to solve network problems.
6. Design searching algorithm efficiently by applying tree and tree traversal logic.

<b>UNIT-I</b>	<b>Propositional Logic and Proof Theory</b> Sets, Set operations, Finite and Infinite sets, Venn diagram, Principle of inclusion and exclusion, Multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Relations and Functions</b> Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence, Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains. Functions, Composition of functions, Invertible functions, Pigeonhole Principle.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Induction and Recurrence Relations</b> Mathematical Induction, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Total solutions, Solutions by the method of generating functions	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Probability</b> Basics of permutations and combinations, Discrete Probability, Conditional Probability, Probability distribution: normal, binomial, <a href="#">Poisson</a> , <a href="#">Bernoulli distribution</a> .	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Graphs</b> Basic terminology, multi graphs and weighted graphs, paths and circuits, shortest path in weighted graph, Hamiltonian and Euler paths and circuits, factors of a graph, planer graph and Travelling salesman problem.	<b>(06 Hours)</b>

**UNIT-VI****Trees****(06 Hours)**

Trees, rooted trees, path length in rooted trees, prefix codes, binary search trees, spanning trees and cut set, minimal spanning trees, Kruskal's and Prim's algorithms for minimal Spanning tree.

**Assignment List:**

1. Write a program to implement following set operations.
  - i) Union
  - ii) Intersection
  - iii) Cartesian product
  - iv) Power set
2. Write a program to implement Warshall's algorithm.
3. Write a program to calculate value of polynomial for variable x.
4. Write a program to find fogoh, where  $g(x)$  and  $h(x)$  is taken from user.
5. Write a program to check whether Eulerian circuit is present in the given graph.
6. Write a program to find shortest path between the vertices in given graph.
7. Write a program to create binary search tree for the values taken from user.
8. Write a program to implement various tree traversals.
9. Write a program to implement Kruskal's algorithm.
10. Write a program to implement Prim's algorithm.

**Text Books:**

- 1) Kenneth H. Rosen, Discrete Mathematics and its Applications, 7th Edition, McGraw Hill.
- 2) Seymour Lipschutz, M.Lipson, Discrete Mathematics, 3rd Edition, McGraw Hill.

**Reference Books:**

- 1) C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 4th Edition, McGraw Hill.
- 2) J.P.Tremblay, R. Manohar, Discrete Mathematical Structures With Applications to Computer Science, McGraw Hill.

**Syllabus for Unit Test:****Unit Test -1     Unit I ,II and III****Unit Test -2     Unit IV, V and VI**

## **Software Project Management**

**Teaching Scheme**  
**Theory : 3Hrs/Week**

**Examination Scheme**  
**End Semester Examination: 60 Marks**  
**Continuous assessment : 40 Marks**

**Credit Allotted**  
**Theory: 3**

### **Course Objectives:**

- 1) To help the students gain understanding of the functions and responsibilities of the manager, and enable them to analyze and understand the environment of the organization.
- 2) To introduce them with techniques used in the performance of managerial job
- 3) Enable them to analyze and understand the environment of an IT organization

**Course Prerequisites: N/ A**

### **Course Outcome:**

**Students will be able to:**



- 1) Understand basic concepts of management functions
- 2) Understand the process of IT project initiation
- 3) Understand the IT project planning process
- 4) Understand the team dynamics of a project team
- 5) Understand the concepts of quality and process improvement for IT projects
- 6) Introduce modern concepts in IT management

<b>UNIT-I</b>	Conceptual difference between terms Management, Administration and Organization, Functions and Principles of Management, Levels of Management, Type of business organization , Organization structures.	<b>(06 Hours)</b>
<b>UNIT-II</b>	Defining Project management life cycle, Gathering and establishing project requirements, Defining the project goals and Scope management, Risk management, Budgeting a project, Creating a work breakdown structure.	<b>(06 Hours)</b>
<b>UNIT-III</b>	Building project plan, Preparing and implementing the project plan, Project schedule, Project network diagram creation and analysis, Project constraints, Tracking project progress and financial obligations, Revising the project plan, Establishing change control, Coping with project delays	<b>(06Hours)</b>
<b>UNIT-IV</b>	Recruitment and selection, Training, Creating roles and responsibilities, Team Management: Leading, Mechanics, Meetings, Maintaining, Motivating, Conflict Management, Job evaluation and merit rating	<b>(06 Hours)</b>
<b>UNIT-V</b>	Metric Frameworks for software projects, Metrics for process and product quality, Quality of deliverables, Quality assurance and standards, Quality planning and control, Process: Classification, measurement, analysis and modeling, Process change, Six sigma, CMM, CMMI, PCMM, ISO standards.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	Knowledge management: Definition, needs, techniques and architecture. Learning Organizations, Knowledge management system life cycle, Knowledge workers and knowledge audits, Supply chain management, Change management, Stress management, Credit rating of software projects, Intellectual property rights and Cyber laws	<b>(06 Hours)</b>

**Assignment List: N/ A**

**Text Books:**

- 1) Joseph Phillips, "IT Project Management", Tata McGraw-Hill 2003 Edition
- 2) Pankaj Jalote, "Software Project Management", Addison-Wesley, 2002

**Reference Books:**

- 1) Kathy Schwalbe, "Information Technology Project Management", Cengage Learning, 7<sup>th</sup> Edition
- 2) Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 2009, 3<sup>rd</sup> Edition
- 3) Ian Sommerville, "Software Engineering", Pearson Education India
- 4) Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Palgrave Macmillan
- 5) Elias M. Awad Hassan M. Ghaziri, "Knowledge Management", Pearson Education
- 6) By Harold R. Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", John Wiley & Sons Inc., 10<sup>th</sup> Edition
- 7) Debora J. Halbert, "Resisting Intellectual Property", Taylor and Francis Group, Routledge-2007

**Syllabus for Unit Test:**

**Unit Test -1    Unit I,II and III**  
**Unit Test -2    Unit IV,V and VI**

**Data Structures and Files**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical : 2 Hrs/Week</b>	<b>Continuous Assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

**Course Objectives:**

1. To study fundamentals of data structures
2. To implement linear sequential and linked organization data structures
3. To study fundamentals of Files and hashing

**Course Prerequisites:**

**Students should have knowledge of**

- 1) 'C' programming
- 2) Basics of OOP

**Course Outcome:**

**Students will be able to:**

- 1) Understand the fundamentals of data structure.
- 2) Implement linear sequential data structures.
- 3) Implement linear linked organization data structures.
- 4) Implement non-linear linked organization data structures.
- 5) Implement searching, sorting techniques.
- 6) Understand Hashing terms and techniques.

**UNIT-I      Review of 'C' programming      (06 Hours)**

Arrays, Pointers, Structure, Functions, Recursive Function

**Introduction to Data Structures:**

Concept of Data object, Data structure, Abstract Data Types (ADT), realization of ADT in 'C'. Types of data structures. Algorithm Analysis: Definition and Characteristics of Algorithm, Analyzing Programs, Time and Space Complexity, Big 'O' Notation, Graphical Representation of Time Complexity, best, Average and Worst Case of Complexity

**UNIT-II      Linear Data Structures using Sequential Organization:      (06 Hours)**

Concept of sequential organization, arrays as ADT, sparse matrix, Polynomial representation using array.

**Stack:** Concepts, Operations on Stacks, Multi-stack, Application of Stack: Polish notation (infix, prefix, postfix expressions), Conversion and Evaluation of expressions

**Queue:** Concept, Operations on Queue, Circular Queue, Priority Queue, Double Ended Queue, Applications of Queue

**UNIT-III      Linear Data Structure Using Linked Organization:      (06 Hours)**

Linear Data Structures using Linked Organization, Limitations of static memory allocation, Dynamic memory allocation in C. Single Linked List, Double Linked List, Circular Linked List, Generalized Linked List, Application of DLL in dynamic storage management, garbage collection and compaction

**UNIT-IV Non-Linear Data Structure: (06 Hours)**

**Trees:** Basic terminology, Binary Trees, representation and operations of binary tree, Binary tree traversal (Inorder, Postorder, Preorder), Threaded Binary Tree, Binary Search Tree (Weighted BST), AVL Tree

**Graphs:** Basic terminology, Representation of Graph using adjacency Matrix, List and Multilist, Graph Traversal (DFS & BFS), Spanning Tree. Kruskal's and Prim's Algorithm for MST, Dijkstra's algorithm for shortest Path.

**UNIT-V Sorting and Searching Techniques: (06 Hours)**

**Sorting:** Need of Sorting and Searching, Internal & External sorting. Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort, Heap sort, Merge sort. Analysis of sorting techniques,  
**Searching:** Sequential search, Binary search, Fibonacci search

**UNIT-VI File Organization and Hashing: (6 Hours)**

Introduction to files, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random access files, File Organization, Indexing

**Hashing:** symbol table, Hash tables, Hashing Functions, Overflow Handling and Collision Resolution strategies

**Assignment List:**

1. Write a Program to implement fibonacci series, factorial of no and checking for prime no.
2. Write a Program to implement functions for Stack, Queue and Circular Queue data structure.
3. Write a Program to convert expression from
  1. Infix to Prefix
  2. Infix to Postfix
4. Write a Program to implement polynomial operations
5. Write a Program to implement Sparse Matrix operations

6. Write a menu driven program to implement Singly Linked List for basic operations
7. Write a menu driven program that implements Doubly Linked List for basic operations
8. Write a Program to implement Binary Search Tree and Traversal in BST(Inorder, Preorder, Postorder)
9. Write a Program to implement Threaded Binary Tree and its Traversals.
10. Write a Program to implement Breadth First search and Depth First Search in graph.
11. Write a C Program to implement Linear and Binary Search
12. Write a Program to implement sorting methods. (Bubble sort, Selection sort, Insertion sort, Quick sort )

**Text Books:**

1. S. Lipschutz, "Data Structures", McGraw Hill Pub.
2. Y. Langsm, M. Augentin, A. Tanenbaum, "Data Structure Using C and C++", Pearson Education
3. R. Gilberg, B. Forozon, "Data Structure: A pseudo code approach with C"

**Reference Books:**

1. Ellis Horowitz, Sartaj Sahni , "Data Structures,Algorithms&Applications Inc++, University Press", 2<sup>nd</sup> Edition
2. Trembley Jean Paul, Sorn Soon Paul G, "An Introducton to Data Structures with Applications", Tata McGraw-Hill Publishing Company, 2008

**Syllabus for Unit Test:**

**Unit Test -1      Unit I ,II and III**  
**Unit Test -2      Unit IV, V and VI**

## Platform Independent Programming Paradigm

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/ Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/ week	Continuous assessment : 40 Marks	Tw & Or :1
	Term Work and Oral (Tw & Or) : 50 Marks	

### Course Objectives:

- 1) To provide an understanding of Platform Independent Programming
- 2) To instill basics of Ruby, Python and Web-applications

### Course Prerequisites:

Students should have knowledge of

- 1) C, C++
- 2) Basic Knowledge of Computing terminologies

### Course Outcome:

Students will be able to:

- 1) Convey basic concepts of cross platform software development.
- 2) Analyze programs in Ruby and Python.
- 3) Demonstrate JAVA concepts in terms of OOP.
- 4) Analyze the concepts of HTML and CSS for creating webpages.
- 5) Analyze the applications of Cross Platform Programming.
- 6) Describe the architecture of JUCE.

<b>UNIT-I</b>	<b>Introduction</b> Cross platform software development, Software Platforms, Operating Systems – introduction and its relevance to application software, Scripting, Compilers and Interpreters.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Ruby Programming Language</b> Semantics, Syntax, data types – strings & collections, conditional statements and loops, Implementation of Class.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Java</b> Architecture, JVM, Byte code, data types, conditional statements and loops, functions.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Python</b> Semantics, Syntax, data types, statements, methods.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Internet</b> Web servers, Browsers, Webpages, Introduction to Scripting languages, Basics of HTML and CSS.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Applications</b> Cross platform development & challenges, Cross platform mobile development, HTML5. <b>JUCE</b> Introduction, JUCE Module Format, Introjucer, Data Structure, Working with Media Files.	<b>(06 Hours)</b>

**Assignment List: (Term work shall consist of Six assignments from above syllabus.)**

- 1) Demonstrate the programming model of Ruby using a simple example.
- 2) Discuss OOP features available in JAVA.
- 3) Summarize atleast 10 Methods of Python.
- 4) Write a Case Study of JUCE Module Format.
- 5) Explain the various types of CSS with suitable example.
- 6) Compare HTML webpage with HTML5 webpage.

**Text Books:**

- 1) “System Software and Operating System” – D M Dhamdhare (Tata McGraw Hill)
- 2) “The Ruby Programming Language” - David Flanagan & Yukihiro Matsumoto (O’Reilly Media)

- 3) “Java - The Complete Reference” - Herbert Schildt( McGraw Hill )
- 4) “Think Python” - [Allen Downey](#) (O’Reilly)
- 5) “Web Technologies” – Black Book (Dreamtech Press)
- 6) “Getting started with JUCE” - Martin Robinson (PACKT Publishing)

**Reference Books:**

- 1) “Professional Cross-Platform Mobile Development” - Scott Olson, John Hunter(Wrox Publication)

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV,V and VI**

## ITL - I

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Practical : 4 Hrs/Week</b>	<b>Practical and Term Work : 50 Marks</b>	<b>Tw &amp; Pr : 2</b>

**Course Objectives: To**

- 1) Apply concepts of programming language to meet the requirements specified.
- 2) Sketch an outline of a website with GUI.
- 3) Solve various problems during development of website.
- 4) Analyze the given requirement to design the pages for a website.
- 5) Test the functionalities required.
- 6) Design web application on an internet.

**Course Prerequisites:**

**Students should have knowledge of**

- 1) Programming language
- 2) Presentation layer, properties

**Course Outcome:**

**Students will be able to:**

- 1) Design the layout of a website
- 2) Maintain the presentation logic and business logic
- 3) Solve customers’ requirement by designing web pages
- 4) Understand principals of GUI
- 5) Validate the component’s role and functionalities associated with it



6) Design website using various client side and server side scripting.

- UNIT-I Introduction to an Internet:** Introduction to internet and its applications, E- mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, netscape navigator, opera, firefox, chrome, mozilla. Search engine, web saver - apache, IIS, proxy server, HTTP protocol. **(06 Hours)**
- UNIT-II HTML :** HTML Tag Reference, Global Attributes, Event Handlers, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Frame Tags, Executable content tags. Imagemaps : What are Imagemaps Client-side Imagemaps, Server-side Imagemaps, Using Server-side and Client-side Imagemaps together, alternative text for Imagemaps, Tables : Introduction to HTML tables and their structure, The table tags, Alignment, Aligning Entire Table, Alignment within a row, Alignment within a cell, Attributes, Content Summary, Background color, Adding a Caption, Setting the width, Adding a border, Spacing within a cell, Spacing between the cells, spanning multiple rows or columns, Elements that can be placed in a table. Passing form data Style Sheets : What are style sheets, Why are style sheets valuable Different approaches to style sheets, Using Multiple approaches, Linking to style information in s separate file, Setting up style information, Using the tag, embedded style information. **(06 Hours)**
- UNIT-III JavaScript:** Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators : Assignment Operators, Comparison Operators Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbIClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onsubmit, onUnload. **(06 Hours)**
- UNIT-IV XML :** Introduction to XML, Anatomy of an XML, document, Creating XML Documents, Creating XML DTDs, XML Schemas, **(06 Hours)**

XSL.

**UNIT-V**      **PHP** : Why PHP and MySQL?, Server-side web scripting, **(06 Hours)**  
Installing PHP, Adding PHP to HTML, Syntax and Variables,  
Passing information between pages, Strings, Arrays and Array  
Functions, Numbers, Basic PHP errors / problems.

**UNIT-VI**      **Advanced PHP and MySQL** : PHP/MySQL Functions, **(06 Hours)**  
Displaying queries in tables, Building Forms from queries, Basic  
CRUD functionalities using PHP, Cookies and HTTP, Type and  
Type Conversions, E-Mail.

**Assignment List:**

- 1) Design a web page for Department of Information Technology, BVUCOE, Pune.
- 2) Develop a website using CSS alignment.
- 3) Simulate e-album of images using Imagemap.
- 4) Maintain database of student using XML and publish the data on a web.
- 5) Using Java Script design a web page that prints factorial / Fibonacci series / any given series.
- 6) Design a form and validate all the controls placed on the form using Java Script.
- 7) Design a DTD, corresponding XML document and display it in browser using CSS.
- 8) Develop MIS for student, faculty, lab and syllabus.
- 9) Simulate cookies using PHP.
- 10) Implement CRUD operation on MySQL

**Text Book:**

- 1) Web Design The complete Reference, Thomas Powell, Tata McGrawHill
- 2) PHP : The Complete Reference By Steven Holzner, Tata McGrawHill

**Reference Books:**

- 2) HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
- 3) JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider

## **Advanced Data Structure**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical : 2 Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>

## Term Work and Practical (Tw & Pr) : 50 Marks

### Course Objectives:

- 1) Apply important algorithmic design paradigms and methods of analysis
- 2) Analyze the Complexity of Algorithms

### Course Prerequisites:

Students should have knowledge of basic data structures with their operations.

### Course Outcome:

#### Students will be able to:

- 1) Understand the analysis of algorithms, Concept of Complexity of Algorithms
- 2) Understand and analyze threaded binary trees.
- 3) Understand graph algorithms
- 4) Understand pattern matching algorithms
- 5) Understand queues and its types.
- 6) Understand dynamic programming

### UNIT-I Analysis of Algorithms : (06 Hours)

Algorithms, Designing Algorithms, Analyzing Algorithms, frequency count and its importance in analysis of an algorithm, Analysis of algorithm efficiency- asymptotic notations and its properties. Performance analysis: Time complexity and Space complexity. Analyzing Recursive Programs.

### UNIT-II Threaded Trees : (06 Hours)

Properties of Threaded trees, Insertion, deletion and traversal AVL Trees, Properties of AVL trees, rotations, insertion and deletion, Red-Black Trees, Properties of Red-Black Trees, rotations, insertion and deletion, B-Trees, Definition of B-Trees, Basic operations on B-Tree, Deleting a key from B tree.

### UNIT-III Graphs: (06 Hours)

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-

Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm.

**UNIT-IV Strings :** (06 Hours)

String Matching: The Native String-Matching Algorithm – Brute force, Rabin-Karp and Knuth-Morris-Pratt Algorithms, Boyer-Moore algorithm, String matching with automata.

**UNIT-V Priority Queues :** (06 Hours)

Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion, External sorting Model, Multiway merge, Polyphase merge.

**UNIT-VI Dynamic Programming :** (06 Hours)

Concept of Dynamic Programming, Dynamic Programming basic strategy, General Method of Dynamic Programming, Limitations of Dynamic Programming, traveling salesman problem ,0/1 Knapsack Problem.

#### Assignment List:

- 1) To analyze the algorithm of anagram detection by writing a Boolean function that will take two strings and return whether they are anagrams.
- 2) Given a list of numbers in random order, write an algorithm that works in  $O(n\log(n))$  to find the kth smallest number in the list.
- 3) Implement the non-recursive pre-order tree traversal algorithm.
- 4) Construct AVL tree for the list {J,F,M,A,N,K,L,A,S,O,P,D}?
- 5) To implement the Floyd Warshall algorithm to find the shortest path.
- 6) Given two strings – a text and a pattern, determine whether the pattern appears in the text using Rabin-Karp and Knuth-Morris-Pratt Algorithms.
- 7) Write a C program to implement queue ADT using Arrays.
- 8) Write a C program to implement queue ADT using Linked List.
- 9) To generate the sets  $S^i \cdot 0 \leq i \leq 3$  for the following knapsack instance:  $n = 3$  ,  $(w_1, w_2, w_3) = (2, 3, 4), (p_1, p_2, p_3) = (1, 2, 5)$  and  $M = 6$ . In addition find an optimal solution.

#### Text Books:

- 1) Anany Levitin-“Introduction to design and analysis of algorithms”, Third Edition, Pearson Education, 2012
- 2) Aho Hopcroft Ullman —Data Structures and Algorithms, Pearson Education, 2002.
- 3) “Fundamentals of Computer Algorithms”, Horowitz, Sahani, Rajsekharan, Galgotia Publications.

### Reference Books:

1)

Tanenbaum A.S, Langram Y, Augustine M.J., Data Structures using C & C++||, Prentice

Hall of India, 2002.

2)

Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++||, Pearson Education,

2002.

3) Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.

4) Thomas H.Corman,Charles E.Leiserson,Ronald L.Rivest and Clifford Stein, ”Introduction to algorithms”Third Edition ,PHI Learning Private Limited,2012.

5) Fundamentals of DATA STRUCTURES in C: 2<sup>nd</sup> ed, Horowitz, Sahni, Anderson-freed, Universities Press.

6) Advanced Data Structures :A.A.Puntambekar,Technical Publications

### Syllabus for Unit Test:

Unit Test -1      Unit I ,II and III

Unit Test -2      Unit IV, V and VI

## **Digital Electronics and Logic Design**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

- 1) To introduce number systems and codes.
- 2) To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
- 3) To introduce the concept of memories, programmable logic devices and digital ICs.
- 4) Give students the basic tools for the design and implementation of digital modules and subsystems.

- 5) Give students the concept of digital logic design.
- 6) Reinforce theory and techniques taught in the classroom through project assignments.

**Course Prerequisites:**

**Students should have knowledge of**

- 1) Basic electronics

**Course Outcome:**

**Students will be able to:**

- 1) Understand various logic families, number systems and different theorems in Boolean Algebra.
- 2) Understand various combinational circuits and reduction of Boolean expressions using different techniques.
- 3) Understand various sequential circuits and solve design problems using this circuits.
- 4) Understand concept of state machines.
- 5) Understand different types of memories, working of cache and different advanced DRAMs.
- 6) Understand the concept and writing programs in VHDL.

**UNIT-I** Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements.TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I<sup>2</sup>L, DCTL.  
Boolean Algebra : Number System : Binary, Hexadecimal numbers, octal numbers and number conversion. Signed Binary number representation: Signed Magnitude, 1's complement and 2's complement representation, Binary, Octal, Hexadecimal Arithmetic: 2's complement arithmetic.Algebra for logic circuits: Logic variables, Logic functions -NOT, AND, NOR, XOR, OR, XNOR, NAND.

**UNIT-II** Standard representations for logic functions, k map representation of logic functions (SOP m POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions,



Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractions, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Decoders, demultiplexer trees. Introduction to Quine McCluskey method.

- UNIT-III** 1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops. Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter. Effect on synchronous designs. **(06 Hours)**
- UNIT-IV** Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. **(06 Hours)**
- UNIT-V** Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM, expanding memory size, Synchronous DRAM (SDRAM), Double Data Rate SDRAM, Synchronous SRAM, DDR and QDR SRAM, Content Addressable Memory. **(06 Hours)**
- UNIT-VI** Algorithmic State Machines: ASM charts, notations, design of simple controller, multiplexer controller method: **(06 Hours)**  
Introduction to HDL, VHDL: Library, Entity, Architecture, Modeling styles, Data objects, Concurrent and sequential statements, Design examples using VHDL for basic combinational and sequential circuits.

**Text Books:**

- 1) Morris Mano, Digital Design, Prentice Hall of India, 2002.
- 2) R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw-Hill, 2003, ISBN 0 –

07 – 049492 – 4

- 3) Malvino, D. Leach “ Digital Principles and Applications”, 5th edition, Tata McGraw Hill

**Reference Books:**

- 1) John M. Yarbrough, ‘Digital Logic, Application & Design’, Thomson, 2002
- 2) Thomson, 2002. 2. Thomas L. Floyd, “Digital Fundamentals”, PHI, 2003.
- 3) J. Bhaskar, “VHDL Primer” 3<sup>rd</sup> Edition. PHI Publication

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## **Database Management System**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3Hrs/Week</b>	<b>Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical : 2Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp; Or : 1</b>
	<b>Term Work and Oral (Tw &amp; Or) : 50 Marks</b>	

### **Course Objectives:**

- 1) Identify various techniques to communicate with database.
- 2) Relate relevant data for effective processing of data.
- 3) Construct a database to maintain data adroitly.
- 4) Study various queries and tools to deal with the data.
- 5) Understand the relation between data set and respective means to access it.
- 6) Understand influence of data in the effective development of software.

### **Course Prerequisites:**

**Students should have knowledge of**

- 1) Basic understanding of data and data structure
- 2) Basic understanding of programming language

### **Course Outcome:**

**Students will be able to:**

- 1) Design database to store data related with application.
- 2) Identify technique to deal with data.
- 3) Extend power of SQL by adding programming paradigm.
- 4) Predict suitable environment for data processing as per type data.
- 5) Apply knowledge of dbms to process the software efficiently.

**UNIT-I Introduction to DBMS:** What is database management system, Use of database system, view of data, relational databases, database architecture, transaction management, Data Models The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. Design of Database, ER-Diagram Database design. ER Model: overview of ER-Model, Constraints, ER-Diagrams, Extended ER Diagrams. **(06 Hours)**

- UNIT-II Relational database model:** Logical view of data, keys, integrity rules. Design of Relational Database: features of good relational database design, Normalization (1NF, 2NF, 3NF, BCNF). Relational Algebra and Calculus Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities. **(06 Hours)**
- UNIT-III Integrity Constraints:** What are constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views Introduction to SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. **(06 Hours)**
- UNIT-IV PL/SQL:** Introduction ,Declaring Variables , Writing Executable Statements , Interacting with Oracle Server , Writing Control Structures , Working with Composite Data Types , Writing Explicit Cursors , Writing Implicit Cursors , Handling Exceptions , Creating Procedures , Creating Functions , Managing Subprograms , Creating Packages , More Package concepts , Oracle supplied Packages, Manipulating Large Objects , Creating Database Triggers. **(06 Hours)**
- UNIT-V Transaction management:** ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management. **(06 Hours)**
- UNIT-VI Data Intensive Computing:** Introduction to big data, unstructured data processing using Hadoop , NoSQL database using MangoDB. **(06 Hours)**

**Assignment List:**

- 1) Draw an ER Diagram to maintain database of Bank
- 2) Normalize the database of Library, upto BCNF
- 3) Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
- 4) Calculate turnover of a banks in pune using group by query
- 5) WAP to implement autorollback option on deletion using trigger.
- 6) WAP to implement Procedure to calculate square of a number.

- 7) Implement implicit cursor using PL/SQL.
- 8) Simulate two phase locking protocol on the database of Movie.
- 9) Perform document processing using MangoDB,.
- 10) Solve word count problem using Hadoop.

**Text Books:**

- 1) A Silberschatz, H Korth, S Sudarshan, "Database System and Concepts", Sixth Edition McGraw-Hill
- 2) Oracle SQL and PL/SQL Guide Till 10gR2
- 3) Ramkrishna R., Gehrke J., Database Management Systems, 3rd Edition, McGraw-Hill

**Reference Books :**

- 1) Rob, Coronel, "Database Systems", Seventh Edition, Cengage Learning.
- 2) Bipin Desai, Introduction to Database Management Systems.
- 3) Groff James R., Paul Weinberg, LAN times guide to SQL.

**Syllabus for Unit Test:**

**Unit Test -1      Unit I ,II and III**  
**Unit Test -2      Unit IV, V and VI**

## **Engineering Mathematics-III**

### **Teaching Scheme:**

**Theory : 3 Hrs / Week**

**Tutorial : 1 Hrs/Week**

### **Examination Scheme:**

**End Semester Examination: 60 Marks**

**Continuous Assessment : 40 Marks**

### **Credits Allotted:**

**Theory : 4**

### **Course Pre-requisites:**

Students should have basic knowledge of:

1. Differential calculus
2. Integral calculus
3. Complex numbers
4. Vector algebra

### **Course Objectives:**

To develop ability to use the mathematical techniques, skills, and tools necessary for

engineering practice.

**Course Outcomes:**

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

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

**UNIT - I      Linear Differential Equations (LDE)      (06 Hours)**

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

**UNIT - II      Complex Variables      (06 Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

**UNIT - III      Transforms      (06 Hours)**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

**UNIT - V      Laplace Transform (LT)      (06 Hours)**

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit

Impulse, ramp, jump, . Problems on finding LT & inverse LT.  
Applications of LT and Inverse LT for solving ordinary differential equations.

**UNIT - V      Vector Differential Calculus      (06Hours)**

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

**UNIT - VI      Vector Integral Calculus      (06 Hours)**

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

**Assignments:**

1. Linear Differential Equations
2. Complex Variables
3. Transforms
4. Laplace Transform
5. Vector Differential Calculus
6. Vector Integral Calculus

**Text Books:**

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

**Reference Books:**

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).

**Syllabus for Unit Test:**

**Unit Test -1                      UNIT – I, UNIT – II, UNIT - III**  
**Unit Test -2                      UNIT – IV, UNIT – V, UNIT - VI**



## **Computer Graphics**

**Teaching Scheme**

**Examination Scheme**

**Credit Allotted**

**Theory : 3Hrs/Week End Semester Examination : 60 Marks Theory : 3**  
**Practical : 2Hrs/Week Continuous assessment : 40 Marks Tw &Pr : 1**  
**Term Work and Practical(Tw & Pr) : 50 Marks**

**Course Objectives:**

- 1) learn basic and fundamental computer graphics techniques;
- 2) learn image synthesis techniques
- 3) examine applications of modeling, design and visualization

**Course Prerequisites:**

**Students should have knowledge of**

- 1)C / C++ programming
- 2)Data structures and files

**Course Outcome:**

**Students will be able to:**

- 1) Understand history and evolution of computer graphics, both hardware and software and use a current graphics API (OpenGL).
- 2) Implement algorithms including: line drawing, polygon filling, clipping, and transformations.
- 3) Write programs that demonstrate geometrical 2 D transformations
- 4) Write programs that demonstrate geometrical 3 D transformations
- 5) Understand illumination and shading concepts
- 6) Implement Fractals.

**UNIT-I Introduction to Computer Graphics (06 Hours)**

Overview of Computer Graphics, , Description of graphics devices, Input Devices, Graphics Devices, Display Technologies, Raster Refresh (Raster-Scan) Graphics Displays, Scan Basics, Video Basics, The Video Controller, Random-Scan, Display Processor, LCD displays, display file and structure, display processor, Graphics file formatComputer Graphics Application and Software Introduction to OPENGL, Applications of Computer graphics, Animation.

**UNIT-II Scan conversion – lines, circles and Ellipses; Filling polygons and clipping algorithms (06 Hours)**

Line and circle drawing: DDA, Bresenham's, algorithms, Thick line segment, Aliasing, Anti aliasing , Polygons Filling algorithms, edge data structure, Line Clipping algorithms– Cyrus-Beck, Cohen-Sutherland, Polygon Clipping algorithms: Sutherland Hodgeman, Color models.

<b>UNIT-III</b>	<p>Transformations:</p> <p>Matrix Representation of 2D Transformations: Rotation, Reflection, Scaling, Combined Transformation, Translations and Homogeneous Coordinate system, Transformation of Points, Transformation of the Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, Window-to-Viewport Transformations. Introduction, Matrix Representation of 3D Transformations: Scaling, Shearing, Rotation, Reflection, Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Composition of 3D Transformations.</p>	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<p>Projections:</p> <p>Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections. Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, viewing, Coordinate Systems and matrices, camera model and viewing pyramid.</p>	<b>(06 Hours)</b>
<b>UNIT-V</b>	<p>Hidden Surface Determination:</p> <p>Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms, Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p>Illumination and Shading</p> <p>Illumination and Shading Models for Polygons, Reflectance properties of surfaces, Ambient, Specular and Diffuse reflections, Atmospheric attenuation, Phong's model, Gouraud shading, some examples.</p>	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<p>Curves and fractals:</p> <p>Curve Representation, Nonparametric Curves, Parametric Curves, The General Conic Equation, Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, B-spline Curve Subdivision,</p>	<b>(06 Hours)</b>

Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces, fractals and fractal surfaces, Hilbert's curve, Koch curve.

**Assignment List:**

- 1) Laboratory exercises will normally be conducted using the currently available computer graphics API such as OpenGL
- 2) Implement Cohen Sutherland/DDA line drawing algorithm.
- 3) Implement Cohen Sutherland/DDA circle drawing algorithm.
- 4) Write a program to implement polygon filling algorithm.
- 5) Implement Cohen Sutherland Line clipping algorithm
- 6) Implement following 2D Transformations:
  - i) Translation
  - ii) Rotation
  - iii) Scaling
  - iv) Shearing
- 7) Implement 3D Transformations
  - i) Translation
  - ii) Rotation
  - iii) Scaling
  - iv) Shearing
  - v) Shearing
- 8) Write a program to draw fractals
- 9) Write a program to draw Koch curve
- 10) Write a program to draw Hilbert's curve
- 11) Using OPENGL libraries create an animation.

**Text Books:**

- 1) S. Harrington, "Computer Graphics", 2<sup>nd</sup> Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6. 2.
- 2) D. Rogers, "Procedural Elements for Computer Graphics", 2<sup>nd</sup> Edition, Tata McGraw-Hill Publication, 2001, ISBN 0 – 07 – 047371– 4.

**Reference Books:**

- 1) J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Computer Graphics - Principles and Practice, Second Edition in C, Pearson Education, 2003.
- 2) D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition, 2004.

- 3) D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990.
- 4) F. S. Hill Jr., Computer Graphics using OpenGL, Pearson Education, 2003

**Syllabus for Unit Test:**

**Unit Test -1 Unit I,II and III**

**Unit Test -2 Unit IV, V and VI**

## **IT Lab – II**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
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<b>Practical :4 Hrs/Week</b>	<b>Term work and Practical (Tw &amp; Pr) : 50 Marks</b>	<b>Tw &amp; Pr : 2</b>
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**Course Objectives: To**

- 1) Compute time and space complexity for given program.
- 2) Demonstrate concepts OOPS using java
- 3) Solve specified requirement
- 4) Infer various approach to decide efficiency of given approach.
- 5) Formulate given problem by providing the proof of behavior of given model.
- 6) Design an application using platform independent approach.

**Course Prerequisites:**

**Students should have knowledge of**

- 1) Object Oriented Programming language
- 2) Logic to solve given problem

**Course Outcome:**

**Students will be able to:**

- 1) Design simple application meeting the requirements.
- 2) Develop their logical skill through various assignments and practicals.
- 3) Breakdown complex problem into subpart and then handle every part to achieve the goal.
- 4) Model a solution to any real world problem
- 5) Analyze significance of platform independency.

6) Design application using object oriented norms.

<b>UNIT-I</b>	<b>Introduction to Java :</b> Java Fundamentals, Features of Java OOPs concepts Java virtual machine Reflection byte codes Byte code interpretation Data types, variable, arrays, expressions, operators, and control structures Objects and classes .	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Classes and objects :</b> Java Classes, Abstract classes Static classes Inner classes Packages Wrapper classes Interfaces This Super Access control, embedded style information Exception handling Exception as objects Exception handling mechanism: Try catch finally Throw, throws.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Object oriented Properties:</b> Inheritance, Encapsulation, Polymorphism, Data Binding, data abstraction. Implementation of these concepts using various statements like if, switch and loops like for,do – while, while.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>IO mechanism:</b> IO package Input streams Output streams Object serialization Deserialization Sample programs on IO files Filter and pipe streams	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Threading and Multithreading:</b> Lifecycle of Thread, Basic functions of thread, multithreading, synchronization.	<b>(06 Hours)</b>
<b>UNIT-VI</b>	<b>Collections and Generics:</b> Introduction to collection framework, List, Set, Maps, utility class, Reflection API.	<b>(06 Hours)</b>

**Assignment List:**

- 1) WAP to create array of an object to maintain data of an employee.
- 2) WAP to design user defined exception to reject negative numbers
- 3) Count the number of objects created for a class using static member function.
- 4) Write programs on interfaces.
- 5) Write programs on packages.
- 6) Write programs to copy contents of file into other file using all possible alternatives.
- 7) WAP to simulate traffic signal using multithreading
- 8) WAP to Maintain the record of student using collection API.

- 9) WAP to map roll and name to maintain data of students.
- 10) WAP to maintain record of an employee using List.

**Text Books:**

- 1) Programming with Java A Primer, E. Balaguruswamy Tata Mc-Graw Hill Companies.
- 2) SCJP 1.6 – Khalid Mughal
- 3) SCJP 1.6 – Kathy Sierra

**Reference Books**

- 1) Herbert Schildt, Java 2 Complete Reference – 5th Edition, Tata Mc-Gra Hill
- 2) Dietel & Dietel, Java How to Program





**Bharati Vidyapeeth Deemed University**  
**B.Tech.(I.T.) - 2014 Course**  
**Semester-V**

S r. N o	Course Title	Teaching Scheme			Examination Scheme							Credits			
					End Semester Examination	ContinuoAssessment			TW & Practical	T W & Or al	Tot al Marks				
		L	T	P	Theory	Un it Test	Attenda nce	Assignm ents				Theory	T w & Pr	Tw & Or	Tot al
1	Theory Of Automata & Formal Languages	3	1	-	60	20	10	10	--	--	100	4	--	--	4
2	Data Communication and Networks	3	-	2	60	20	10	10	--	50	150	3	--	1	4
3	System Programming	3	-	2	60	20	10	10	50	--	150	3	1	--	4
4	Microprocessor Architecture and Programming	3	-	2	60	20	10	10	50	--	150	3	1	--	4
5	Elective-I	3	-	-	60	20	10	10	--	--	100	3	--	--	3
6	Professional skill Development -V	4	-	-	100	--	--	--	--	--	100	4	-	--	4
7	IT Lab-III	-	-	4	--	--	--	--	50		50	--	2	--	2
	<b>TOTAL</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>04</b>	<b>01</b>	<b>25</b>

**ELECTIVE- I:**

- |   |                                |
|---|--------------------------------|
| 1) Software Testing and Quality Assurance | 3) Human Computer Interactions |
| 2) Management of Information System       | 4) Information Theory & Coding |

**Bharati Vidyapeeth Deemed University**  
**B.Tech.(I.T.) - 2014 Course**  
**Semester-VI**

Sr · N	Course	Teachin g Scheme	Examination Scheme				Credits
			End Semester	Continuous Assessment	T	Tota	

o.	Title				r Examination				W & P R	T W & O R	I Mar ks				
		L	T	P		Theory	U nit Te st	Attend ance				Assign ments	The ory	T w & P r	T w & O r
1	Operatin g System	3	- -	2	60	20	10	10	50	--	150	3	1	--	4
2	Advance d Databas e Manage ment Systems	3	- -	2	60	20	10	10	--	50	150	3	--	1	4
3	Design and Analysis of Algorith ms	3	1	--	60	20	10	10	--	--	100	4	--	--	4
4	Elective- II	3	- -	--	60	20	10	10	--	--	100	3	--	-	3
5	Comput er Organiz ation and Architec ture	3	- -	2	60	20	10	10	50	--	150	3	1	--	4
6	Professi onal skill Develop ment -VI	4	- -	--	100	--	--	--	--	--	100	4	--	- -	4
7	IT Lab- IV	--	- -	4	--	--	--	--	50	--	50	-	2	--	2
	<b>TOTAL</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>50</b>	<b>800</b>	<b>20</b>	<b>04</b>	<b>01</b>	<b>25</b>

**ELECTIVE-II:**

- 1) Multimedia Techniques
- 2) Embedded System

- 3) Geographical Information System
- 4) Cyber Law and Security Policies

### Optional Subject: Mathematics- IV

Course Title	Teaching Scheme			Examination Scheme							Credits		
				End Semester Examination	Continuous Assessment			TW & P R	TW & O R	Total Marks			
	L	T	P	Theory	Unit Test	Attendance	Assignments				Theory	TW	Total
Mathematics- IV	4	-	-	60	20	10	10	--	--	100	4	-	4
<b>TOTAL</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>4</b>	<b>-</b>	<b>4</b>

### Theory of Automata and Formal Languages

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 4</b>
<b>Tutorials :1Hr/Week</b>	<b>Continuous assessment : 40 Marks</b>	

#### Course Objectives:

Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

**Course Prerequisites:** Students should have knowledge of set theory and state transition diagrams.

#### Course Outcome:

**Students will be able to:**

- 1) Design automata machines for strings given.
- 2) Write regular expression for the given string and find set of strings if regular expression is given.
- 3) Write grammar rules for the strings given.
- 4) Design push down automata for the string and grammar.
- 5) Design Turing machine and apply the same to solve algorithmic problems.
- 6) Apply knowledge of TAFL in compiler construction.

#### UNIT-I **State Machines:** **(06 Hours)**

Abstract Machine, Acceptance of language by machine. Finite Automata (FA) - Definition, Types of FA, NFA and DFA, Language accepted by NFA and DFA, Designing of finite state machines.

Equivalence and difference between DFA and NFA, Inter-conversion between NFA and DFA, Machines with output- Moore and Mealy machines, Designing, Inter-conversion between Moore and Mealy machine.

**UNIT-II Regular Expression (R.E.): (06 Hours)**

Operators of RE, Building RE, Precedence of operators, Algebraic laws for RE, Arden's theorem, FA and RE: DFA to RE, RE to DFA, Properties of Regular Languages: Pumping lemma for Regular Languages, Closure and decision properties of regular languages, Equivalence and minimization of automata.

**UNIT-III Grammars: (06 Hours)**

Definition, Production rules, Derivation trees, Ambiguous Grammar, Removal of ambiguity, Regular Grammar, Inter-conversion between RE and Grammar, Reduced form of grammar- Removal of unit production, Removal of useless symbols, Removal of epsilon symbol. Linear grammar: left & right linear grammar, Inter-conversion. Chomsky hierarchy of languages, Context Free Grammar- Definition, Context free language (CFL. Normal Forms- Chomsky Normal Form(CNF), Griebach Normal Form(GNF).

**UNIT-IV Push Down Automata (PDA): (06 Hours)**

Limitations of FA, PDA: Definition, Uses, Equivalence between FA and PDA, Designing of PDA, Deterministic Push Down Automata and Non-Deterministic Push Down Automata- Definition, Language accepted by PDA, Properties of CFL, Pumping Lemma for CFL. Limitations of PDA, Applications of PDA.

**UNIT-V Turing Machine(TM): (06 Hours)**

Definition, Model, Comparison of TM, FSM, PDA, Design of TM, Examples of TM- Combinational TM, Iterative TM, Recursive TM, Universal TM, TM as a language acceptor, Some Problems that cannot be solved by Turing Machines, Language accepted by TM, Recursive sets, Partially recursive functions. Church's Turing hypothesis, Multitask TM, TM limitations, Halting problem.

**UNIT-VI Applications: (06 Hours)**

Comparison between FA, PDA, TM. Application of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text, Application of CFG: Parser, Markup languages, XML and Document Type Definitions. Applications of PDA and TM.

**Assignment List:**

1. Solve problems on designing of finite automata.
2. Design and inter-convert Moore and Mealy Machine for same problems.

3. Form grammar rules for language or set of regular expression or strings given.
4. Design Push Down Automata for grammar or given string.
5. Construct Turing Machine to solve given problem.
6. Compile all the applications of RE, Grammar, TM.
7. Study Assignment on Complexity Theory.

**Text Books:**

- 1) John Martin. Introduction to Languages and Theory of Computation. McGrawHill.
- 2) Michael Sipser. Introduction to The Theory of Computation . ISE.
- 3) Vivek Kulkarni. Theory of Computation. Oxford University Press.

**Reference Books:**

- 1) John E. Hopcroft, Rajeev Motwani, Jeffrey D-Ullman. Introduction to Automata Theory Languages And Computation. Addison-Wesley.
- 2) Sanjeev Arora, Boaz Barak. Computational Complexity: A Modern Approach. Cambridge University Press
- 3) Mishra K.L.P., Chandrasekaran N. Theory of Computer Science: Automata, Languages and Computation. Prentice Hall India.
- 4) Christos H. Papadimitriou. Computational Complexity. Pearson Education.
- 5) Cristopher Moore, Stephan Mertens. The Nature of Computation. Oxford University Press

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

<b>Subject Code: Data Communication and Networks.</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 03 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :03</b>
<b>Practical : 02 Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Term Work :01</b>
	<b>Term Work : 50 Marks</b>	
<b>Course Objectives:</b>		
1) Build an understanding of the fundamental concepts of computer networking		
2) Familiarize the student with the basic taxonomy and terminology of the computer Networking area.		
3) Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.		
4) Gain expertise in some specific areas of networking such as the design and maintenance of individual networks.		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1) how computer networks operate and the fundamentals of data communication		
2) Concepts and fundamental design principles of modern computer networking in a top-down approach, focusing on the Internet's architecture and protocols.		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) describe network architecture		
2) understand basic computer network technology		
3) analysis including error detection, error control and flow control.		
4) recognize the different types of network topologies and protocols		
5) analyze the different types of network devices and their functions within a network		
6) familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation		
<b>UNIT-I</b>	<b>Fundamentals of digital communications :</b>	<b>(06 Hours)</b>
	Introduction to digital communications. Definitions of terms. Signal propagation. Signal types: Sine waves, Square waves. Signal parameters: Amplitude, Frequency, and Phase. Channel effects on transmission: Attenuation, Effects of limited bandwidth. Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission impairment, Data Rate Limits, Performance. Digital Transmission: Analog-to-Digital Conversion, Digital-to-Digital Conversion. Analog Transmission: Digital-to-analog Conversion (ASK, FSK, PSK, QAM), Analog-to- Analog Conversion.	
<b>UNIT-II</b>	<b>Transmission Media and Technologies:</b>	<b>(06 Hours)</b>

	<p>Transmission Media: Guided Media: Twisted pair cables, Co-axial cables, Fiber optic cables. Unguided Media: Radio waves, Microwave, Infrared. Wireless Transmission Medium.</p> <p>Introduction to switching: – Switching, Circuit-Switched Networks, Datagram networks, Concept of Virtual circuit networks, Structure of circuit and packet switch. Types of services: Connection oriented services (Virtual circuits) Connectionless services (Datagrams).</p>	
<b>UNIT-III</b>	<b>Data transmission mechanisms:</b>	<b>(06 Hours)</b>
	<p>Communication modes: Simplex, Half-duplex, Full – duplex. Transmission modes: Serial transmission, Parallel transmission.</p> <p>Synchronization: Asynchronous transmission, Synchronous transmission.</p> <p>Multiplexing: Frequency division multiplexing, Synchronous time division multiplexing, Statistical time division multiplexing. (Time slots &amp; frames, interleaving, data rate management). Spread Spectrum – FHSS, DSSS.</p>	
<b>UNIT-IV</b>	<b>Introduction to computer networks :</b>	<b>(06 Hours)</b>
	<p>Introduction to computer networks, Network Topologies: Bus, Star, Ring. Types of networks: Local area networks (LAN), Wide area networks (WAN), Metropolitan Area networks (MAN), Personal area networks (PAN). Layered network model: OSI model, TCP/ IP model.</p> <p>Connecting Devices Repeaters, Hubs, Bridges, Two &amp; Three layer Switches Routers, Gateways, Backbone networks, Concept of VLAN.</p> <p>Data Link Layer – Error correction &amp; detection. Types of errors. Block Coding, Cyclic Codes, Checksum, Data Link control, Framing, Flow and Error Control.</p>	
<b>UNIT-V</b>	<b>NETWORK LAYER :</b>	<b>(06 Hours)</b>
	<p>Internetworking, IPv4 &amp; IPv4 protocol packet format, IPv6 Protocol &amp; Packet format, IPv4 VS IPv6, Transition from IPv4 to IPv6, Address Resolution protocols (ARP, RARP), BOOTP, DHCP. Address Mapping ICMP, IGMP, ICMPv6.</p> <p>Routing Protocols – Delivery, forwarding, routing, types of routing, routing tables, Unicast Routing, Unicast Routing protocols, RIP, Concepts of OSPF, and BGP &amp; Multicast Routing, Multicast routing protocols.</p>	
<b>UNIT-VI</b>	<b>TRANSPORT LAYER :</b>	<b>(06 Hours)</b>
	<p>Process-Process Delivery: UDP, TCP and SCTP, Process-to-Process Delivery, User Datagram Protocol (UDP), Congestion Control and Quality of service : Data Traffic, Congestion, Congestion Control (Open Loop, Closed Loop &amp; Congestion control in TCP), Quality Services (QoS), Techniques to improve QoS, Integrated services, Differentiated Services and Flow Characteristics.</p> <p>Introduction to Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP.</p>	
<b>Assignment List:</b>		
<b>1)</b>	Socket programming - TCP and UDP.	
<b>2)</b>	Socket programming Client Server using RPC.	
<b>3)</b>	Study and demonstration of CISCO packet tracer with data transmission. (Windows/Linux)	
<b>4)</b>	Study and demonstration of CISCO packet tracer with data loss. (Windows/Linux)	
<b>5)</b>	Study and execution of Network commands.	

6)	What are the responsibilities of physical layer, data link layer, network layer?
7)	Explain the differences in the impact on performance of : a) TCP packet being lost or dropped. b) UDP packet being lost or dropped.
8)	Implementation of CRC.
9)	Explain IP 4& IP 6 .Identify the class and default subnet mask of the IP address 217.65.10.7.
10)	Demonstration of Setting Firewall, Enabling /Disabling Ports.

**Text Books:**

1)	Data Communications and Networking, Fourth Edition by Behrouza A. Forouzan, TMH.
2)	Computer Networks, A.S.Tanenbaum, 4th edition, Pearson education.
3)	Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education.

**Reference Books:**

1)	Introduction to Data communications and Networking, W.Tomasi, Pearson education.
2)	Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.
3)	An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
4)	Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
5)	William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.

**Syllabus for Unit Test:**

<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>



## System Programming

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical: 2Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

### Course Objectives:

- 1) To learn & understand fundamentals of system software program as Assembler, Linkers, and loaders.
- 2) To study phases of compiler in detail.
- 3) To learn how to design system programs.

### Course Prerequisites:

Students should have knowledge of

- 1) Data Structures
- 2) Computer Organization
- 3) Microprocessor
- 4) Basic Searching & Sorting Algorithms

### Course Outcome:

Students will be able to:

- 1) Understand operating system user view point, fundamentals of Language processing
- 2) Understand general machine structure and instruction formats.
- 3) Design & implement low level programming using TASM, software for programming development
- 4) Design & implement System Programs as Macroprocessor
- 5) Understand various loader schemes and Design of absolute and direct linking loaders
- 6) Understand Compiler phase
- 7) use tool Lex for generation of Lexical Analyzer
- 8) use tool YACC for generation of Syntax Analyzer.

**UNIT-I Introduction: (06 Hours)**

Evolution Of the Components of Programming System, Evolution Of Operating System

**Operating system User Viewpoint** : Functions , **Operating System User Viewpoint** : Batch Control Language , **Operating System User Viewpoint** : Facilities

Language Processing Activities, Fundamentals of Language Processing, Language processor development t tools

**UNIT-II Machine Structure, Machine Language And Assembly Language (06 Hours)**

**General Machine Structure :**General Approach to a new Machine,  
Machine Structure : 360 and 370

**Machine Language:** Long Way, No Looping, Address Modification  
Using Instructions as Data, Address Modification Using Instructions  
Using Index Registers, Looping

**Assembly Language :** An Assembly Language Program, Example  
using Literals

**UNIT-III Assemblers : (06 Hours)**

General Design Procedure, Design Of Assembler,

**Table Processing :**

**Searching:** Linear Search, Binary Search

**Sorting :** Interchange Sort, Shell Sort, Bucket Sort, Radix Exchange  
Sort, Address Calculation Sort, Comparison of Sorts

**UNIT-IV MACRO Language And The MACROPROCESSOR : (06 Hours)**

Macro Instructions, Features of Macro Facility, Implementation Of  
Restricted Facility : A Two pass Algorithm

**UNIT-V Loaders : (06Hours)**

**Loader Schemes :** Compile-And-Go Loaders, General Loader  
Scheme, Absolute Loaders, Subroutine Linkages, Relocating  
Loaders, Direct Linking Loaders,, Other Loader Schemes,

**Linkers:**

Relocation and linking concepts, Design of linker, self relocating  
programs, Static and dynamic linking

**Design of Absolute and Direct-Linking Loaders**

**UNIT-VI Compilers : (06 Hours)**

Basics of Compiler:

Recognizing Basic Elements

Recognizing Syntactic Units and Interpreting Meaning

Storage Allocation

Code Generation

Phases Of Compiler :

Lexical Phase, Syntax Phase, Interpretation Phase, Optimization,  
Storage Assignment, code Generation ,Assembly phase

**Text Books:**

- 1) D.M. Dhamdhere ,”Systems Programming and Operating Systems”, Tata McGraw-Hill, ISBN-13:978-0-07-463579-7
- 2) JOHN J.DONOVAN “System Programming “,TATA McGRAW-HILL EDITION
- 3) Alfred V. Aho, Ravi Sethi, Reffrey D. Ullman, “Compilers Principles, Techniques, and Tools”,Addison Wesley, ISBN 981-235-885-4

**Reference Books:**

- 1) Terence Parr, “Language Implementation Patterns”,SPD,2009
- 2) Leland L. Beck, “System Software An Introduction to Systems Programming” 3rd Edition, Person Education, ISBN 81-7808-036-2
- 3) R.K. Maurya Wiley-dreamtech , “System Programming and Compiler Construction”
- 4) Srimanta Pal ,” System Programming “ OXFORD Publication
- 5) Richard Anthony,” **Systems Programming: Designing and Developing Distributed Applications**” 1st Editio

**Assignment List:**

- 1 To Study Fundamentals of language processing.
- 2 Write an assembly language program using Literals.
- 3 Write an assembly language program for table processing.(Searching & sorting)
- 4 To study the design of two pass Macroprocessor.
- 5 To study the phases of compilers.
- 6 To study the design of Absolute and Direct-Linking Loaders
- 7 Use of tool Lex for generation of Lexical Analyzer.
- 8 Use of tool YACC for generation of Syntax Analyzer.

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

## **Microprocessor Architecture and Programming**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practical : 2 Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

### **Course Objectives:**

- 1) To study 8-bit Microcontroller
- 2) To study Advanced Computer Architectures
- 3) To study 16-bit Microprocessor and Peripherals

### **Course Prerequisites:**

**Students should have knowledge of**

- 1) Basic Electronics Engineering

### **Course Outcome:**

**Students will be able to:**

- 1) Understand basics of microprocessors, 16-bit microprocessor architecture
- 2) Understand various microprocessor peripherals and their interfacing with 8086
- 3) Understand assembly language programming concepts
- 4) Understand advanced computer architectures
- 5) Understand 8-Bit Microcontroller architecture, Programming and Interfacing
- 6) Understand multiprocessor and multicore architecture.

<b>UNIT-I</b>	<b>16-Bit Microprocessor Architecture:</b> Basic microprocessor architecture, Bus concept, Intel 8086 microprocessor: Features, Block diagram and pin configuration, Max/min mode, Instruction cycles, Read Write cycles. Memory segmentation, 8086 Memory organization, , Instruction pipelining, Instruction set, 8086 Interrupt structure	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>8086 Assembly Language Programming:</b> Programmers model of 8086, 8086 addressing modes, Assembler directives, DOS and BIOS interrupts, Function calls, Procedures and Macros, EXTRN and PUBLIC directives, FAR procedure, Turbo debugger, Writing programs in C using int86, int86x, intdos, intdosx functions.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>NDP and Peripherals :</b> 8087 Architecture, Communication and Interfacing with 8086, Writing basic programs using 8087, Architecture, Modes and Interfacing of following peripherals with 8086 : 8255 Programmer Peripheral Interface, 8259 Programmable Interrupt Controller, 8253 Programmable Interval Timer, 8237 DMA Controller, Designing 8086 based applications using above peripherals	<b>(06 Hours)</b>

- UNIT-IV Advanced Processor Architectures :** (06 Hours)  
Multiprocessor Architectures : Closely coupled and Loosely coupled, RISC and CISC Architectures, SPARC, Superscalar Architecture, Multicore Architecture, Intel i3, i5 and i7 architectures
- UNIT-V 8-bit Microcontroller-I** (06 Hours)  
Microcontroller 8051 Architecture, On-Chip data memory and program memory organization, Programming of 8051 : Register set, Register bank, SFRs, Instruction format & addressing modes. Instruction set. External data memory and program memory & its interfacing, I/O ports programming.
- UNIT-VI 8-bit Microcontroller-II** (06 Hours)  
Interrupts structure and Response. Timers/counters and their programming, Serial port and programming, Interrupt programming, Design of minimum system using 8051 micro-controller for various applications, Software & hardware tools for development of microcontroller based system such as assembler, compiler, IDE, Emulators, debugger, programmer, development board, DSO, Logic Analyzer.

**Text Books:**

- 1) Microprocessor Architecture and Interfacing : Ramesh Gaonkar
- 2) Microprocessor and Interfacing : Douglas V.Hall
- 3) 8086 Microprocessor: Programming and Interfacing, Keneth Ayala
- 4) Microprocessors and Microcontrollers : N.Senthil Kumar
- 5) 8051 microcontroller & embedded system, Mazidi
- 6) IBM PC Assembly Language Programming, Peter Abel

**Reference Books:**

- 1) Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005
- 2) Ray Dunkon, "Advanced MSDOS Programming", 2nd Edition, BPB Publication.
- 3) Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
- 4) Intel Microprocessor and peripheral Handbook: Volume 1
- 5) Yashwant Kanitkar, "TSR through C", BPB Publication, 1995, ISBN 81- 7029-520-3.

**List of Assignments :**

- 1) Programs based on numerical computing, code conversion
- 2) Programs based on string processing
- 3) Programs using EXTRN, PUBLIC directives
- 4) Creating library of macros and using it in programs.
- 5) Programs in C using int86, int86x, intdos, intdosx functions
- 6) Simple 8051 programs based on 8085 development board
- 7) Program on Timer programming: ISR based

- 8) Program with interfacing : a) A/D Converter  
b) D/A Converter  
c) Stepper motor

**Syllabus for Unit Test:**

**Unit Test -1 Unit I,II and III**

**Unit Test -2 Unit IV, V and VI**

## **Elective-I : Software Testing and Quality Assurance**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

This course equips the students with a solid understanding of:

- 1) Practices that support the production of quality software
- 2) Software testing life cycle and activities
- 3) Software Quality Assurance and Models

### **Course Prerequisites:**

**Students should have knowledge of**

Software Engineering, Software development life cycles, methodologies

### **Course Outcome:**

**Students will be able to:**

- 1) Understand the concepts of software testing
- 2) Learn techniques of dynamic black box testing
- 3) Learn techniques of dynamic white box testing
- 4) Learn techniques of static black and white box testing
- 5) Understand special Software Testing Activities
  
- 6) Study software quality assurance, models

<b>UNIT-I</b>	<b>Introduction to Software Testing</b>	<b>(06 Hours)</b>
	Basics of Software Testing, Software quality, Need of software testing, Testing principles, Goals, Software Testing Life Cycle(STLC), Error, Fault, Failure, Defect Life Cycle, Testing terms and definitions: Precision and Accuracy, Verification and Validation, Quality and Reliability, Testing and Quality Assurance, Software test plan (IEEE format), Software Failure Case Studies	
<b>UNIT-II</b>	<b>Dynamic Testing: Black Box Testing</b>	<b>(06 Hours)</b>
	Need of Black Box Testing, Black box testing concept, Requirement analysis, Test case design criteria, Testing methods, requirement based testing, positive & negative testing, boundary value analysis, equivalence class testing, state based testing, cause effect graph based testing, error guessing, design of test cases	

**UNIT-III      Dynamic Testing: White Box Testing      (06 Hours)**

Need of white box testing, White box testing concept, Logic coverage criteria, Structure- Control flow testing, Cyclomatic complexity, Loop Testing, Data flow testing, Slice based testing, Mutation Testing, Design of test cases, Challenges in White box testing.

**UNIT-IV      Static Testing:      (06 Hours)**

Static Black Box Testing: testing the specification, performing a high level review of the specification, low- level specification test techniques  
Static White Box Testing: examining the design and code, Formal reviews: peer reviews, walkthroughs, inspections, coding standards and guide lines, generic code review checklist.

**UNIT-V      Software Testing Activities:      (06 Hours)**

Levels of testing: Unit testing, Integration testing, system testing, Acceptance Testing  
Special tests: GUI testing, compatibility testing, configuration testing, recovery testing, stress testing, load testing, recovery testing, regression testing, usability testing, documentation testing, website testing  
Debugging process and tools, Software testing tools: Static and Dynamic testing tools, Automation testing and tools

**UNIT-VI      Software Quality Assurance:      (06 Hours)**

Software quality, Quality cost, Quality attribute, Quality assurance, Quality control & assurance, Quality management, Quality management and project management, Methods of quality management, SQA models: ISO 9126, Capability Maturity Model(CMM), Software Total Quality Management, Six Sigma.

**Text Books:**

- 1) Software Testing Principles and Practices By Naresh Chavan Oxford Publication
- 2) Software Testing Principles and Tools By M.G. Limaye TMG Hill Publication
- 3) Software Testing, Second Edition By: Ron Patton, Pearson Education

**Reference Books:**

- 1) Metric and Model in Software Quality Engineering, Stephen H Kan, Pearson Education
- 2) Effective methods for software testing by William Perry , Willey Publication
- 3) Foundation of software testing by Dorothy Graham, Erik Van Veenendaal, CENGAGE learning
- 4) Introducing to Software Testing, Louis Tamres, Addison Wesley Publications
- 5) Software Quality Assurance, Daniel Galin, Pearson Education.



**Syllabus for Unit Test:**

**Unit Test -1 Unit I,II and III**

**Unit Test -2 Unit IV, V and VI**

## **Elective-I : Management of Information System**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives: To**

- 1) Understand significance management of information.
- 2) Use technology and resources for effective usage of information.

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Introduction to computer
- 2) Significance of Information needed for business

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand necessity of information.
- 2) Use effective technique to maintain the data.
- 3) Analyze information using tools and techniques to increase the business.
- 4) Use huge data available due to social networking site and internet.
- 5) Apply information analysis for decision making.
- 6) Apply adequate tool for MIS

<b>UNIT-I</b>	<b>Introduction of MIS</b> Architecture of MIS, data storage, processing and formatting. Need of MIS, pre requisites for MIS.	<b>(06Hours)</b>
<b>UNIT-II</b>	<b>Transaction processing System</b> Information Technology, Information extraction, Information retrieval, Approach and algorithms used to store and manage data.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Information Filtration and analysis:</b> Information extraction, representation of useful information, derives various forms of information, reporting useful for business.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Social Engineering:</b> Effective use of social engineering sites, use of internet to increase the reach, Extract the information and deliver the necessary things in adequate form at social network.	<b>(06 Hours)</b>
<b>UNIT-V</b>	<b>Decision Support System:</b> Data Analytics, business intelligence, chart and report generation , logical conclusion to ease the process of decision making	<b>(06 Hours)</b>

(06 Hours)

## UNIT-VI

### Applications of MIS

ERP, CRM, SCM, KMS, case study of SAP, openbiz

#### Assignment List:

- 1) Analyze different forms of information required for particular business domain.
- 2) Use technology to collect the information.
- 3) Design expert system to manage the information for business.
- 4) Use information extraction approaches and algorithms.
- 5) Analyze valuable information by representing it in suitable format.
- 6) Use social engineering in decision making.
- 7) Use google analytics to create complete history of user, needed for decision making.
- 8) Apply various filtration techniques using OLAP for decision making.
- 9) Understand working of SAP – case study.
- 10) Understand working of moodle– case study.

#### Text Books:

- 1) Management Information Systems, Laudon and Laudon, 7th Edition, Pearson Education Asia.
- 2) Management Information Systems, Jawadekar, Tata McGraw Hill.
- 3) Management Information Systems, Davis and Olson, Tata McGraw Hill.

#### Reference Books:

- 1) Decision Support Systems and Intelligent Systems, Turban and Aronson, Pearson Education Asia .
- 2) Management Information Systems, Schulthesis, Tata McGraw Hill.
- 3) Management Information Systems - Sadagopan, Prentice Hall.
- 4) Management Information Systems - Jayant Oke.
- 5) MIS: Managing Information Systems in Business, Government and Society , Rahul De.

#### Syllabus for Unit Test:

Unit Test -1 Unit I ,II and III

Unit Test -2 Unit IV, V and VI

## **Elective-I : Human Computer Interaction**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

To build interaction between human and computer using Graphical User Interface, Design processes, software tools and various interaction devices

### **Course Prerequisites:**

**Students should have knowledge of**

1) Analysis and design of software

### **Course Outcome:**

**Students will be able to:**

- 1) Understand User interface design
- 2) Understand Graphical user interface and its characteristics
- 3) Identify various design processes
- 4) Understand screen designing
- 5) Understand Windows, Components and Software Tools
- 6) Identify various interaction devices

### **UNIT-I Introduction: (06 Hours)**

Importance of user interface, Importance of good design, Benefits of good design, A brief history of screen design.

### **UNIT-II The Graphical User Interface: (06 Hours)**

Popularity of Graphics, The concept of direct manipulation, Graphical system, Characteristics, Web user-Interface popularity, characteristics- Principles of user interface.

### **UNIT-III Design process: (06 Hours)**

Human interaction with computers, importance of human characteristics, Human consideration, Human interaction speeds and understanding business junctions.

### **UNIT-IV Screen Designing: (06 Hours)**

Design goals-Screen planning and purpose, organizing screen elements, ordering of screen data and content-screen navigation and flow, information retrieval on web-statistical graphics-Technological

consideration in interface design

**UNIT-V Windows,Components and Software Tools: (06 Hours)**

**Windows:** New and navigation schemes,selection of window,selection of devices based and screen based controls.

**Components:**Text and messages,Icons,Multimedia,colors

**Software Tools:**Specification methods,interface-Building Tools.

**UNIT-VI Interaction Devices (06 Hours)**

Keyboard and function keys-Pointing devices-speech recognition digitization and generation-image and video displays-drivers.

**Assignment List:**

- 1) A Case study on Graphical User Interface
- 2) A Case study on Design process
- 3) A Case study on Screen Designing
- 4) A Case study on Windows and Components
- 5) A Case study on Software Tools
- 6) A Case study on Interaction Devices

**Text Books:**

- 1) Designing the user interface,Third edition,Ben Shneiderm ann,Pearson Education Asia
- 2) The essential guide to user interface design,Wilbert O Galitz,Wiley Drdeam Tech

**Reference Books:**

- 1) User Interface Design,soren Lauesen,Pearson Education
- 2) Human Computer Interaction,Alan Dix,janet Fincay,GreGoryd,Abowd,Russell Bealg,Pearson Education

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

## **Elective-I : Information Theory & Coding**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3Hrs/Week</b>	<b>End Semester Examination: 60 Marks</b>	<b>Theory:3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

- 1) To deeply understand the mathematics of Information Theory and its physical meaning
- 2) To understand various channel coding techniques
- 3) Students will be introduced to convolution and block codes, decoding techniques, and automatic repeat request

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Student should have knowledge of Communications Systems or equivalent.
- 2) Knowledge of calculus, algebra, and probability

### **Course Outcome:**

#### **Students will be able to:**

- 1) This course covers the fundamental concepts of information theory and error control coding.
- 2) Students will be introduced to the basic notions of information and channel capacity.
- 3) Students will be understood how error control coding techniques are applied in communication systems.
- 4) Design a data compression scheme using suitable source coding technique.
- 5) Design a convolution coding scheme for a communication system.
- 6) Evaluate performance of a communication system

**UNIT-I Introduction:** Introduction to Information Theory, uncertainty and information, number theory, group theory average mutual information and entropy, average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequence, Mark-off statistical model for information source, source coding theorem. **(06 Hours)**

**UNIT-II Channel Capacity:** Channel models, channel capacity, Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels. information capacity theorem, Entropy and information rate of mark-off source, random selection of codes. **(06 Hours)**

**UNIT-III Coding:** Error control coding: linear block codes and their properties, decoding of linear block code, perfect codes, Shannon-Fano coding, Huffman coding, Arithmetic coding, Lempel-Ziv algorithm, run- **(06 Hours)**

length encoding and rate distortion function hamming codes, and optimal linear codes and MDS codes .

**UNIT-IV Cyclic Codes:** Polynomials, division algorithm for polynomials, a method for generating cyclic codes, matrix description of cyclic codes, burst error correction, fire codes, golay codes, CRC codes, circuit implementation of cyclic codes. BCH codes: minimal polynomials, generator polynomial for BCH codes, decoding of BCH codes, Reed-Solomon codes and nested codes. **(06 Hours)**

**UNIT-V Convolution Codes:** Tee codes and trellis codes, polynomial description of convolution codes, distance notions for convolution codes, generation function, matrix description of convolution codes, viterbi decoding of convolution codes, distance bounds for convolution codes, turbo codes and turbo decoding. **(06 Hours)**

**UNIT-VI Trellis Coded Modulation:** Concept of coded modulation, mapping by set partitioning, Ungerboeck's TCM design rules, TCM decoder, Performance evaluation for Additive White Gaussian Noise (AWGN) channel, TCM for fading channels, applications and use cases of ITCT, applications of coding technique in cryptography, cryptosystem like ECC(Ellyptical curve cryptography). **(06 Hours)**

**Assignment List:**

- 1) A code is composed of dots and dashes. Assume that the dash is 3 times as long as the dot and has one-third the probability of occurrence. (i) Calculate the information in dot and that in a dash; (ii) Calculate the average information in dot-dash code; and (iii) Assume that a dot lasts for 10 ms and this same time interval is allowed between symbols. Calculate the average rate of information transmission.
- 2) State Shannon-Hartley's law. Derive an equation showing the efficiency of a system in terms of the information rate per Unit bandwidth. How is the efficiency of the system related to B/W?
- 3) Consider a source with 8 alphabets and respective probabilities as shown: A B C D E F G H 0.20 0.18 0.15 0.10 0.08 0.05 0.02 0.01 Construct the binary Huffman code for this. Construct the quaternary Huffman and code and show that the efficiency of this code is worse than that of binary code
- 4) If  $C_i$  and  $C_j$  are two code vectors in a  $(n,k)$  linear block code, show that their sum is also a code vector and Show  $CHT = 0$  for a linear block code.
- 5) A) Write short notes on BCH codes B) Draw the general block diagram of encoding circuit using  $(n-k)$  bit shift register and explain its operation.

- 6) What are convolutional codes? How is it different from block codes? Implement a convolutional code with a viterbi (trellis) and a sequential decoder.
- 7) Write a program to ensure to ensure integrity of packet transfer using coding technique similar top CRC
- 8) Analysis and study of crypt tool.

**Text Books:**

- 1) Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGraw- Hill, 2002.
- 2) K. Sam Shanmugam, John Wiley “Digital and analog communication systems”, 1996

**Reference Books:**

- 1) Viterbi, “Information Theory and Coding”, McGraw-Hill, 1982.
- 2) John G. Proakis, “Digital Communications”, McGraw-Hill, New edition, 2000.
- 3) Gareth A. Jones and J. Mary Jones, “Information and Coding Theory”, Springer Undergraduate Mathematics Series, 2000. 104
- 4) Glover and Grant; “Digital Communications”, Pearson Ed. 2nd Ed 2008

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**





## IT Lab-III

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 4Hrs/Week	Term Work and Practical (Tw & Pr) : 50Marks	Tw & Pr :2

### Course Objectives: To

- 1) Understand web environment for building the application.
- 2) Implement web application.
- 3) Implement server side programming.
- 4) Analyze life cycle servlet.
- 5) Analyze life cycle JSP.

### Course Prerequisites:

#### Students should have knowledge of

- 1) Core Java
- 2) Scripting languages

### Course Outcome:

#### Students will be able to:

- 1) Understand the lifecycle of web application
- 2) Understand flow of request and data in web application.
- 3) Implement relevant technology based on the functionalities involved in the respective web application.
- 4) Design a competitive web application which will work real web environment.
- 5) Implement server side technology.
- 6) Apply server side programming to implement web application.

### UNIT-I JDBC: (06 Hours)

Introduction to JDBC, JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases

### UNIT-II Servlet Basics: (06 Hours)

Web Application Basics, Architecture and challenges of Web, application. Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml). Handling Request and Response Initializing a Servlet, Accessing Database, Servlet Chaining, Session Tracking & Management, Dealing with cookies.

### UNIT-III Servlet Advanced: (06 Hours)

Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, Sharing information using scope object Controlling concurrent access User Authentication, Filtering Request and Response, Programming Filter, Filter Mapping, Servlet Listeners

**UNIT-IV Java Server Pages : Standard approach: (06 Hours)**

Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JSP Implicit Objects.

**UNIT-V Java Server Pages : Customized approach: (06 Hours)**

Tag Libraries, JSP Expression Language (EL), Using Custom Tag, JSP Capabilities Exception Handling Session Management Directives JSP with Java. Case study of struts and spring framework.

**UNIT-VI RMI (Remote Method Invocation) & EJB (Enterprise java Beans): (06 Hours)**

Bean RMI overview, RMI architecture, concept of stub and skeleton, Example demonstrating RMI ,Introduction to EJB , Types of enterprise beans Advantages of enterprise beans, The Life Cycles of Enterprise Beans, Types of EJB.

**Assignment List:**

- 1) Maintain record of students and perform CRUD functionality.
- 2) Write a program to redirect a request using a dynamic approach.
- 3) Write a program to pass the data using session
- 4) Write a servlet to remove spam.
- 5) Maintain the record of faculty member using jsp action tags and directives.
- 6) Design a tag to perform the necessary editing in a given report.
- 7) Design reusable components of the form using taglib.
- 8) Perform multiplication of two numbers using RMI.
- 9) Implement submission of assignment and evaluation of the same using EJB.
- 10) Understand working of framework – struts, spring- case study

**Text Books:**

- 1) SCWCD Exam Study Kit: Java Web Component Developer Certification  
Hanumant Deshmukh, Jignesh Malavia, Manning Publication
- 2) Head First Servlets and JSP , by Bryan Basham (Author), Kathy Sierra (Author), Bert Bates, Head First Publication
- 3) J2EE: The complete Reference, Jim Keogh (Author)

**Reference Books:**

- 1) OCEJWCD Study Companion: Certified Expert Java EE 6 Web Component Developer (oracle Exam 1Z0-899), by Charles E. Lyons (Author), Garner Press.
- 2) JDBC, Servlets and JSP Black Book Paperback , by Santosh Kumar K. (Author), Kogent Solutions Inc.
- 3) Java Server Programming Java EE7 (J2EE 1.7): Black Book

- Kogent Learning Solutions Inc
- 4) Sun Certified Enterprise Architect for Java EE Study Guide(Second edition) Mark Cade (Author)
  - 5) Sun Certified Enterprise Architecture for J2EE Technology Study Mark Cade (Author), Simon Roberts (Author)

# Operating System

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 3
Practical : 2 Hrs/Week	Continuous assessment : 40 Marks	Tw & Or : 1
	Term Work and Oral (Tw & Or) : 50 Marks	

## Course Objectives:

- 1) To Introduce basic concepts and functions of modern operating systems
- 2) To Understand the concept of process, and thread management
- 3) To Understand how the resources are scheduled and managed
- 4) To Understand the concepts of process synchronization and deadlock
- 5) To know the concept of I/O and File management
- 6) To Understand various Memory management techniques
- 7) To be aware of latest trends in Operating Systems

## Course Prerequisites:

Students should have knowledge of

- 1) Computer Organization
- 2) Data Structure

## Course Outcome:

Students will be able to:

- 1) Possess knowledge of the role of Operating Systems and their types.
- 2) Apply the concept of a process, thread and scheduling algorithms.
- 3) Apply the concepts of process synchronization and how it is achieved.
- 4) Realize the concept of deadlock and different ways to handle it.
- 5) Realize various memory management techniques, concept of I/O management and File system.
- 6) Realize latest trends and techniques in various operating systems

## UNIT-I Operating System Overview (06 Hours)

Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, OS Design Considerations for Multiprocessor and Multicore architectures, Microsoft Windows Overview, Modern UNIX Systems, Linux, Android. Booting Process of all the above operating systems.

## UNIT-II Process Description and Control (06 Hours)

**Process:** Concept of a Process, Process States, Process Description, Process Control (Process creation, Waiting for the process/processes, Loading programs into processes and Process Termination), Execution of the Operating System.

**Threads:** Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using pthreads, Multicore processors and threads, Linux Process and Thread Management,

Android Process and Thread Management.

**Scheduling:** Uniprocessor Scheduling Types of Scheduling, Scheduling Algorithms, and Thread Scheduling, An introduction to Multiprocessor and RealTime Scheduling, Traditional UNIX Scheduling, Linux Scheduling.

**UNIT-III Concurrency: Mutual Exclusion and Synchronization (06 Hours)**

Concurrency: Process/thread Synchronization and Mutual Exclusion Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Hardware Support, Operating System Support (Semaphores and Mutex), Programming Language Support (Monitors),

Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem.

Concurrency: Deadlock and Starvation Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock detection, An Integrated Deadlock Strategy, Example: Dining Philosophers Problem, Linux interprocess communication and concurrency mechanisms, Android Interprocess communication mechanisms and concurrency mechanisms

**UNIT-IV Memory Management (06 Hours)**

Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Segmentation.

Virtual Memory: Hardware and Control Structures, Operating System Software, Linux Memory Management, Windows Memory Management, Android Memory Management

**UNIT-V Input/Output And Files (06 Hours)**

I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, Disk Cache, Linux I/O.

**File Management:** Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Linux Virtual File System, Android File Management.

**UNIT-VI Recent And Future Trends In OS (06 Hours)**

Linux Kernel Module Programming, Embedded Operating Systems: Characteristics of Embedded Systems, Embedded Linux, and Application specific OS. Basic services of NACH Operating System.

Introduction to Service Oriented Operating System (SOOS), Introduction to Ubuntu EDGE OS, etc.

**Assignment List:**

- 1) Study of hardware and software requirements of different operating systems (UNIX,

- LINUX, WINDOWS XP, WINDOWS 7/8/10)
- 2) Implement CPU scheduling policies a) SJF (b) Priority (c) FCFS (d) Multi-level queue
  - 3) Implement file storage allocation techniques: (a) Contiguous (using array) (b) Linked –list (using linked list) (c) Indirect allocation (indexing)
  - 4) Implementation of Contiguous allocation techniques: (a) Worst-Fit (b) Best-Fit (c) First-Fit
  - 5) Calculation of external and internal fragmentation.
  - 6) Implementation of Compaction for the continually changing memory layout and calculate total movement of data.
  - 7) Implementation of resource allocation graph (RAG).
  - 8) Conversion of resource allocation graph (RAG) to wait-for-graph (WFG) for each type of method used for storing graph.
  - 9) Write a program where parent process counts number of vowels in the given sentence and child process will count number of words in the same sentence. Use FORK and JOIN construct.
  - 10) Implement the solution for Bounded Buffer (Producer-Consumer) problem using inter process communication technique – Semaphores.
  - 11) Study latest trends in various operating systems.

**Text Books:**

- 1) William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014, ISBN10: 0133805913 • ISBN13: 9780133805918
- 2) Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, John Wiley & Sons ,Inc., 9th Edition,2012, ISBN 9781118063330
- 3) Maurice J. Bach, “Design of UNIX Operating System”, PHI

**Reference Books:**

- 1) Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, Inc., 1st Edition, 2007.ISBN10: 0596009526 | ISBN13: 9780596009526
- 2) Harvey M. Deitel, Operating Systems, Prentice Hall, 3rd Edition,2003, ISBN10: 0131828274 | ISBN13: 9780131828278
- 3) Andrew S. Tanenbaum, Modern Operating System, Prentice Hall, 3rd Edition, 2007,ISBN10: 0136006639 | ISBN13: 9780136006633
- 4) Operating System in depth by Thomson

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**

## **Advanced Database Management Systems**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :3</b>
<b>Practical :2Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp;Pr :1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

### **Course Objectives:**

Exploring the working of large scale and emerging database management systems  
Study and analysis of query processing and query optimization

### **Course Prerequisites:**

Student should be well aware of database management systems, analysis of data structure and algorithms and sufficient programming experience

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand the concepts of Object Oriented Database Management Systems
- 2) Understand various system architectures
- 3) Understand the processes of query processing and optimization
- 4) Understand Data warehousing concepts
- 5) Understand Data mining concepts
- 6) Familiarize with emerging database applications

### **UNIT-I Object-Oriented and Object Relational Databases (06 Hours)**

Overview of Object-Oriented Concepts, Object Identity, Object Structure, and Type Constructors, Encapsulation of Operations, Methods, and Persistence, Type and Class Hierarchies and Inheritance, Complex Objects, Overview of the Object Model of ODMG, The Object Definition Language, The Object Query Language, Object Database Conceptual Design, Other Objected-Oriented Concepts Database design for an ORDBMS–Nested relations and collections, Implementation and Related Issues for Extended Type Systems, The Nested Relational Model, Extended ER diagram, Comparison of OODBMS, ORDBMS and RDBMS.

### **UNIT-II Database-System Architectures (06 Hours)**

Centralized and Client –Server Architectures, Server System Architectures



**Parallel Databases:** Introduction to Parallel Systems , I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Design of Parallel Systems.

**Distributed Databases:** Introduction to Distributed Systems, Homogeneous and Heterogeneous Databases, Distributed Data Storage, Availability, Heterogeneous Distributed Databases.

**UNIT-III Query Processing and Query Optimization (06 Hours)**

**Query Processing :** Overview, Measures of Query Cost, Algorithms for Selection, Sorting and Join Operation, Evaluation of Expressions.

**Query Optimization :** Overview, Transformation of Relational Expressions, Estimating Statistics of Expression, Results, Choice of Evaluation Plans, Semantic Query Optimization, Materialized Views, Introduction to dynamic query evaluation.

**UNIT-IV Data Warehousing and OLAP (06 Hours)**

Characteristics of Data warehouse, Data marts, Building data warehouse, Architectural strategies and organizational issues, Design considerations, Data Content, Metadata, Distribution of data, Tools for Data Warehousing, Applications of Data warehousing.

OLAP and OLTP, Data Modeling- Star and snowflake schema.

**UNIT-V Data Mining and information retrieval (06 Hours)**

Overview of data mining, Steps of data mining, Association Rules, Classification, Clustering, Applications of data mining

Decision support systems, Information retrieval systems, Web search engines, Directories.

**UNIT-VI Emerging Database Technologies and Applications (06 Hours)**

Time in Databases, Spatial and Geographic Data, Geographic Information Systems, Genome Data Management, Multimedia Databases, Mobility and Personal Databases, Mobile Databases.

Performance Tuning, Performance Benchmarks, Standardization, Application Migration, Transaction-Processing Monitors.

**Assignment List:**

1. Study and implementation of nested relations using SQL.
2. Study and implementation of Object types and collection in SQL .
3. Study and design of Extended ER diagram for any given DBMS.

4. Study (and implementation if possible) of web search engine (Lucene).
5. Study and implementation of selection, sorting and join operations.
6. Study and implementation of semantic queries.
7. Study, implementation and comparison of Views and Materialised views.
8. Study, implementation and comparison of Snowflake and Star schema
9. Study and demonstrating of OLAP operations in SQL.
10. Implementation of triggers in PL/SQL (Performance statistics and diagnostics)

**Text Books:**

- 1) Fundamentals of Database Systems, Sixth Edition, Ramez Elmasri, Shamkant B. Navathe, Pearson Education
- 2) Database System Concepts, Seventh Edition, Avi Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill
- 3) Data Warehousing: Concepts, Techniques, Products and Applications, 3rd Edition, C.S.R. PRABHU, PHI Learning Pvt. Ltd.,

**Reference Books:**

- 1) Database Management Systems, 3rd Edition, Raghu Ramakrishnan and Johannes Gehrke, Mcgraw Hill Education
- 2) An Introduction to Database Systems, 8th Edition, C.J. Date, Pearson
- 3) Database Systems: A Practical Approach to Design, Implementation, and Management, Third Edition, Thomas Connolly, Carolyn Begg, Pearson

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**

## **Design and Analysis of Algorithms**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 4</b>
<b>Tutorials : 1Hr/Week</b>	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

Students will be able to find a best suited algorithmic approach as a solution for given problem.

### **Course Prerequisites:**

Students should have knowledge advanced data structures, graph theory and algorithmic steps in problem solving.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand fundamental data structures and with the manner in which these data structures can best be implemented.
- 2) Learn how to analyze algorithms and estimate their worst-case and average-case behavior.
- 3) Ability to analyze and design algorithms divide and conquer approach.
- 4) Ability to understand and design algorithms using greedy strategy and dynamic programming
- 5) Learn fundamental knowledge of computational complexity, approximation and randomized algorithms.
- 6) Apply subject knowledge in various scenarios .

#### **UNIT-I Introduction: (06 Hours)**

Elementary data structures: Linear data structures, Graphs, Trees.  
Algorithm: Understanding problem, Designing, Analyzing, and Coding.  
Mathematical analysis of algorithms, Standard and Asymptotic Notations.

#### **UNIT-II Brute Force and Exhaustive Search: (06 Hours)**

Selection Sort and Bubble Sort, Sequential Search and Brute-Force String Matching, Closest-Pair and Convex-Hull Problems by Brute Force, Exhaustive Search: Traveling Salesman Problem, Knapsack Problem. Depth-First Search and Breadth-First Search

#### **UNIT-III Divide and Conquer: (06 Hours)**

Merge sort, Quick sort, Binary Tree Traversals and Related Properties, Multiplication of Large Integers and Strassen's Matrix Multiplication,

Multiplication of Large Integers, Strassen's Matrix Multiplication, The Closest-Pair and Convex-Hull Problems by Divide-and-Conquer, The Closest-Pair Problem, Convex-Hull Problem. Heaps and Heap sort.

**UNIT-IV Dynamic Programming and Greedy Techniques: (06 Hours)**

The Knapsack Problem and Memory Functions, Optimal Binary Search Trees, Warshall's and Floyd's Algorithms, Greedy Techniques: Prim's Algorithm, Kruskal's Algorithms, Dijkstra's Algorithm, Huffman Trees and Codes.

**UNIT-V Backtracking and Complexity Theory: (06 Hours)**

Lower-Bound Arguments, Problem Reduction, Decision Trees, Decision Trees for Sorting, Decision Trees for Searching a Sorted Array, P, NP and NP-Complete, Coping with the Limitations of Algorithm Power, Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem, Branch-and-Bound, Knapsack Problem, Traveling Salesman Problem.

**UNIT-VI Applications: (06 Hours)**

Case Studies of Algorithmic Designs & Applications, Deadlock detection and avoidance implementation. Resource allocation algorithm with deadlock avoidance, Heuristic search algorithm. Recent advances in the subject.

**Assignment:**

Concerned course faculty can arrange classroom tutorials, MCQ tests and students presentations on each unit. Discuss recent advances in the subject.

**Text Books:**

- 1) Anany Levitin. *Introduction to Design and Analysis of Algorithms*. Pearson Education.
- 2) Horowitz E, Sahni S, Rajasekaran S. *Fundamentals of Computer Algorithms*. University Press.
- 3) Thomas H. Cormen. *Introduction to Algorithms*. MIT Press.

**Reference Books:**

- 1) Jon Kleinberg. *Algorithm Design*. Pearson Education.
- 2) Gilles Brassard, Paul Bratley. *Fundamentals of Algorithms*. Pearson Education.
- 3) Donald E. Knuth. *Art of Computer Programming*. Dorling Kindersley Pvt Ltd.
- 4) Steven S Skiena, *The Algorithm Design Manual*. Springer.
- 5) Michael T. Goodrich. *Algorithm Design*. Wiley.

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

## Computer Organization and Architecture

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 3</b>
<b>Practicals : 2 Hrs/Week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Tw &amp; Pr : 1</b>
	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	

### Course Objectives:

- 1) To study various advanced computer architectures.
- 2) To study 32-bit/64-bit processor architecture
- 3) To study latest technology

### Course Prerequisites:

Students should have knowledge of

- 1) Basic Microprocessors and Microcontrollers

### Course Outcome:

Students will be able to:

- 1) Learn 32-bit as well as 64-bit processor architectures.
- 2) Learn latest computer architectures
- 3) Learn design of the control unit
- 4) Learn various latest memory and bus technologies
- 5) Learn parallel processing concepts

**UNIT-I 80386DX Features:** Functional Block Diagram, PIN Description, Register set, Flags, Physical address space, Data types (06 Hours)  
80386Dx descriptor Tables GDT, LDT, IDT, descriptor cache, Code, data and stack descriptors, system descriptors, privilege levels, Segmentation in 80386DX, comparison of segmentation with 8086, paging, TSS, Nested Tasks, Operating in Real Mode, Protected Mode, Virtual 86 mode, Virtual addressing, 80386DX instruction set, setting protected mode, setting v86 mode, Real mode programming, Memory Management, Protection Mechanism.

**UNIT-II Memory Organizations:** Flash memory, SDRAM, DDR3, DDR4, (6Hours)  
Advanced DRAMs, Memristors, PRAM (Phase change RAM / PCM – Phase Change Memory) by IBM, Magneto-resistive RAM (MRAM), Resistive RAM (RRAM), Spin Transfer Torque RAM (STT-RAM), Ferro-electric RAM (FRAM), MLC NAND Flash, 3-D NAND, , 3 -D XPoint Technology by Intel and Micron, Intelligent RAM (IRAM) , NUMA and UMA, Memory allocation policies, Cache memory: Concept, architecture (L1, L2, L3), mapping Techniques, Replacement algorithms, Cache coherency, Interleaved and Associative memory. Virtual Memory: Concept, Segmentation and Paging, Page replacement policies.  
Secondary Storage: RAID, Blue Ray Disk, Solid State Drives

(SSD), Cloud storage

Bus design considerations, Bus types : PCI, ISA, AGP, SCSI, GPIB, USB, Bus arbitration

**UNIT-III Single Bus Organization, Micro operations and Register Transfers (6Hours)**

Hardwired Control Design methods, Typical Example - Multiplier Control unit, Micro-programmed Control: Basic concepts, Microprogram, Microinstruction sequencing, micro-program sequencing, A complete microprogram, Applications of microprogramming

**UNIT-IV Intel Pentium Processor (6Hours)**

Features, Block Diagram, Pin grouping according to function, Modes, Programmer's model, Superscalar Operation, Integer & Floating Point Pipeline Stages, Branch Prediction, Cache Organization, Cache coherence, MESI. Study of features of Pentium Pro, Pentium 2, Pentium 3 and Pentium 4 Processors.

**UNIT-V Advanced Processor Architectures : (6Hours)**

Multiprocessor Architectures : Closely coupled and Loosely coupled, UMA, NUMA, COMA, RISC and CISC Architectures, Basics of ARM processor, Superscalar Architecture, SuperSPARC, Nehalem micro-architecture, Intel Haswell micro-architecture Multicore Architecture, Hyper Threading Technology (HTT), Intel 64bit Architecture: Block Diagram, Intel Core i3, i5 and i7 architectures, Supercomputer architectures : CDAC PARAM, IBM Blue Gene

**UNIT-VI Introduction to parallel processing systems: (6Hours)**

Introduction to parallel processing concepts, Architectural classification of parallel processors, pipeline processing, instruction pipelining, pipeline stages (Intel Pentium pipelining), pipeline hazards, Performance evaluation of pipeline, Data dependency analysis, concurrency analysis, Bernstein's conditions, Message passing libraries like PVM, MPI, CUDA : Parallel Programming Model, Vector processing concepts, NVIDIA GPU Computing

**Text Books:**

- 1) C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 2002, 5th edition.
- 2) J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0-07-100479-3
- 3) 2. Stallings William, "Computer Organization and Architecture: Principles of structure and function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 - 02 -946297 - 5.
- 4) 80386 Microprocessor Handbook, Chris H. Pappas, William H. Murray

- 5) Pentium Processor System Architecture: Tom Shanley & Don Anderson, Addison-Wesley.
- 6) Advanced Computer Architecture: Parallelism, Scalability and Programmability-Kai Hwang

**Reference Books:**

- 1) B. Govindarajulu, "Computer Architecture and Organization: Design Principles and Applications", Second Edition, Tata McGraw-Hill.
- 2) Dr. M. Usha, T. S. Srikanth, "Computer System Architecture and Organization", First Edition, Wiley- India.
- 3) John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
- 4) The 80386DX Microprocessor: Hardware, Software and Interfacing: Walter A Triebel, Prentice Hall.

**List of Assignments :**

- 1) A program for
  - a) LRU page replacement algorithm.
  - b) FIFO page replacement algorithm.
- 2) A program to simulate the mapping techniques of Cache memory.
  - a) Direct Mapped cache
  - b) Associative Mapped cache
  - c) Set Associative Mapped cache
- 3) A program to simulate memory allocation policies.
  - a) First-fit algorithm
  - b) Best-fit algorithm
- 4) A program to implement serial communication (PC - PC communication).
- 5) A program to implement parallel communication. (PC - Printer communication).
- 6) A program for printer simulation.
- 7) A program for keyboard simulation.
- 8) Write ALP using to read and display the table content pointed by GDTR/LDTR and IDTR.

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

## **Elective-II : Multimedia Techniques**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory: 3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives:**

- 1) To enable the students to develop synchronization concepts and mechanisms across the whole multimedia system architecture.
- 2) To study the basic concepts for multimedia transmission at the physical, Medium access control layers presenting the past and existing network technologies

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Student have knowledge of Computer Graphics and GUI Programming
- 2) Student should have knowledge of Computer programming with C and C++

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand the concepts of Multimedia architecture, elements, applications and interface standards.
- 2) Learn the different types of compression techniques and different types of data file Format used in multimedia systems.
- 3) Understand Different types of audio and video file formats.
- 4) Develop an interactive multimedia application to display their ability to use multimedia tools including multimedia authoring.
- 5) Have an insight into how the quality of multimedia systems is perceived and how this relates to the design of multimedia input, output and editing systems.
- 6) Student will able develop any academic or commercial application.

### **UNIT-I**

#### **Introduction to Multimedia and Graphic Devices:**

Types of media, Introduction to Multimedia, Multimedia (06 hours)  
Information, Multimedia Objects, Multimedia in business and work.  
Convergence of Computer, Multimedia Elements, Color Schemes,  
Picture representation, display devices, display adapters.

### **UNIT-II**

#### **Data Compression**

Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, (06 hours)  
Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite  
Context Modelling, Dictionary based Compression, Sliding Window  
Compression, LZ77, LZW compression, Compression, Compression



ratio loss less & lossy compression

### **UNIT-III**

#### **Audio and Video**

Basic sound concept, Multimedia system sound, MIDI versus digital audio, Audio file formats, National interchange file formats, Digital Audio software's. Types of Video, Video broadcasting standards, Video Quality, Digital Video Software's, Video file formats (for web), Video Compression, Video codec's. **(06 hours)**

### **UNIT-IV**

#### **Image/Graphics and Animation**

Still images, Types of Image, Image Quality, Image Compression, Graphics Software's, Image file formats (for web) Principals of animation, Methods of Animation, Animation Software's, Animation file formats (for web) (JPEG, & MPEG standards). **(06 hours)**

### **UNIT-V**

#### **Multimedia Storage Devices**

Magnetic media, optical media, file systems (traditional, multimedia), Communication devices, Multimedia software's, presentation tools, CD, DVD construction details, recording and reproducing data from CD & DVD. CDROM, COMBO DRIVE, DVD Writer technologies. **(06 hours)**

### **UNIT-VI**

#### **Multimedia Applications:**

Media preparation, communication, entertainment using commercial tools, Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors. **(06 hours)**

#### **Assignment List:**

- 1) Explain Types of Multimedia? Multimedia Objects
- 2) An audio clip has duration of 8 minutes. The highest frequency in the sound wave is 15 kHz. This is to be sampled using 8 bits per sample and in stereo mode. Calculate the file size. Mention any assumptions made?
- 3) Sound capturing & editing using tools like SOUNDFORGE
- 4) An MPEG-1 video has a frame sequence: IBBPBBPBBPBB. Determine the size of GOP. Derive the transmission sequence of the frames?
- 5) Creating/editing motion video/animation clips (using tools like Flash / Adobe Premier)
- 6) Consider a TV camera where the maximum intensity of a color signal is represented by 1 volt. An unsaturated magenta signal is formed by mixing 70% R, 20% G and 60% B. What is the luminance output voltage for the signal? What would this value be if the magenta color is saturated?

7) A CD-ROM contains 333000 blocks to be played back in 74 minutes. Calculate the data rate and capacity of the CD-ROM when operating in (a) Mode 1 (b) Mode 2 333000 blocks are played back in 74 minutes?

8) Prepare case study on Educational application Or Industrial application

**Text Books:**

- 1) Multimedia – Making it work 5th edition by Tag Vaughan (TMGH)
- 2) Multimedia Communication – Pearson Education Fred Halsall.
- 3 Mark Nelson “Data Compression Book” BPB

**Reference Books:**

- 1) David Hillman “Multimedia technology and Applications” Galgotia Publications.
- 2) Rosch “Multimedia Bible” Sams Publishing.
- 3) Sleinreitz “Multimedia System” Addison Wesley.
- 4) James E Skuman “Multimedia in Action” Vikas.
- 5) J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**

## Elective-II : Embedded System

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :3</b>
	<b>Continuous assessment : 40 Marks</b>	

### Course Objectives:

- 1) To enable the students to gain a fair knowledge on characteristics and applications of Embedded systems
- 2) To introduce students to the design issue of embedded system
- 3) To understanding and experience of state-of-the-practice industrial embedded systems and intelligent embedded system development

### Course Prerequisites:

#### Students should have knowledge of

- 1) Students have knowledge about the basic functions of embedded systems Outcomes
- 2) Digital hardware, introductory electrical circuits concepts, computer architecture, programming & systems programming

### Course Outcome:

#### Students will be able to:

- 1) Identify the unique characteristics of real-time systems,
- 2) Explain the general structure of a real-time system,
- 3) Define the unique design problems and challenges of real-time systems,
- 4) Apply real-time systems design techniques to various software programs
- 5) Understand the basics of an embedded system,
- 6) Program an embedded system,
- 7) Design, implement and test an embedded system

### UNIT-I INTRODUCTION:- (06 Hours)

Introduction to embedded systems ,Classification, Characteristics and requirements, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design, Concept of Real time Systems, Challenges in Embedded System Design, Design Process Requirements, Specifications, Architecture Design, Designing of Components and System Integration,.

### UNIT-II EMBEDDED SYSTEM ARCHITECTURE:- (06 Hours)

Instruction Set Architecture-CISC architecture [8051] and RISC instruction set architecture [ARM processors], DSP Processors, Coprocessors and Hardware Accelerators, Processor Performance Enhancement Pipelining, Super-scalar Execution, CPU Power Consumption, Memory System Architecture-, Caches, Virtual Memory,

- Memory management unit and address Translation.
- UNIT-III DESIGNING EMBEDDED COMPUTING PLATFORM: - (06 Hours)**  
 Designing with Processors System Architecture, Hardware Design, Implementation Development Environment, Debugging Techniques, Manufacturing and Testing. Design Using CPU Bus: Bus Protocols, Bus Organization, I/O Device Interfacing, Interfacing Protocols-GPIB, FIREWIRE, USB, Watchdog Timers.
- UNIT-IV OPERATING SYSTEMS:- (06 Hours)**  
 Kernel Features: Real-time Kernels, Polled Loops System, Co-routines, Interrupt driven System, Multi-rate System, Processes and Threads, Context Switching, Cooperative Multi-tasking, Pre-emptive Multi-tasking, Scheduling-Rate, Monotonic Scheduling, Earliest-Deadline First Scheduling, Task Assignment, Fault-Tolerant Scheduling. Inter-process Communication-Real-time Memory Management: Stack Management, Dynamic Allocation-Evaluating and Optimizing Operating System Performance-Response.
- UNIT-V RTOS- (06 Hours)**  
 Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes. 8. Advanced Processor-(only architectures) 80386, 80486 and ARM (References)
- UNIT-VI EMBEDDED CONTROL APPLICATIONS: - (06 Hours)**  
 Open-loop and Closed Loop Control Systems-Application Examples- Washing Machine, Automotive Systems, Auto-focusing digital camera, Air-conditioner, Elevator Control System, ATM System.

**Assignment List:**

Concerned course faculty can arrange classroom tutorials, MCQ tests and students presentations on each unit. Discuss recent advances in the subject.

**Text Books:**

- 1) Raj Kamal, "Embedded Systems", TMH, first edition, 2004
- 2) David E. Simon, "An Embedded Software Primer", Pearson Education, 1999.
- 3) Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw- Hill @ 2005

**Reference Books:**

- 1) Wayne wolf, "Computers as components", Morgan Kaufmann publishers, 2nd Edition, 2008.
- 2) Ayala. K.J. "The 8051 Microcontroller", Penram International, 1991.
- 3) Dr. Prasad, "Embedded Real Time System", Wiley Dreamtech, 2004.
- 4) Jean J. Labrosse, "Embedded system building blocks", CMP books, 2nd Edition, 1999.
- 5) Arnold berger, "Embedded system design", CMP books, 1st Edition, 2001.
- 6) Narayan and gong, "Specifications and design of embedded systems", Pearson education, 2nd Edition, 1999.

**Syllabus for Unit Test:**

**Unit Test -1    Unit I,II and III**  
**Unit Test -2    Unit IV, V and VI**



**UNIT-III GIS Data Processing, Analysis and Visualization: (06 Hours)**

Raster based GIS data processing, Vector based GIS data processing, Human computer interaction and GIS, Visualization of geographic information, principles of cartographic design in GIS, Generation of information product, Image Classification and GIS, Visual Image Interpretation, Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image Interpretation Equipments.

**UNIT-IV Terrain Mapping, Geocoding and Segmentation: (06 Hours)**

Interpolation, Visualization of Continuous Surfaces, Data Sources for Interpolations, Methods for Interpolations, Global Interpolation, Local Deterministic Methods, Comparison of Global and Local Method, Optimal Interpolation Using Geo Statistics. Kriging, Variogram, Geocoding, Applications of Geocoding, Dynamic Segmentation, Applications of Dynamic Segmentation.

**UNIT-V Remote Sensing Fundamentals: (06 Hours)**

Remote Sensing - Basic Principles, Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Microwave Remote Sensing, The Radar Principle, Factors Affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Sar, Interpreting Sar Images, Geometrical Characteristics, Remote Sensing, Platform and Sensors, Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.

**UNIT-VI GIS Project Design and Management: (06 Hours)**

Software engineering as applied to GIS, GIS project planning, System analysis and study of user requirement, Geographic database design methodology, GIS application software design methodology, system implementation, system maintenance and support.

**Issues and Applications in GIS:** Changes in Technology, Data Supply and Users, Role of Satellite Imagery and Data Sets, Trends in GIS, GIS users, Urban and Municipal Applications, Other Applications.

**Assignment List:**

- 1) Analyze google Maps for geographical area of any city
- 2) Analyze data from google Maps for any city's geographical structure
- 3) Study data resource sources for any GIS system
- 4) Analyze Google Map with Geocoded Address
- 5) Study various remote sensing application
- 6) Analyze any GIS Project with tools and techniques used.

**Text Books:**

- 1) M. Anji Reddi ,” Remote Sensing and Geographical Information Systems” B. S.

- Publications, Second Edition
- 2) George B Korte, .The GIS Book., Onword press, Thomson Learning, 5<sup>th</sup> Edition, 2003.
  - 3) Ian Heywood, Sarah Cornelius & etal., .An Introduction to Geographical Information Systems., 2<sup>nd</sup> Edition, Pearson Education

**Reference Books:**

- 1) Tor Bernhardsen, .Geographic Information Systems. An Introduction., 3<sup>rd</sup> edition,Wiley.
- 2) Peter A Burrough and McDonell, .Principles of Geographical Information Systems, Oxford University Press, 1998
- 3) M. N. DeMers, .Fundamentals of Geographic Information Systems., 3<sup>rd</sup> edition, Wiley.

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**



## **Elective – II : Cyber Law and Security Policies**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory :3 Hrs/Week</b>	<b>End Semester Examination: 60 Marks</b>	<b>Theory:3</b>
	<b>Continuous assessment : 40 Marks</b>	

### **Course Objectives: To**

- 1) Understand significance of cyber security and its effect on Individual and society at large.
- 2) Use of IT ACT 2000 for its possible implementation.

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Working of the Internet
- 2) Basic security related issues.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand security policies
- 2) Use effective technique to maintain the data.
- 3) Analyze information using tools and techniques to increase the business.
- 4) Use huge data available due to social networking site and internet.
- 5) Apply information analysis for decision making.
- 6) Apply adequate tool for MIS

<b>UNIT-I</b>	<b>Introduction to Computer Security:</b> Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Secure System Planning and administration:</b> Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Information security policies and procedures:</b> Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Information security:</b>	<b>(06 Hours)</b>

fundamentals-Employee responsibilities- information classification-Information handling- Tools of information security- Information processing-secure program administration.

**UNIT-V Organizational and Human Security: (06 Hours)**

Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

**UNIT-VI Indian IT Act 2000 and 2008: (06 Hours)**

Introduction, Definitions in Act, Electronic signature, certifying authority,

**Assignment List:**

**Text Books:**

- 1) Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2<sup>nd</sup> Edition, O' Reilly Media
- 2) Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2<sup>nd</sup> Edition Prentice Hall
- 3) Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global

**Reference Books:**

- 1) Thomas R Peltier, Justin Peltier and John blackley, "Information Security Fundamentals", 2<sup>nd</sup> Edition, Prentice Hall
- 2) Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag
- 3) Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional
- 4) Joseph M.Kizza, "Computer Network security", Springer
- 5) Thomas R.Peltier, "Information Security Risk Analysis", CRC Press

**Syllabus for Unit Test:**

**Unit Test -1 Unit I ,II and III**

**Unit Test -2 Unit IV, V and VI**



## IT Lab-IV

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Practical :4</b>	<b>Term Work and Practical (Tw &amp; Pr) : 50 Marks</b>	<b>Tw &amp; Pr :2</b>

### Course Objectives:

- 1) Describe the basic features of the Linux operating system.
- 2) Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
- 3) Discuss correct synchronization techniques for both application programs and kernel code running on uniprocessor as well as multiprocessor (SMM) platforms.
- 4) Use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.
- 5) Apply the UNIX/Linux system to accomplish typical personal, office, technical, and software development tasks.
- 6) Ability to use Linux environment and write programs.

### Course Prerequisites:

#### Students should have knowledge of

- 1) Prior exposure to a computer running an operating system such as Apple or Windows.
- 2) A Unix editor, understands files and directory structures, shell mechanisms.
- 3) Basic fundamentals of shell programming.

### Course Outcome:

#### Students will be able to:

- 1) Understand the open source software movement and the advantages and disadvantages of open source software.
- 2) Acquire knowledge of script programming basics.
- 3) Acquire a fundamental knowledge of operating system file systems.
- 4) Use modern operating system calls such as Linux process and synchronization libraries.
- 5) Understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks.

#### **UNIT-I Introduction : (06 Hours)**

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed – scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands in awk.

#### **UNIT-II Working with the Bourne again shell(bash): (06 Hours)**

Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell

as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

**UNIT-III** **Files:** **(06 Hours)**

File Concept, File System Structure, Inodes, File Attributes, File types, Library functions, the standard I/O and formatted I/O in C, stream errors, kernel support for files, System calls, file descriptors, low level file access – File structure related system calls(File APIs), file and record locking, file and directory management – Directory file APIs, Symbolic links & hard links.

**UNIT-IV** **Process :** **(06 Hours)**

– Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions.

Interposes Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues- Kernel support for messages, Unix system V APIs for messages, client/server example.

**UNIT-V** **Multithreaded Programming:** **(06 Hours)**

Differences between threads and processes, Thread structure and uses, Threads and Lightweight Processes, POSIX Thread APIs, Creating Threads, Thread Attributes, Thread Synchronization with semaphores and with Mutexes, Example programs.

**UNIT-VI** **Sockets:** **(06 Hours)**

Introduction to Sockets, Socket Addresses, Socket system calls for connection oriented protocol and connectionless protocol, example-client/server programs

**Assignment List:**

- 1) Installation of Unix/Linux operating system
- 2) Study of logging/logout details.
- 3) Study of Unix/Linux general purpose utility command list obtained from (man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown) commands.

- 4) Write a shell script program to display the process attributes.
- 5) Write a shell script program to check variable attributes of file and processes.
- 6) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
- 7) Study of Unix/Linux files system (tree structure).
- 8) Study of .bashrc, /etc/bashrc and Environment variables.
- 9) Shell script program to copy contents of one file to another.
- 10) Create directory, write contents on that and Copy to a suitable location in your home directory.

**Text Books:**

- 1) Unix System Programming using C++, T.Chan, PHI.(UNIT III to UNIT VIII)
- 2) Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.
- 3) Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones,Wrox, Wiley India Edition.

**Reference Books:**

- 1) Linux System Programming, Robert Love, O'Reilly, SPD.
- 2) Advanced Programming in the Unix environment, 2nd Edition, W.R.Stevens, Pearson Education.
- 3) Unix Network Programming, W.R.Stevens,PHI.
- 4) Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.

## Semester-VII

Sr. no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	PR& TW	OR& TW	Total Marks	Theory	TW
1	Compiler Construction and Design	4	-	2	6	60	20	10	10	--	50	150	4	1
2	Computer Forensics and Cyber Laws	3	-	2	5	60	20	10	10	50	-	150	3	1
3	Software Testing	3	-	2	5	60	20	10	10	50	--	150	3	1
4	Elective –III	2	2	-	4	60	20	10	10	--	50	150	2	2
5	Seminar I	-	-	2	2	--	--	--	--	--	50	50		1
6	Project Stage-I	-	-	2	2	--	--		--	--	50	50	-	4
7	Industrial Training	-	--	-	-	--	--		--	--	50	50	-	3
<b>TOTAL</b>		<b>12</b>	<b>2</b>	<b>10</b>	<b>24</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>100</b>	<b>250</b>	<b>750</b>	<b>12</b>	<b>13</b>

**Elective III :**

- 1) Web Services
- 2) Natural Language Processing
- 3) Network Modeling & Designing
- 4) Neural Network

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR&TW	OR&TW	Total	Theory	TW
12	10	02	240	80	40	40	100	250	750	12	13

# Compiler Construction and Design

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 4 Hrs/Week</b>	<b>End Semester Examination: 60 Marks</b>	<b>Theory:04</b>
<b>Practical : 2 Hrs/Week</b>	<b>Internal Assessment:40 Marks</b>	<b>Term Work:01</b>
	<b>Oral and Term Work: 50 Marks</b>	

## Course Objectives:

- 1) Students will understand concepts of compiler phases and design.
- 2) Students will get deeper insights into the more advanced semantic aspects of programming language and compilers.

## Course Prerequisites:

### Students should have knowledge of

- 1) Basic Programming Skills
- 2) Data Structure Fundamentals.
- 3) Theory of Automata and Formal Languages

## Course Outcome:

### Students will be able to:

- 4) Learn about different phases of a compiler and their functioning.
- 5) Implement a program to exhibit basic functionalities of compiler.
- 6) Understand how compilers generate source code to machine code and manages memory during runtime.
- 7) Acquaint with techniques for simple code optimizations.
- 8) Use compiler construction tools and softwares like LEX, YACC and FOSS.
- 9) Know functioning of advanced compilers and advancements in the field.

## UNIT-I Lexical Analysis: (06 Hours)

Language Processor: Preprocessor, compiler, assembler, interpreters, Translation Process, Phases of Compiler, Compiler construction: Design issues, Tools. Lexical Analysis: Role, Regular expressions, Specification and recognition of tokens, LEX, Construction of lexical analyzer using LEX.

## UNIT-II Syntax Analysis: (06 Hours)

Context free grammar, writing a grammar, Top down parsing, Bottom up parsing, LR parsers: LR parsing algorithm, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, Using ambiguous grammars, YACC. Symbol tables: use and need of symbol tables.

## UNIT-III Syntax Translation: (06 Hours)

Syntax directed definition and analysis, Syntax tree construction, Bottom up evaluation, S and L attribute definitions, Top down translation, Space allocation at compile time, Type checking, Type



conversion.

**UNIT-IV Run Time Environment and Intermediate Code Generation: (06 Hours)**

**Runtime Environment:** Storage organization, Stack allocation, Access to non-local data, Heap management, Parameter passing mechanisms, Garbage collection, Dynamic storage allocation techniques.

**Intermediate Code Generation:** Declaration, Assignment statement, Boolean expression, Case statement, Backpatching, Procedure calls.

**UNIT-V Code Generation: (06 Hours)**

Issues in Code generation, Basic Code generation techniques, run time storage management, Basic blocks and Flow graphs, Next-use information, A simple Code generator, DAG representation of Basic blocks, Peephole optimization, Generating code from dags, Code generation algorithms.

**UNIT-VI Code Optimization and Applications: (06 Hours)**

Code optimization techniques, Principal Sources of Optimization, Optimization of basic Blocks, Global Data Flow Analysis, Runtime Environments, Source and Target Language issues, Dynamic compilation, Cross compilers, Decompiler, Tools: FOSS, C Compiler, GCC, javac, JIT, Interpreters (JVM/Dalvik).

**Assignment List:**

- 1) Analyze source program compilation with respect to compilation phases.
- 2) Explain the role of lexical analysis in compilation process.
- 3) Explain in brief i) Top down parsing ii) Bottom up parsing.
- 4) Write a short note on necessity of type checking and type conversion.
- 5) Write a procedure to insert an item into a linked list by passing a pointer to the head of the list. Under what parameter passing mechanisms does this procedure work?
- 6) Discuss dynamic storage allocation techniques.
- 7) Explain DAG representation of basic blocks with suitable example.
- 8) Briefly explain runtime storage management in code generation phase.
- 9) Write a short note on code optimization technique.
- 10) Enlist and explain advanced compiler tools.

**Term Work Assignment List:**

- 1) Understand basic syntax of LEX specifications, built-in functions and variables.
- 2) Implement a preprocessor for C program.
- 3) Implement a lexical analyzer for subset of C language.
- 4) Implement a parser for an expression grammar using YACC and LEX.
- 5) Write a program to simulate symbol table generator.
- 6) Implement operations of semantic analysis like type checking, verification of function parameters, variable declarations and coercions etc.

- 7) Simulation and Demo: Compiler and interpreter using LEX and YACC.
- 8) Implement intermediate code generator for the Boolean expression in three Address code format.
- 9) Implement the front end of a compiler that generates the three-address code for a simple language.
- 10) Generate an appropriate Target Code from the given intermediate code assuming suitable processor details.

**Text Books:**

- 1) Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education Edition.
- 2) J. R. Levin, T. Mason, D. Brown, "Lex and Yacc", O'Reilly.

**Reference Books:**

- 1) *Kenneth C. Loudon., "Compiler Construction Principles and Practice", Cengage Learning India.*
- 2) *Andrew Appel and Jens Palsberg., "Modern Compiler Implementation in ML: Basic Techniques", Cambridge University Press.*
- 3) *Anthony J. Dos Reis, "Compiler Construction Using Java, JavaCC and Yacc", Wiley.*
- 4) *Keith D. Cooper, Linda Torczon, "Engineering a Compiler", Elsevier.*
- 5) *Axel T. Schreiner, H. George Friedman Jr, "Introduction to Compiler Construction with Unix", Prentice Hall.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**

## Computer Forensics and Cyber Laws

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3Hrs/Week</b>	<b>End Semester Examination : 60Marks</b>	<b>Theory : 03</b>
<b>Practical : 2 Hrs/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work : 01</b>
	<b>Practical and Term Work : 50 Marks</b>	

### Course Objective:

To maintain an appropriate level of awareness, knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.

### Course Prerequisites:

**Students should have knowledge of**

- 1) Basics of data communication.
- 2) Aware about security issues with digital world.

### Course Outcome:

**Students will be able to:**

- 1) Understand how to analyze evidences and its use in investigation.
- 2) Demonstrate data recovery in computer forensic.
- 3) Analyze hardware and operating systems in cyber security.
- 4) Demonstrate Computer Forensic tools and Disaster Recovery.
- 5) Understand Network Forensic and Mobile Network Forensic.
- 6) Discuss cyber laws.

### UNIT-I Introduction to Computer Forensics: (06 Hours)

computer crimes, evidence, extraction, preservation

Overview: Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device. Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.

Evidence: Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence.

Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team.

### UNIT-II Data recovery: (06 Hours)

**Computer crime and Legal issues:** Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court

of law.**Data Recovery:** Definition of data recovery, Identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files.data recovery mechanism, tools used for recovery.**Digital evidence controls:** uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary & cache files

**UNIT-III Hardware and Operating Systems: (06 Hours)**

**Overview of hardware and operating systems:** structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.**Investigating Logs:** Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event reporter and Application Logs.**Software Reverse Engineering:** defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

**UNIT-IV Computer Forensic tools and Disaster Recovery: (06 Hours)**

**Computer Forensic tools:** X-Ways, Index.dat Analyzer, Data Doctor ,Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools. **Disaster Recovery:** Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.

**UNIT-V Network Forensic and Mobile Network Forensic: (06 Hours)**

**Network Forensic:** Collecting and analyzing network-based evidence, reconstructing web browsing, email activity, and windows registry changes, intrusion detection, tracking offenders, etc. **Mobile Network Forensic:** Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

**UNIT-VI Cyber Law: (06 Hours)**

**Battling Cyber Squatters and Copyright Protection in the Cyber World :** Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and

acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy. Licenses and versions of GPL, Trademark, Patent. Digital Signature, Certifying Authorities and E-Governance : Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India

### **Term Work Assignment List:**

1. Explain role of Computer Forensic Investigator and investigation steps.
2. Explain life cycle of evidence and its types.
3. Demonstrate deleted data recovery by using suitable tools.
4. Demonstrate setting up remote logging in Windows.
5. Use Computer Forensic tools.
6. Demonstrate backing up data and restoring data.
7. Implement collecting and analyzing network-based evidence.
8. Implement interpretation of digital evidence on mobile network.
9. Design copyright protection in the cyber world.
10. Implement digital signature.

### **Assignment List:**

1. Discuss types of Forensic Science
2. Discuss Intellectual property.
3. Demonstrate data recovery mechanism
4. Demonstrate event reporter and Application Logs
5. Discuss selecting disaster recovery methods
6. Demonstrate computer Forensic tool X-Ways
7. Discuss Collecting and analyzing network-based evidence
8. Demonstrate intrusion detection
9. Demonstrate digital signature certificate heads.
10. Differentiate between Copyright, Patent and Trademark.

### **Text Books:**

- 1) Jay A. Siegel "Forensic Science: The Basics ", CRC Press.
- 2) Anthony J. Bertino, "Forensic Science: Fundamentals and Investigations", Cengage Learning.
- 3) Joe Nickell and John F. Fischer, "Crime Science: Methods of Forensic Detection", Kentuckypress.
- 4) Sherri Davidoff, Jonathan Ham, " Network Forensics: Tracking Hackers Through Cyberspace", Prentice Hall, 2012.

### **Reference Books:**

- 1) *Stuart H. James and Ph. D., Jon J. Nordby, "Forensic Science: An Introduction to Scientific and Investigative Techniques", 2nd edition.*
- 2) *Andy Jones and Debi Ashenden, "Risk Management for Computer Security: Protecting Your*

- Network & Information Assets*".
- 3) Colin Evans, *"The Casebook of Forensic Detection: How Science Solved 100 of the World's Most Baffling Crimes"*.
  - 4) Edward Amoroso, *"Cyber Security, Computer Network Security and Cyber Ethics"*, 2nd edition by Joseph Migga Kizza.
  - 5) Robert McCrie, *"Security Operations Management"*, Second Edition.

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## Software Testing

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 3 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 03</b>
<b>Practical : 2 Hrs/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work: 01</b>
	<b>Practical and Term Work : 50 Marks</b>	

### Course Objectives:

- 1) Students will learn the advanced techniques that underlie the practice of software testing.
- 2) Course will provide deeper insights into quality assurance of developed softwares.

### Course Prerequisites:

**Students should have knowledge of**

Software Development and Software Engineering concepts.

### Course Outcome:

**Students will be able to:**

- 1) Classify measurement models and software metrics.
- 2) Perform unit and integration tests by determining test design and test automation.
- 3) Apply suitable higher order testing techniques and methods in order to achieve verified and validated software by following best testing practices.
- 4) Understand the methods of software quality measurement.
- 5) Understand various test processes, fault models and methods of test generation.
- 6) Acquaint with software automation tools and applications.

### **UNIT-I Principles of Testing: (06 Hours)**

Purpose of Software Testing, Testing Principles, Goals of Testing, Software components, characteristics, architecture, Software testing life cycle, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures. Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing, White-Box Testing, Black-Box Testing.

### **UNIT-II Functional Testing: (06 Hours)**

Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment, Functionality Matrix (FM), Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Types of Testing, Creating Test Cases from Requirements and Use cases, Software Defects: Origins, Classes, cycle, attributes, Need for Testing.

### **UNIT-III Higher Order Testing: (06 Hours)**

Object Oriented Testing, Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client–Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing. IEEE Standards Related to Testing.

**UNIT-IV Software Measurement: (06 Hours)**

Objectives, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Software measurement validation, Measuring Internal Product Attributes: Size, structure, Halstead’s Software Science, Product Quality Metrics, In-Process Quality Metrics, Software Reliability: Measurement and Prediction, The Rayleigh Model, Exponential Distribution and Reliability Growth Models, SRE process.

**UNIT-V Software Quality Assurance and Test metrics: (06 Hours)**

Software Quality Concepts, Planning for SQA, Six Sigma Principles, Malcolm Baldrige Assessment, Edward Deming’s Principles, Ishikawa’s Seven Basic Tools, Software Maintenance, Software inspection concepts, Software Benchmarks and Baselines, Identifying Software Best and Worst Practices.  
**Test metrics:** Types of metrics, project metrics, Progress metrics, Test Defect metrics, Development defect metrics, Productivity metrics, Release metrics.

**UNIT-VI Automation and Applications: (06 Hours)**

Software test automation: Introduction, Scope. Design and architecture for automation: External modules, test cases and test framework modules, tools and result modules, report generator, process model for automation, challenges. Manual testing, Automated Testing Tools & Case studies, Study of Testing tools: QTP, Rational Robot, Winrunner, Loadrunner, Bugzilla, Selenium.

**Assignment List:**

- 1) Explain in detail the difference between Software Product and Software Project.
- 2) Explain the need of Software Testing in software development.
- 3) Explain software defects with reference to origins, classes and defect repository.
- 4) What is minimization and prioritization of Test Cases for Regression Testing? Explain with suitable example.
- 5) Write a short note on ‘Quality Standards’ of testing.
- 6) Explain in detail ‘Software Reliability’.
- 7) Enlist different software reliability models, briefly explain each.



- 8) Explain Defect cycle and Bug execution.
- 9) Write a short note on tools and models to measure Software Quality.
- 10) What is the need of regression testing? Which test cases are executed in regression testing?

**Term Work Assignment List:**

- 1) Describe architecture, components, characteristics, type, category, types of users and user expectations for given software application.
- 2) State and describe software development life cycle (SDLC) and software testing life cycle (STLC) phases.
- 3) Create Functionality Matrix (FM) for any software application.
- 4) Write down test scenario and test cases on mobile application.
- 5) Construct Requirement Traceability Matrix (RTM) for software application.
- 6) Perform following testing for E-commerce application,
  - a) Functional Testing
  - b) Performance Testing
  - c) UI testing
  - d) Security testing.
- 7) Installation and Demo of open source testing tool (Selenium, Bugzilla etc.)
- 8) Test your project as a software application using any software testing tool.
- 9) Study different Defect Tracking Tool, and Create Defect report using Bugzilla.
- 10) Study assignment: Explain Quality attributes of Software Application and differentiate between QA, QC, and QMS.

**Text Books:**

- 1) Fenton, Pfleeger, "Software Metrics: A Rigorous and practical Approach", CRC Press.
- 2) Desikan, Ramesh, "Software Testing: principles and Practices", Pearson Education.

**Reference Books:**

- 1) *Burnstein, "Practical Software Testing", Springer International Edition.*
- 2) *William E. Perry, "Effective Methods for Software Testing", John Wiley and Sons.*
- 3) *Yogesh Singh, "Software Testing", Cambridge University Press.*
- 4) *Ronald Radice, "Software Inspections", Tata McGraw Hill.*
- 5) *Capers Jones, "Software Assessments, Benchmarks, and Best Practices", Addison-Wesley.*
- 6) *Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", CRC Press.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

### Elective-III: 1) Web Services

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 3 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 2 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 01
	Oral and Term Work : 50 Marks	

#### Course Objectives:

This course will cover the practical aspects web services in detail. The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Services, Applications of Web Services.

#### Course Prerequisites:

##### Students should have knowledge of:

- 1) Understanding the working of Network with TCP / IP.
- 2) Basic idea of how the Internet Works.
- 3) .Net and Java Framework Knowledge.

#### Course Outcome:

##### Students will be able to:

- 1) To understand the details of web services technologies like WSDL, UDDI, SOAP.
- 2) To learn how to implement and deploy web service client and server.
- 3) To explore interoperability between different frameworks.

#### UNIT-I Introduction: (06 Hours)

Evolution and Emergence of Web Services – Evolution of distributed computing, Core distributed computing technologies — client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services — The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Services Architecture — Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

#### UNIT-II SOAP: (06 Hours)

Fundamentals of SOAP — SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP.

**UNIT-III WSDL: (06 Hours)**

Describing Web Services — WSDL — WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

**UNIT-IV Web Service Discovery: (06 Hours)**

Discovering Web Services — Service discovery, role of service discovery in a SQA, service discovery mechanisms, UDDI — UDDI registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, Publishing API, Publishing, searching and deleting information in a UDDI Registry, limitations of UDDI.

**UNIT-V Web Services Interoperability: (06 Hours)**

Web Services Interoperability — Means of ensuring Interoperability, Overview of .NET, Creating a .NET client for an Axis Web Service, creating Java client for a Web service, Challenges in Web Services Interoperability. Web Services Security — XML security frames work, Goals of Cryptography, Digital signature, Digital Certificate, XML Encryption.

**UNIT-VI Designing Web service: (06 Hours)**

Java, and .Net Frame Work. Case Studies with Java and .Net.

**Term Work Assignment List:**

- 1) Compare different distributed computing technologies like CORBA, JAVA RMI, Microsoft DCOM, MOM.
- 2) Implement a simple web service of checking the status of client.
- 3) Implement SOAP in Java with simple messaging.
- 4) Identify limitations of SOAP. Suggest the solutions.
- 5) Study WSDL in detail with respect to WWW.
- 6) Implement a simple program for discovery.
- 7) Write a Java program to verify digital signatures.
- 8) Write a Java program to verify digital certificates.
- 9) Case Study: Use of Java for Web Services.
- 10) Case Study: Use of .NET for Web Services.

**Text Books:**

- 1) R. Nagappan, R. Skoczylas, R.P. Sriganesh, “Developing Java Web Services”, Wiley India.

**Reference Books:**

- 1) James McGovern, Sameer Tyagi et al., “Java Web Service Architecture”, Elsevier
- 2) S. Graham and others “Building Web Services with Java”, 2 Edition, Pearson Edn.

- 3) *D.A. Chappell & T. Jewell, "Java Web Service"s, O'Reilly,SPD.*
- 4) *G. Alonso, F. Casati, "Web Service's, Springer.Outcomes*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## **Elective III: 2) Natural Language Processing**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 02</b>
<b>Tutorial : 2 Hrs/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work : 02</b>
	<b>Oral and Term Work : 50 Marks</b>	

### **Course Objectives:**

- 1) To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
- 2) To give introduction of knowledge acquisition, information retrieval and machine translation.

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Probabilities and statistics.
- 2) Algorithms and programming experience.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand the models, methods, and algorithms of statistical Natural Language Processing (NLP).
- 2) Understand the basic NLP techniques, including syntactic parsing, semantic interpretation, lexical and morphological analysis.
- 3) Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars.
- 4) Choose appropriate solutions for solving typical NLP sub problems (tokenizing, tagging, parsing)
- 5) Understand basics of knowledge representation.
- 6) Understand resources of natural language data – corpora.

<b>UNIT-I</b>	<b>Language Modeling:</b> NLP-Language and Grammar-Processing:Origins and challenges, Language models: Uni-gram, N-gram –Statistical Language Model, NLP Applications.	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Natural Language and Formal Language:</b> Text Preprocessing, Regular Expressions and Finite State Automata word recognition, lexicon. Phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Part of Speech Tagging and Hidden Markov Models:</b> The concept of parts-of-speech, Tagging, Tagsets, and Morphology, The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs). The Viterbi Algorithms.	<b>(06 Hours)</b>
<b>UNIT-IV</b>	<b>Grammars &amp; Parsing Algorithms:</b>	<b>(06 Hours)</b>

Context-free Grammars, Parsing Regular Grammars, Parsing Context Free Grammars, Example Toy NL Grammar, Shift-Reduce Parsers, Probabilistic Parsing: Introduction.

**UNIT-V Information Extraction: (06 Hours)**

Vector space model, term weighting, homonymy, polysemy, synonymy, Improving user queries. Machine Translation– Overview, Applications of NLP- Spell-checking, Summarization.

**UNIT-VI Linguistics resources: (06 Hours)**

Introduction to corpus, elements in balanced corpus, TreeBank, PropBank, WordNet, VerbNet etc. Resource management with XML, Management of linguistic data with the help of GATE, The Semantic Web technologies, ontologies, OWL, NLTK.

**Assignment List:**

- 1) Write note on word normalization and stemming. Explain case folding with suitable example.
- 2) What is significance of decision tree in sentence segmentation also give implementation of decision tree for suitable example.
- 3) Discuss challenges of Machine translation .What are classical approaches of machine translation?
- 4) Case study on IBM translation model.
- 5) Case study on WordVET and VerbNet
- 6) Study of Hidden Markov Model and POS tagging.
- 7) Study assignment on Python—Analyzing Text with the Natural Language.
- 8) Research paper reading, analyzing and demonstrating.
- 9) Describe various Natural Language representation methods.
- 10) Describe different techniques for removal of ambiguity.

**Term Work Assignment List:**

- 1) Implement bottom up parser for any given grammar.
- 2) Analysis of natural language using lexical analysis.
- 3) Case study of any parsing algorithm.
- 4) Study of clustering algorithm in NLP.
- 5) Case study: NLP in web mining or text mining.
- 6) Case study of Viterbi Algorithm.
- 7) Study of Python features used in NLP.
- 8) Study assignment of information retrieval techniques.
- 9) Installation of NTLK Toolkit.
- 10) Implement program in Python to calculate frequency distribution.

**Text Books:**

- 1) Allen, J. “Natural Language Understanding”, The Benajmins/Cummings Publishing Company ,Inc. 1994. ISBN 0-8053-0334-0.
- 2) Daniel Jurafsky and James H Martin. “Speech and Language Processing”, 2e, Pearson Education,

2009.

**Reference Books:**

- 1) James A".*Natural language Understanding*"2e, Pearson Education, 1994
- 2) Bharati A., Sangal R., Chaitanya V. "*Natural language processing: a Paninian perspective*", PHI, 2000.
- 3) Siddiqui T., Tiwary U. S. "*Natural language processing and Information retrieval*", OUP, 2008
- 4) NLTK – *Natural Language Tool Kit* - <http://www.nltk.org/>
- 5) *Journals : Computational Linguistics, Natural Language Engineering, Machine Learning, Machine Translation, Artificial Intelligence.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I ,II and III**

**Unit Test -2    Unit IV, V and VI**

## **Elective III :3) Network Modeling & Designing**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 02 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 02</b>
<b>Tutorial : 02 Hrs/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work : 02</b>
	<b>Oraland Term Work : 50 Marks</b>	

### **Course Objectives:**

- 1) Build an understanding of the fundamental concepts of networking.
- 2) Familiarize the student with the basic taxonomy and terminology of the networking Design & Modeling.
- 3) Introduce the student to advanced networking concepts preparing the student for entry Advanced courses in computer networking.
- 4) Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

### **Course Prerequisites:**

#### **Students should have knowledge of**

The fundamental concepts of computer networking.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Understand basic network technology.
- 2) Understand and building the skills of network traffic.
- 3) Design a network topology.
- 4) Design a network algorithm.
- 5) Understand internals of main protocols such as SNMP v1,v2,v3, RMON1, RMON2.
- 6) Understand the organization of Network Administration.

### **UNIT-I Requirements Planning and Choosing Technology: (06 Hours)**

User Requirements, documentation and planning, traffic sizing, tuning data size across the network, traffic characteristics, time and delay consideration

### **UNIT-II Traffic Engineering and Capacity Planning: (06 Hours)**

Poisson Arrivals, Markov processes, Voice traffic modeling, Queuing system models, Markovian queuing system models M/D/1, M/M/1, Bernoulli process, Erlang formulas and M/M/c/e system priority queue system, LAN Traffic Modeling, Availability and Reliability.

### **UNIT-III Network Design: (06 Hours)**

Designing the network topology and solutions-Top down Approach – Network Design Layers--Application Layer, Premises Architecture or Local Enterprise, Architecture Layer, Access Layer, Backbone Layer, Access Layer Design, Backbone Network Design.



**UNIT-IV Network Design Problem definition: (06 Hours)**

Network Design Problem definition : Multipoint line layout heuristics, CMST algorithm, ESAUWilliam's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location.

**UNIT-V Network Management Protocols: (06 Hours)**

Network Management Protocols: SNMP v1,v2,v3, RMON1, RMON2, Netflow, Syslog. Network Management Standards, ASN.1, encoding structure, Macros, Functional Model.

**UNIT-VI Network Administration: (06 Hours)**

Functions and responsibilities, Network planning and implementation, Sub-netting, Bandwidth management, security issues, Tools for BW and security management, modifying network implementation.

**Assignment List:**

- 1) Explain in detail 'Requirement paling Traffic sizing of network'.
- 2) Discuss Various characteristics with time & delay consideration for better network design.
- 3) List and explain 'Markovian Queen system models'.
- 4) Discuss LAN traffic modeling with its average and Reliability.
- 5) Demonstrate Various design approach with respect to design layers for networking.
- 6) Describe backbone network design.
- 7) Summarize network design problem definition with various algorithm (CMST, Sharma's, Unified).
- 8) Justify network management protocol SNMPv1,v2,v3.
- 9) Draw and explain functions model of network management standard.
- 10) State various functions and responsibility of network administration.

**Term Work Assignment List:**

- 1) Study assignment: Network topology.
- 2) Simulate Markovian queuing system models.
- 3) Design LAN traffic model assuming suitable model.
- 4) Design network of your college considering layers present.
- 5) Implement CMST algorithm.
- 6) Implement Bin packing algorithm assuming suitable parameters.
- 7) Study assignment: Network management protocols.
- 8) Analyze traffic using traffic monitor analyzer.
- 9) Demonstrate tools used for network management.
- 10) Case study: Tools for Security Management.

**Text Books:**

- 1) Keshav S., "An Engineering Approach to Computer Networking," AddisonWesley.

**Reference Books:**

- 1) *Darren L. Spohn, "Data Network Design", Tata McGraw Hill Edition.*
- 2) *Mani Subramanian, "Network Management Principles and Practice", Pearson Education.*
- 3) *James D, "Network Analysis, Architecture, and Design", Morgan Kaufman.*
- 4) *Robert S Kahn, "Wide Area Network Design", Morgan Kaufman.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

### **Elective III: 4) Neural Network**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 02</b>
<b>Tutorial : 2 Hrs/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work : 02</b>
	<b>Oral and Term Work : 50 Marks</b>	

#### **Course Objectives:**

- 1) To understand the basics concept of biological Neural Network.
- 2) To learn the basics concept of artificial Neural Network
- 3) To analyze applications of ANN
- 4) To study different pattern recognition application using ANN.
- 5) To use the practical approach of artificial neural networks in various technical, organizational and economic applications.
- 6) To learn basic learning algorithms: the delta learning rule, the back-propagation algorithm, self-organized learning, etc.

#### **Course Prerequisites:**

**Students should have knowledge of**

- 1) Algorithms and programming, data structures.
- 2) Probability theory, calculus etc.

#### **Course Outcome:**

**Students will be able to:**

- 1) Analyze the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
- 2) Understand the differences between for supervised and unsupervised learning.
- 3) Designing of single and multi-layer feed-forward neural networks.
- 4) Understand the concept of generalization and function approximation.
- 5) Understand the concepts and techniques of neural networks through the study of the most important neural network models.
- 6) Analyze the sufficient theoretical background to be able to reason about the behavior of neural networks.
- 7) Develop an application of neural network, and to know what steps to take to improve performance.

#### **UNIT-I Introduction and Basics of Artificial Neural Networks: (06 Hours)**

Introduction to Neural Networks, Features of ANN, Structure of Biological Neural Network, Comparison of BNN and ANN, Characteristics of neural network, Artificial Neural Model: McCulloch – Pitts model, Perceptron, Adaline model, Learning process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive Learning, Supervised and Unsupervised Learning,, Topology of neural network architecture.

- UNIT-II Architectures of Neural Networks: (06 Hours)**  
Architecture of Feedforward and Feedback network, Single layer ANN, Multilayer perceptron, Perceptron Learning Algorithm, Perceptron Coverage Theorem, Backpropagation Learning, input - hidden and output layer computation, Backpropagation algorithm, applications, Selection of tuning parameters in BPN, Limitation of Backpropagation Algorithm.
- UNIT-III Associative Memories, Activation & Synaptic Dynamics: (06 Hours)**  
Basic Concepts, Linear Associator, Basic Concepts of Recurrent Autoassociative Memory: Retrieval Algorithm, Storage Algorithm, Performance Considerations, Performance Analysis of Recurrent Autoassociative Memory, Bidirectional Associative Memory: Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved Coding of Memories, Multidirectional Associative Memory, Associative Memory of Spatio-temporal Patterns, Introduction To Activation, Activation Dynamics models, Basics of Synaptic Dynamics models, Stability and Convergence.
- UNIT-IV Basic functional units of ANN: (06 Hours)**  
Basic feedforward, Basic feedback, and basic competitive learning neural network, Feedforward neural networks: Linear responsibility X-OR problem and solution, Analysis of pattern mapping networks summary of basic gradient search methods, Feedback neural networks Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.
- UNIT-V Competitive learning, Matching and Self-Organizing Networks: (06 Hours)**  
Components of CL network pattern clustering and feature mapping network, Hamming Net and MAXNET, Unsupervised Learning of Clusters: Clustering and Similarity Measures, Winner-Take-All Learning, Recall Mode, Initialization of Weights, Separability Limitations, Counter propagation Network, Feature Mapping, Self-organizing Feature Maps, ART networks, Features of ART models, character recognition using ART network, Cluster Discovery Network (ART1).
- UNIT-VI Applications of ANN: (06 Hours)**  
Linear Programming Modeling Network, Robot Control, Pattern association, Pattern classification and pattern mapping tasks, Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters, Recognition of handwritten characters,

## Connectionist Expert Systems for Medical Diagnosis

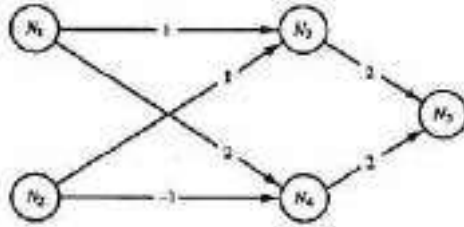
NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation

### Assignment List:

- 1) Draw and Explain structure and working of Biological Neural Network
- 2) Write note on:
  - a) Mc Culloch – Pitts model
  - b) Adaline model
- 3) Explain when, where and why it is sensible to use the sigmoid (logistic) function as the activation function in a Back-Propagation network.
- 4) Describe how the basic Back-Propagation Learning Algorithm for Multi-Layer Perceptron (MLP) networks is related to gradient descent learning.
- 5) Explain the significance of each of the following theorems: (a) Cohen-Grossberg theorem (b) Cohen-Grossberg-Kosko theorem (c) Adaptive bidirectional associative memory theorem
- 6) Consider a stochastic unit with a bipolar I-1, 11 output function. The probability distribution for the unit is given by  $P(s = 1 | x) = 1/(1 + \exp(-2 \lambda x))$  If the learning of the stochastic unit is based on gradient descent on the error between the desired and the average output, show that the resulting learning law is the same as the learning law obtained using delta learning for a deterministic unit with hyperbolic tangent as the output function.
- 7) How to perform the following tasks by a Boltzmann machine? (a) Pattern completion (b) Pattern association (c) Pattern recall from noisy input.
- 8) What is meant by full free energy and clamped free energy in a Boltzmann machine? How do you interpret the Boltzmann learning in terms of full free energy and clamped free energy?
- 9) Explain the Components of CL network pattern clustering and feature mapping network.
- 10) Explain the process of character recognition using ART network.
- 11) What is the significance of neural networks in the NETtalk application?
- 12) Explain how a constraint satisfaction model can be exploited for improving the recognition accuracy for. CV units.

### Term Work Assignment List:

- 1) Consider the Neural Network of McCulloch-Pitts neurons shown in Figure. Each neuron (other than the input neuron  $N_1$  and  $N_2$ ) has a threshold of 2.
  - a) Define the purpose of neuron  $N_5$  at time  $t$  in terms of the activations of the input neurons,  $N_1$  and  $N_2$ , at the appropriate time.
  - b) Show the activation of each neuron that results from the input signal of  $N_1=1, N_2=0$  at  $t=0$



- 2) What is Learning Process of Neural Network? Explain in Detail the types of Learning in NN.
- 3) Write and Explain Perceptron Learning algorithm and Perceptron Coverage Theorem.
- 4) Write a program implementing the error back-propagation training algorithm (EBPTA) for user-selectable I, J, and K values for a single hidden layer network. Learning constant  $\eta$  should be user-selectable; no momentum term is needed. The initial weights for the network should be selected at random. Provisions for specification of input pattern(s) and the desired response(s) should be made in order to initiate and carry out the training. Use bipolar continuous perceptrons
- 5) Assume that a linear associator has been designed using the crosscorrelation matrix for heteroassociative association of  $p$  orthonormal patterns. Subsequently, another orthonormal pattern  $s^{(p+1)}$  associated with  $f^{(p+1)}$  must be stored. An incremental change in the weight matrix needs to be performed using the cross-correlation concept. Prove that the association  $s^{(p+1)} \rightarrow f^{(p+1)}$  results in no noise term present at the output
- 6) The weight matrix of the temporal associative memory is known as

$$W = \begin{bmatrix} -1 & 3 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & 3 \\ -1 & -1 & 3 & -1 & -1 \\ -1 & 3 & -1 & -1 & -1 \\ 3 & -1 & -1 & 3 & 1 \end{bmatrix}$$

Knowing that a vector  $s^{(1)} = [-1 \ 1 \ -1 \ -1 \ 1]^t$  belongs to a sequence, find the remaining vectors of the sequence. Having found the full sequence, verify that encoding it actually yields the weight matrix  $W$  as specified in the problem. Calculate the noise term vectors generated at each recall step and determine that they are suppressed during the thresholding operation.

- 7) Explain the Concept of Feed Forward and Feed back NN with suitable Example.
- 8) Consider the ART1 neural net with four F1 units and three F2 units. After some training, the weights are as follows:

**Bottom-up weights  $b_{ij}$**

0.67	0.0	0.2
0.0	0.0	0.2
0.0	0.0	0.2
0.0	0.67	0.2

**Top-down weights  $t_{ji}$**

1	0	0	0
0	0	0	1
1	1	1	1

Determine the new weight matrices after the vector (0,0,1,1) is presented if

- a) the vigilance parameter is 0.3.
- b) the vigilance parameter is 0.7.
- 9) The MAXNET with four output nodes,  $p = 4$ , receives the input vector

$$y^0 = [0.5 \ 0.6 \ 0.7 \ 0.8]^t$$

- (a) Find the  $\epsilon$  value that would be required to suppress the output of the weakest node exactly to the zero value after the first cycle.
- (b) Find subsequent responses of the network,  $y^1$  and  $y^2$ , for the computed value of  $\epsilon$ .

- 10) Develop a multilayer feedforward character classifier for five printed digits shown as 5 X 5 black-white pixel maps on Figure. Devise a suitable network architecture for a local representation classifier. Prepare the set of five input/output binary training vector pairs. Train the network for zero decision errors. Perform the recall of nondistorted digits by reusing the training input data. Perform the evaluation of the classifier by recalling digits distorted by the center pixel (pixel 13) of the 5 X 5 field being white rather than black. Evaluate the classifier by recalling digits distorted by reversal of input pixels 12, 13, and 14.

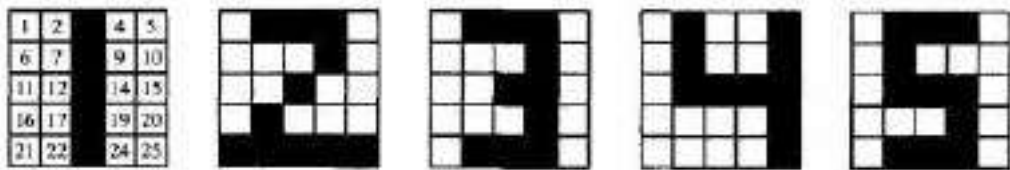


Figure. Pixel maps for digit recognition network in problem.

**Text Books:**

- 1) Stuart Russel, Peter Norvig, “Artificial Intelligence – A Modern Approach.
- 2) Patrick Henry Winston, “Artificial Intelligence”, Pearson Education.
- 3) L. Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications”, Prentice-Hall.
- 4) Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing.

**Reference Books:**

- 1) B. Yegnanarayana ,”Artificial neural Networks”, PHI Publication.
- 2) S. Raj sekaran , Vijayalakshmi Pari, “Neural networks, Fuzzy logic and Genetic Algorithms”, PHI Publication.
- 3) Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms, and Applications”, Prentice Hall International.
- 4) Satish Kumar, “Neural Networks”, McGraw Hill publication.
- 5) B. D. Ripley, “Pattern Recognition and Neural Networks”, Cambridge University Press
- 6) Simon Haykin, “Neural Networks: A Comprehensive Foundation”, pearson Education.

**Syllabus for Unit Test:**

**Unit Test -1     Unit I ,II and III**

**Unit Test -2     Unit IV, V and VI**

## **Seminar I**

**Teaching Scheme**  
**Practical: 02Hrs/Week**

**Examination Scheme**  
**Oral and Term Work: 50 Marks**

**Credit Allotted**  
**Term Work: 04**

### **Course Objectives:**

- 1) To improvise presentation, technical documentation and communication skills.
- 2) To learn recent technologies and understand its functioning.

### **Course Prerequisites:**

**Students should have knowledge of**

- 1) Source of good research articles.
- 2) Basic knowledge of mathematical modeling.

### **Course Outcome:**

**Students will be able to:**

- 1) Learn documentation of the seminar report.
- 2) Learn to communicate effectively.
- 3) Analyze the recent technologies.
- 4) Present their idea and convey the concepts.
- 5) Use the research material in the project.
- 6) Understand to draft research paper.

### **Guidelines for the project:**

- 1) Refer quality research article from IEEE, Springer, Elsevier and ACM
- 2) Select a domain of interest and use of it in developing the project.
- 3) Check the demand and future scope of that topic to utilize it for research or startup.
- 4) Check the feasibility of research considering technology, timeline, available resources.
- 5) Propose novel approach to deal with the future scope mentioned in the paper.
- 6) Check plagiarism and quality of contents.
- 7) Prepare a presentation and documentation of your seminar.

### **Exam**

<b>Parameter</b>	<b>Marks</b>
<b>Novelty</b>	<b>10</b>
<b>Understanding of Mathematical Model</b>	<b>05</b>
<b>Presentation Skills</b>	<b>05</b>
<b>Publication or Demonstration</b>	<b>05</b>



## Project Stage - I

**Teaching Scheme**  
**Practical : 02 Hrs/Week**

**Examination Scheme**  
**Oral and Term Work : 50 Marks**

**Credit Allotted**  
**Term Work : 04**

### Course Objectives:

- 1) To apply concepts mathematics and basic science while doing literature survey.
- 2) To plan the project by assigning tasks per user.
- 3) To coordinate the project with project partners.

### Course Prerequisites:

**Students should have knowledge of**

- 1) Logic used in programming language.
- 2) Basic concepts of database.

### Course Outcome:

**Students will be able to:**

- 1) Identify the problem in the existing system.
- 2) Learn various approaches to deal with problem.
- 3) Decide best solution for optimization to solve the problem.
- 4) Learn management of project.
- 5) Propose novel approach to solve a problem.
- 6) Apply skills that they have acquired.

### Guidelines for the project:

- 1) Prepare plan by following standards of project planning.
- 2) Select domain by using quality research papers like IEEE, Springer, Elsevier, ACM.
- 3) Analyze every approach by doing literature survey (preferably transaction journal of current year).
- 4) Identify the problem in the existing system.
- 5) Design solution by using mathematical model and prove it hypothetically.
- 6) Check the feasibility for implementation.
- 7) Select tools and technologies suitable for the implementation.
- 8) Prepare presentation, report and research paper on literature survey (To be submitted in IEEE transaction for critical analysis and uniqueness in contents and approaches).

### Examination

Parameter	Marks
Selection of problem for betterment of a life	2.5
Analysis of Literature survey	05
Finalizing problem statement	2.5
Design of project plan	05
Mathematical Modeling	05
Review of paper by publishing agency – like IEEE, Springer, ACM, Elsevier, EOS, Scopus Indexed journals only	05

## **Industrial Training**

**Examination Scheme**  
**Oral and Term Work: 50 Marks**

**Credit Allotted**  
**Term Work: 03**

**Course Objectives:**

- 1) To apply industry standards and technologies.
- 2) To learn to be good team player to coordinate tasks assigned at industry during the training.

**Course Prerequisites:**

**Students should have knowledge of**

Knowledge of Programming, Database Management, Software Engineering.

**Course Outcome:**

**Students will be able to:**

- 1) Learn to implement knowledge gained.
- 2) Learn to be a good team player.
- 3) Understand of work culture at industry.
- 4) Design efficient tools and techniques.
- 5) Apply the techniques and tools learnt.
- 6) Bridge the gap between industry and institute.

**Guidelines for the Industrial Training:**

- 1) Submit acceptance letter issued from organization before undergoing for the training.
- 2) Undergo for industrial training for 45 days in industries preferably government organization and NASSCOM listed organizations.
- 3) Apply the techniques and tools learnt during the curriculum.
- 4) Understand the new technologies for accomplishing the tasks.
- 5) Prepare Presentation and Reports based on the work completed at industry.
- 6) Maintain Log book and prepare day to day activity chart and get it authorized by concerned person from industry.
- 7) Work sincerely to grab opportunities for sponsored projects as well as job.

**Exam**

<b>Parameter</b>	<b>Marks</b>
<b>Presentation</b>	<b>10</b>
<b>Log Book</b>	<b>10</b>
<b>Demonstration of skills acquired</b>	<b>05</b>

## Semester-VIII

Sr.no	Course Title	Teaching Scheme				Examination Scheme							Credits	
		L	T	P	Contact hrs/wk	Theory	Unit Test	Attendance	TA & Assignments	Practical& TW	Oral& TW	Total Marks	Theory	TW
1	Web Engineering	2	1	2	5	60	20	10	10	50	--	150	3	1
2	Component Engineering	2	1	2	5	60	20	10	10	--	50	150	3	1
3	Mobile Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
4	Distributed Computing	2	1	-	3	60	20	10	10	--	--	100	3	-
5	Elective-IV	2	--	--	2	60	20	10	10	--	--	100	2	-
6	IT Lab-V	-	--	2	2	--	--	--	--	50	--	50	-	1
7	Project stage - II	-	-	4	4	--	--	--	--	50	50	100	-	8
	<b>TOTAL</b>	<b>10</b>	<b>04</b>	<b>10</b>	<b>24</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>150</b>	<b>100</b>	<b>750</b>	<b>14</b>	<b>11</b>
	Environmental Studies	4	-	-	4	100	-	-	-	-	-	100	-	-

**Elective-IV :**

- 1)Advanced TCP/IP
- 2)Genetic Algorithm
- 3) Network Security and Cryptography
- 4)Semantic Web Mining

Teaching Scheme			Examination Scheme							Credits	
Lecture	Practical	Tutorial	Theory	Unit Test	Attendance	Assignments	PR+TW	OR+TW	Total	Theory	TW
10	10	04	300	100	50	50	150	100	750	14	11

## Web Engineering

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory: 03</b>
<b>Tutorial : 1Hr/Week</b>	<b>Internal Assessment : 40 Marks</b>	<b>Term Work: 01</b>
<b>Practical : 2Hrs/Week</b>	<b>Practical and Term Work : 50 Marks</b>	

### Course Objectives:

- 1) Learn web application architectures.
- 2) Learn to model web applications.
- 3) Understand testing techniques for web applications.

### Course Prerequisites:

#### Students should have knowledge of

- 1) Basic concepts of Software engineering.
- 2) Basic concepts of HTML, XML, CSS.

### Course Outcome:

#### Students will be able to:

- 1) Understand categories and characteristics of web applications.
- 2) Understand client and server side technologies.
- 3) Understand Web Application Architectures.
- 4) Design model for Web Applications.
- 5) Design various Web Applications.
- 6) Test various Web Applications.

### **UNIT-I Introduction to web engineering: (06 Hours)**

Motivation, Evolution and need for web engineering, Categories of web applications, Characteristics of web applications: Product related, Usage related, Development related.

#### **Requirements Engineering**

Introduction, Fundamentals, Requirements engineering activities, Requirements engineering specifics in web engineering, Adapting requirements engineering methods to web application development, Principles for requirements engineering of web applications, Requirement types, Tools.

### **UNIT-II Technologies for Web Applications: (06 Hours)**

Client Side Technologies:HTML, HTML basic concepts, Static and Dynamic HTML, DHTML, XML, XSL,JavaScript.Server Side Technologies:Servlet, URI handlers, Middlewares, Web services.

### **UNIT-III Web Application Architectures: (06 Hours)**

Introduction, Specifics of web application architecture, Layered

architectures(2-layer,N-layer),Database centric architectures, Data aspect architectures, Architectures for web document management, Components of generic web application architecture.

**UNIT-IV Modeling Web Applications: (06 Hours)**

Introduction, Modeling specifics in web applications, Modeling requirements, Hypertext modeling, Content modeling, Access modeling concepts, Customization modeling, Presentation modeling

**UNIT-V Web Application Design: (06 Hours)**

Web design from an evolutionary perspective, Software design, Information design, Problems in integrated web design, Presentation design, Device independent development, Interaction design, Navigation design, Designing link internals, Functional design.

**UNIT-VI Testing Web Applications: (06 Hours)**

Objectives of testing, Levels of testing, Test approaches, Test schemes, Test methods and techniques, Test automation, Test driven development, Test tools, Advantages and Disadvantages of automated test.

**Web Project Management:**

Understanding scope, defining framework activities, Web team building, Risk management, Schedule development, Quality management, Change management, Project tracking

**Assignment List:**

- 1) Explain evolution and need of web engineering
- 2) Describe requirement engineering methods for web application development
- 3) Explain in detail client side technologies for web applications
- 4) Explain in detail server side technologies for web applications
- 5) Describe various web application architectures
- 6) Explain in detail components of generic web application architecture
- 7) Explain various modeling techniques of web applications.
- 8) Describe various designing methods of web applications
- 9) Study of latest testing techniques of web applications
- 10) A case study on designing and testing websites

**Term Work Assignment List:**

- 1) A case study on any static websites like wikipedia, college websites, etc
- 2) A case study on any dynamic websites like E-commerce, social networking sites,etc
- 3) Design a client-side form validation webpage using javascript
- 4) Create a web application for student database

- 5) Design and develop IT department website
- 6) Design and develop E-commerce website
- 7) A case study on methodology, techniques and tools used in designing websites
- 8) A case study on latest testing techniques of web applications
- 9) Create a mini project using html, css and javascript
- 10) Test mini project using any testing methodology

**Text Books:**

- 1) Roger S.Pressman,DavidLowe,“Web Engineering”,TataMcGraw Hill Publication,2007
- 2) GertiKappel, Birgit Proll, “Web Engineering”, John Wiley and Sons Ltd, 2006
- 3) GertiKappel, Birgit Proll, Siegried Reich, Werner Retschitzegger,“Web Engineering: The Discipline of Systematic Development of Web Applications”,Wiley,2006

**Reference Books:**

- 1) *“Web Engineering: A Practitioner's Approach”Roger Pressman and David Lowe, McGraw-Hill, 2009.*
- 2) *Moller, “An Introduction to XML and Web Technologies” , Pearson Education New Delhi, 2009*
- 3) *“Web Engineering: Principles and Techniques” ,Woojong Suh,Idea Group Inc.,2005*
- 4) *“Web Engineering:Managing Diversity and complexity of web application development”,Springer,2001*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## Component Engineering

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 02 Hrs/Week	End Semester Examination : 60 Marks	Theory : 03
Practical : 02 Hrs/Week	Internal Assessment : 40 Marks	Term Work : 01
Tutorial : 01 Hr/Week	Oral and Term Work : 50 Marks	

### Course Objectives:

- 1) To learn evolution of distributed computing.
- 2) To provide students with fundamental knowledge needed to design and implement object-oriented client-server applications.
- 3) To understand the object models
- 4) To design a framework to bridge the gap. In this framework, inter-component communication is separated from the components and handled by ports and links which deal with infrastructure level middleware and protocols, including CORBA

### Course Prerequisites:

Students should have knowledge of

- 1) Object Oriented Programming.
- 2) Distributed System.
- 3) Java Programming and Applications.

### Course Outcome:

Students will be able to:

- 1) Learn objectifying enterprise system.
- 2) Understand the component architecture.
- 3) Use CORBA Technology and the Java™ Platform Standard Edition.
- 4) Learn the issues regarding the designing of distributed objects.
- 5) Understand Object Reuse.
- 6) Analyze Java component technologies.

### UNIT-I Object Technology: ( 06 Hours)

A typical OO system, Object Oriented concepts, Advantages of the client model, integrating object technology with Enterprise systems: Objectifying individual Modules, Objectifying Conventional Architecture model, Using OO language in an OO architecture Model, Objectifying enterprise system.

### UNIT-II Component Technology: ( 06 Hours)

Component concepts, characteristics Of components, component and Objects, Modules, callbacks, fundamental properties of Component technology ,component Architecture, Interfaces – specification, Component Models objects, components and middleware ,Components and Object-Oriented Implementations, Bridging the Gap: Framework and Composition

- UNIT-III CORBA Component Technologies:** ( 06 Hours)  
 Introduction to Java and CORBA, Object Request Broker, System object model, CORBA's Objective and design criteria CORBA services-overview, information management services Model driven architecture
- UNIT-IV Distributed Object Technology:** ( 06 Hours)  
 Evolution Of Distributed Systems, Characteristics of Distributed Systems, Study of Distributed Objects, Characteristics of distributed Objects, Methods in distribution, Issues in designing of distributed objects, Need of multitier architecture, Evolution of multitier Architecture
- UNIT-V Interfaces in COM and DCOM:** ( 06 Hours)  
 Introduction to COM, OLE/ActiveX, DCOM and .NET, Introduction to interfaces, Interface definition Language, (IDL), COM – interface and versioning and object reuse  
**COM services:** Dispatch interface, connectable objects
- UNIT-VI Java Based Component Models:** ( 06 Hours)  
 Introduction to Java Component Technologies EJB and Java Bean, Threads Introduction, Threads-state transition diagram, example  
**Enterprise Java Beans:** EJB architecture, Enterprise JavaBeans and JavaBeans.  
**Types of Beans :** Session beans- Stateful and stateless session beans, Entity beans and Message driven beans  
**Distributed Object Model :** Introduction RMI, RMI Architecture ,RMI Service.

**Assignments List:**

- 1) Implement polynomial as an object in C++.
- 2) Create an RMI Application.
- 3) Explain CORBA component model.
- 4) Explain information management services.
- 5) Sketch simple components and define their interface.
- 6) Explain of evolution of multitier Architecture.
- 7) Discuss interfaces in COM and DCOM.
- 8) Write simple banking application program using CORBA IDL.
- 9) Write java component technologies EJB and Java Bean.
- 10) Create a Java Bean connecting to Google API.

**Term Work Assignments List:**

- 1) Describe Integrating object technology with Enterprise systems.
- 2) Explain the software architecture in object oriented programming.
- 3) Enlist and describe characteristics of components.



- 4) Explain object request broker.
- 5) Elaborate Evolution of Distributed Systems.
- 6) What is the Need of multitier architecture? Elaborate evolution of multitier Architecture.
- 7) Describe Interfaces in COM and DCOM.
- 8) Describe Component Technologies EJB and Java Bean.
- 9) Describe Enterprise Java Beans.
- 10) Describe RMI Architecture and RMI Service.

**Text Books:**

- 1) G. Sudha Sadasivam, "Component Based Technology", Wiley India Edition
- 2) Paul Allen, Stuart Frost, "Component-Based Development for Enterprise Systems: Applying the SELECT Enterprise", Cambridge University Press
- 3) Clemens Szyperski, "Component Software: Beyond Object-Oriented Programming", Pearson Education publishers, 2003

**Reference Books:**

- 1) Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
- 2) Mowbray, "Inside CORBA", Pearson Education, 2003.
- 3) Freeze, "Visual Basic Development Guide for COM & COM+", BPB Publication, 2001.
- 4) Hortsamann, Cornell, "CORE JAVA Vol-II" Sun Press, 2002.

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## Mobile Computing

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 02 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 03</b>
<b>Tutorial : 01 Hr/Week</b>	<b>Internal Assessment : 40 Marks</b>	

### Course Objectives:

- 1) To study wireless network for clear understanding of Mobile Network.
- 2) To understand important terms of data communication required for mobile computing.
- 3) To apply knowledge of mobile computing for understanding of applications on operating systems used for mobile.

### Course Prerequisites:

Students should have knowledge of

- 1) Operating system.
- 2) Network communication.

### Course Outcome:

Students will be able to:

- 1) Understand mobile network.
- 2) Learn mobile communication technologies.
- 3) Understand GSM.
- 4) Analyze OS used in Mobile.
- 5) Design application on Android platform.
- 6) Design application on ios platform.

### UNIT-I Introduction to Mobile Computing: (06 Hours)

Introduction to wireless Network, Concept of Mobile Computing, principles of Mobile Computing, usage of MAC in Mobile computing, types of Sharing of wireless channels: FDMA, TDMA, CDMA. MAC layer, issues in wireless communication.

### UNIT-II Mobile Network: (06 Hours)

Introduction to IP, static and dynamic IP, usage of TCP/IP for communication, IPV6, acknowledgment, wireless network: allocation of channel, interferences, concept of handoffs and management of location, LAN, PAN, Bluetooth, ZigBee

### UNIT-III Architecture of GSM: (06 Hours)

GSM Architectures, Radio Interfaces, PLMN Interface, Protocols Localization, Calling, SMS service, Modulation, Multiplexing, controlling the medium access, spread spectrum, methods of coding, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks, introduction to 5G, concept of GPRS.

### UNIT-IV Mobile Data communication: (06 Hours)

Communication Asymmetry, classification of data delivery mechanism, data dissemination Broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.

**UNIT-V Mobile Operating System: (06 Hours)**

Functions of operating system in mobile, Concept of kernel, interfacing between O.S. used in mobile and hardware, Mobile Computing Environment, protocols used, security in mobile operating system.

**UNIT-VI Mobile Application Development: (06 Hours)**

Android App development, Android SDK, publishing play store, ios app development, Windows phone app development, publicizing and monetization of App.

**Assignment List:**

- 1) Draw and explain wireless architecture.
- 2) Explain mobile communication in detail.
- 3) Explain different layers in mobile network.
- 4) Explain synchronization protocol.
- 5) Explain MANET in detail.
- 6) Explain characteristics of mobile OS.
- 7) Write a complete process of GSM tracking of a mobile.
- 8) Case study on mobile agents.
- 9) Implement login system using android sdk.
- 10) Implement login system using ios.

**Text Books:**

- 1) Jochen Schiller, "Mobile communications", Addison wisely, Pearson Education
- 2) Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, concepts and protocols, Wiley, India.

**Reference Books:**

- 1) *T. Rappaport, "Wireless Communication: Principles and Practice", Pearson Education.*
- 2) *Reza B'Far (Ed), "Mobile Computing Principles", Cambridge University Press.*
- 3) *Andrew Tanenbaum, Modern Operating System, 3rd/e, Pearson Education International, ISBN Q-1B- 1BMST-L.*
- 4) *Digital Content: iOS Technology Overview: IOSTechOverview.pdf, Apple Inc. Copyright 2014.*

**Syllabus for Unit Test:**

**Unit Test -1 Unit I, II and III**

**Unit Test -2 Unit IV, V and VI**

## Distributed Computing

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :03</b>
<b>Tutorial : 1 Hr/Week</b>	<b>Internal Assessment : 40 Marks</b>	

### Course Objectives:

The course is aimed to provide an understanding of key concepts underlying the function of distributed computing systems along with issues in its design and implementation.

### Course Prerequisites:

**Students should have knowledge of**

1) Fundamentals of Data Structures, Operating Systems, Networking concepts.

### Course Outcome:

**Students will be able to:**

- 1) Understand the fundamentals of distributed computing environment.
- 2) Implement inter process communication.
- 3) Learn of process and threads and implement threads.
- 4) Understand the concepts of clock synchronization and distributed transaction.
- 5) Learn distributed file system and distributed shared memory.
- 6) Understand the concepts of distributed system security.

### UNIT-I Fundamentals: (06 Hours)

Definition and evolution of Distributed Computing System, Models and Types of Distributed Computing Systems, Issues and Goals in designing Distributed System, Distributed Computing Environment, Peer to peer systems and its middleware, Routing overlays, Mobile and Ubiquitous computing.

### UNIT-II Communication: (06 Hours)

Inter process communication (IPC): Introduction and need  
Message Passing system: Desirable features of good message passing system, Issues in IPC, Group and multicast communication,  
Remote Procedure Calls (RPC): The RPC Model, Implementation of RPC mechanisms (Stubs and marshalling)  
Java RMI: Architecture, Implementation (Stubs and Skeletons)  
Web services and SOAP.

### UNIT-III Processes and Threads: (06 Hours)

Process Migration: Introduction, Features, Mechanisms, Advantages, use in heterogeneous systems.  
Threads: Concept, Motivation, Models, Issues, Synchronization, Scheduling, Implementing.

**UNIT-IV Synchronization and Distributed Transactions: (06 Hours)**

Clock synchronization: Drifting, Issues, Algorithms, Event Ordering  
Deadlock: Conditions, Modeling, Handling, Avoidance, Prevention, Detection, Election Algorithms  
Distributed Transaction: Introduction, Locks, Optimistic Concurrency Control, Timestamp Ordering

**UNIT-V Distributed File system and Distributed Shared memory: (06 Hours)**

Distributed Files Systems: Advantages, Features, Models, Caching, Replication, Fault Tolerance  
Distributed Shared Memory: Architecture, Design and Implementation Issues, Advantages, Granularity, Structure of Shared Space, Consistency Models, Replacement Strategy, Thrashing

**UNIT-VI Distributed System Security: (06 Hours)**

Distributed System Security: Goals, Design Principles, Attacks, Confinement Problem, Cryptography, Authentication, Access control, Digital Signatures.

**Assignment List:**

- 1) Study the details of IPC mechanism used by Sun RPC for DCE
- 2) Implement Java RMI client and server programs using stub and skeleton.
- 3) Elaborate the life cycle of process and threads.
- 4) Implement Threads in java and explain each step of its life cycle.
- 5) Compare the various algorithms available for clock synchronization.
- 6) Study any one journal paper which has proposed/ implemented any new mechanism for concurrency control.
- 7) Case study of Open Software Foundation's distributed file service.
- 8) Study of any one journal paper which has implemented/ proposed any one mechanism related to any issue of distributed shared memory.
- 9) Consider any one security mechanism you know and discuss how it achieves the goals and design principles of distributed system security.
- 10) Study any real-time security attack and propose alternate strategies that could have been used to counteract those.

**Text Books:**

- 1) Pradeep K. Sinha, "Distributed Operating Systems: Concepts and Design", Wiley-IEEE Press.
- 2) Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall India Learning Private Limited, Second edition
- 3) George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems: Concepts and Design", Pearson Education India; 5th edition

**Reference Books:**

- 1) *Ajay D. Kshemkalyani, Mukesh Singhal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press- South Asian edition*
- 2) *Abraham Silberschatz, Peter B. Galvin, Greg Gagne , "Operating System Concepts", Wiley, 8th Edition*
- 3) *Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson, 2<sup>nd</sup> edition*
- 4) *Cay Horstmann and Gary Cornell, Core Java, Volume II - Advanced Features, Prentice Hall, 7 edition.*

**Syllabus for Unit Test:**

**Unit Test -1      Unit I, II and III**  
**Unit Test -2      Unit IV, V and VI**

## Elective-IV : 1) Advance TCP/IP

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2 Hrs/ Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 02</b>
	<b>Internal Assessment : 40 Marks</b>	

### Course Objectives:

The course is headed for afford theoretical and practical understanding regarding the TCP/IP networking. Concepts similar to multiplexing, switching, addressing, naming, quality of service, routing, flow and congestion control are explored all the way through their implementation in TCP/IP protocol suite.

### Course Prerequisites:

#### Students should have knowledge of

- 1) A preliminary TCP/IP course or else has equivalent knowledge.
- 2) TCP/IP and it's configuration in addition to a operational knowledge of LAN plus WAN networking.
- 3) An admiration of the TCP/IP suit of protocols in addition to protocol stacks.

### Course Outcome:

#### Students will be able to:

- 1) Enumerate layers of the OSI model as well as TCP/IP.
- 2) Describe the functioning of Internet Protocol.
- 3) Demonstration IP Address of allocation methods.
- 4) Understand and building the skills of routing mechanisms and sub netting.
- 5) Explain the Transmission Control Protocol concepts.
- 6) Understand the basic structure of IP Version 6.

**UNIT-I Introduction: (06 Hours)**  
History of TCP/IP :The Internet, TCP/IP Architecture, The TCP/IP Suite. Standards Bodies – ISO, Open System Interconnection. ISO- OSI 7 - layer model, Layered Protocols Model, TCP/IPwithProtocol Encapsulation.

**UNIT-II Internet Protocol (IP): (06 Hours)**  
What is Internet Protocol, IPv4 Address Classes, Classful IPv4 Address Ranges, Internet Protocol Addressing, Multicast Addresses, IPv4 Reserved Addresses.IPv4 Address Assignment, IPv4 Private Network Addressing, Internet Protocol Routing, The IPv4 Header, Protocol Numbers, IP Fragmentation.  
IP Precedence (Type Of Service), Differentiated Services – DiffServ, Per Hop Behavior (PHB), Commonly Used DSCP's.

**UNIT-III Address Resolution and Address Allocation (06 Hours)**  
**Address Allocation :**  
Dynamic IP Address Allocation – RARP, BOOTP, BOOTP Message

format, Operations. Dynamic IP Address Allocation – DHCP, The DHCP Server, DHCP Address Acquisition States, DHCP Operations, DHCP Relay, Windows DHCP Commands.

**Address Resolution:**

Address Resolution Protocol (ARP), Default Gateway, Connecting Hosts – Similar Network, Connecting Hosts – Dissimilar Network, ARP Message Format, Network Protocol Analyzers.

**UNIT-IV Internet Protocol Routing: (06 Hours)**

Introduction to Routers and Routing, Structure of a Basic Router, Types of Routing -Static Routing, Dynamic Routing, Distance-Vector, Link State, Hop Count, Metrics and Costs. Routing Protocols, Protocols of Dynamic Routing, Protocol Comparison. The Default Route.

**UNIT-V Host to Host Communication and IP Address Translation: (06 Hours)**

Transmission Control Protocol (TCP) Concepts, Simple Reliability, TCP Segment, Port Numbers (TCP), Connection Set-up (TCP), Connection Closure (TCP), Protocol of Sliding Windows, User Datagram Protocol (UDP), UDP Segment, UDP vs. TCP.

**IP Address Translation :**

Network Address Translation, Configuring NAT, Port Address Translation with NAT, Dynamic NAT with Port Address Translation.

**UNIT-VI IP Version 6: (06 Hours)**

Introduction: What is IPv6? , Comparison of IPv4 VS IPv6, IPv6 Header. Address Representation, Address Types of IPv6, Unicast IPv6, Anycast IPv6, IPv6 extension headers. DNS enhancements for IPv6.

**Assignment List:**

- 1) Define following 1) Talk 2) Echo 3) Ping Network Commands.
- 2) Describe (RCE) Remote Command Execution.
- 3) Discuss simulating of ARP /RARP.
- 4) Relate how HTTP used for web page upload as well as Download.
- 5) Define TCP module Implementation. (TCP services).
- 6) Define how File Transfer within client-server architecture by subsequent methods.  
(a) TCP/IP (b) USING RS232C.
- 7) Illustrate Remote Method Invocation (RMI).
- 8) Explain IPv6 with header format.
- 9) Outline Case study regarding the different routing algorithms to choose the network path by its best possible and economical during data transfer. • Shortest path routing • Flooding • Distance vector.
- 10) Write Case study of building a firewall for BVDUCOEP campus network.



**Text Books:**

- 1) Douglas E.Comer, “Internetworking with TCP/IP–Principles, Protocols & Architecture”, Pearson education, 4th Edition, 2000.
- 2) Behrouz A. Forouzan, TCP/IP Protocol Suite, Tata McGraw Hill, 4th Edition 2010.

**Reference Books:**

- 1) *Douglas E.Comer, Internetworking with TCP/IP, 5th Edition Pearson Education Asia 2005.*
- 2) *Behrouz Forouzan, “TCP/IP protocol suite”,Tata Mc Grawhill, Fourth Edition,2012.*
- 3) *Richard Stevens, — TCP/IP Illustrated, Vol 1,2,3 Pearson education India, 1<sup>st</sup> edition,2001.*
- 4) *Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## **Elective IV: 2) Genetic Algorithm**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 2 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 02</b>
	<b>Internal Assessment : 40 Marks</b>	

### **Course Objectives:**

- 1) Learn basics of Evolutionary Computation and Genetic Algorithm.
- 2) Understand terminologies and operators of GA.
- 3) Understand Advanced operators and techniques in Genetic Algorithm.
- 4) classify of GA Algorithms.
- 5) Implement Genetic Programming.
- 6) Understand practical approach of Genetic Algorithm Optimization Problems.

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) A programming language.
- 2) Linear algebra, probability and calculus.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Analyze the concept of evolutionary computation.
- 2) Understand the basic concepts of genetic algorithms.
- 3) Understand the result of applying various genetic operators.
- 4) Develop GA problem using different GA operators.
- 5) Understand about the way GA is used and the domain of application.
- 6) Develop a different application using GA Optimization problem.

### **UNIT-I Evolutionary Computation and Introduction to Genetic Algorithms: (06 Hours)**

Introduction to Evolutionary Computation, Historical Development of EC, Features of Evolutionary Computation, Applications of Evolutionary Computation, Introduction to Genetic Algorithm: Biological Background, What is Genetic Algorithm? Conventional Optimization and Search, A Simple Genetic Algorithm, Comparison of Genetic Algorithm with Other Optimization Techniques, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm. Theoretical Analysis of Evolutionary Algorithms: Schema theorems, convergence of the algorithms, computational time complexity of the algorithms, no free lunch theorem, Evolutionary applications to medicine and public health, Applications of evolutionary biology for veterinarians.

### **UNIT-II Terminologies and Operators of GA: (06 Hours)**

Introduction, Key Elements, Genes, Populations, Data, Search Strategies, Encoding, Breeding, Search Termination (Convergence Criteria), Why do Genetic Algorithms Work?, Solution Evaluation, Search Refinement, Constraints, Fitness Scaling, Example Problems: Maximizing a function, Travelling Salesman Problem.

**UNIT-III Advanced Operators and Techniques in Genetic Algorithm: (06 Hours)**

Introduction, Diploidy, Dominance and Abeyance, Multiploid, Inversion and Reordering, Niche and Speciation, Few Micro-operator, Non-binary Representation, Multi-Objective Optimization, Combinatorial Optimizations, Knowledge Based Techniques.

**UNIT-IV Classification of Genetic Algorithm: (06 Hours)**

Introduction, Simple Genetic Algorithm (SGA), Parallel and Distributed Genetic Algorithm (PGA and DGA), Hybrid Genetic Algorithm (HGA), Adaptive Genetic Algorithm (AGA), Fast Messy Genetic Algorithm (Fm GA), Independent Sampling Genetic Algorithm (ISGA).

**UNIT-V Genetic Programming: (06 Hours)**

Introduction, Comparison of GP with Other Approaches, Primitives of Genetic Programming, Attributes in Genetic Programming, Steps of Genetic Programming, Characteristics of Genetic Programming, Application of Genetic Programming, Haploid Genetic Programming with Dominance.

**UNIT-VI Genetic Algorithm Optimization Problems: (06 Hours)**

Introduction, Fuzzy Optimization Problems: Fuzzy Multi objective Optimization, Interactive Fuzzy Optimization Method, Genetic Fuzzy Systems. Multi objective Reliability Design: Network Reliability Design, Bicriteria Reliability Design. Combinational Optimization problem: Linear Integral Model, Applications of Combinatorial Optimization Methods. Scheduling Problems: Genetic Algorithm for Job Shop Scheduling Problems (JSSP). Transportation Problems: Genetic Algorithm in Solving Transportation, Location-Allocation Problems with Euclidean Distances. Network Design and Routing Problems: Planning of Passive Optical Networks, Planning of Packet Switched Networks, Optimal Topological Design of All Terminal Networks, Learning with Genetic Fuzzy Systems: An Application, Pittsburgh Approach

**Assignment List:**

- 1) Define Evolutionary computation? State three fundamental features of biological evolutionary computation.
- 2) Explain difference between Genetic algorithm and Genetic Programming. Describe how evolutionary computation is applied to engineering applications.
- 3) Give a suitable example for the Genetic Algorithm principle “Survival of the fittest”.
- 4) What is Search space? Describe various conventional optimization and search techniques.
- 5) How genetic algorithms work? Explain the building block hypothesis and schema theorem.
- 6) Find the safe light combinations for 8 traffic lights, four of which are vehicle lights having four possible colors (red, yellow/red, yellow and green) and the other four pedestrian lights having only two colors (red and green).
- 7) Describe the various knowledge-based techniques that improve the efficiency of simple genetic algorithm.
- 8) Implement Travelling Salesman Problem using advanced operators and techniques.
- 9) Discuss the operations involved in the Fast messy Genetic Algorithm.
- 10) Build a C program to implement simple genetic algorithm for a multi objective optimization problem.
- 11) Discuss the crossover and mutation operation of GP. Explain with suitable examples, the characteristics of GP.
- 12) Write a computer program to implement GP for a function optimization problem.

**Text Books:**

- 1) Mitchell Melanie, “An Introduction to Genetic Algorithms”, MIT publications.
- 2) S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI.

**Reference Books:**

- 1) *S.N.Sivanandam, S.N.Deepa, “Introduction to Genetic Algorithms”, Springer Publications.*
- 2) *David A, “An Introduction to Genetic Algorithms for Scientists and Engineers”, World Scientific Publishing.*
- 3) *David E. Gold Berg, “Genetic Algorithms in Search, Optimization & Machine Learning”, Pearson Education.*
- 4) *L. D. Davis, Evolutionary algorithms, Springer-Verlag, 1999.*
- 5) *K. Deb, Multi-Objective Optimization Using Evolutionary Algorithms, Wiley and Sons, 2009.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## **Elective-IV :3) Network Security and Cryptography**

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory: 02 Hrs/Week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory: 02</b>
	<b>Internal Assessment : 40 Marks</b>	

### **Course Objectives:**

- 1) To know the main beliefs of encryption algorithms, public key cryptography.
- 2) To Depth knowledge regarding authentication.
- 3) To understand the application level security mechanisms.
- 4) To be familiar with the network security tools in addition to applications.

### **Course Prerequisites:**

#### **Students should have knowledge of**

- 1) Computer Networks & Security associated issues.
- 2) Some understanding of linear algebra as well as statistics.

### **Course Outcome:**

#### **Students will be able to:**

- 1) Recognize the methods of conventional encryption.
- 2) Understand the concepts of number theory and public key encryption.
- 3) Learn Hash functions and authentication.
- 4) Understand stream cipher models and various block cipher.
- 5) Learn the system level security used.
- 6) Distinguish the network security tools along with applications.

### **UNIT-I Introduction to Mathematical Foundation: (06 Hours)**

Introduction to Security trends, Attacks along with services, Classical Crypto systems, Types of ciphers – LFSR sequences. Overview on Modern Cryptography. Finite Fields and Number Theory: Groups, Rings, Fields-Modular arithmetic-Euclids algorithm-Finite fields- Polynomial Arithmetic – Prime numbers-Fermats and Eulers theorem-Testing for primality. The Chinese remainder theorem- Discrete logarithms.

### **UNIT-II Network Security Model: (06 Hours)**

The OSI security architecture, Network security Model, Model for CNSS Security, Access and Information Security, Approaches toward Information Security Implementation, The Security Systems Development Life Cycle. Model for Symmetric cipher, techniques of Substitution, Techniques of Transposition, Rotor machines, Steganography, Simplified DES, Principles of Block cipher.

### **UNIT-III Public Key Cryptography&Block Ciphers: (06 Hours)**

Data Encryption Standard (DES) – Principals of Block cipher, Modes of operation for Block cipher. Advanced Encryption Standard (AES), Triple DES, Algorithm for Blowfish-RC5.  
Public key cryptography: Public key cryptosystems Principle's, The RSA algorithm, Key management, Diffie Hellman Key exchange, Elliptic curve cryptography, Elliptic curve arithmetic,  
Other attacks on RSA and Semantic Security of RSA. Primarily test, Cayley Purser algorithm, Factoring Technique, Probabilistic public key encryption.

**UNIT-IV Hash Functions and Authentication: (06 Hours)**

Requirements of Authentication, Functions of Authentication. Message Authentication Codes (MAC) - Hash Functions, Security of hash function and MAC, MD5, SHA, HMAC, CMAC, RIPEMD.  
Digital signature: Protocols for Authentication, Digital Signature Standard (DSA), Digital signatures -RSA, SecureID, ElGamal, DSA  
Quantum Cryptography-Okamoto to Uchiyama cryptosystem.

**UNIT-V System Security and Security Practice: (06 Hours)**

Introduction to Applications for Authentication, Kerberos – X.509 Authentication services, Internet Firewalls for Trusted System: Roles of Firewalls, Terminology related to Firewall. Types of Firewalls, Secure Electronic Transaction (SET) for E-Commerce Transactions.  
Intruder: Intrusion detection system, Virus furthermore related threats, Countermeasures, Principle's of Firewalls design. Trusted systems – Realistic implementation of cryptography along with security.

**UNIT-VI Network Security: (06 Hours)**

Introduction to Security Services intended for E-mail-attacks possible through E-mail, Establishing privacy of keys, source authentication, Integrity of Message -Non-Repudiation-Pretty Good Privacy (PGP), S/MIME.  
Internet Protocol (IP) Security: Abstract of IPSec, IPv4 and IPv6, Authentication Header, Encapsulation Security Payload (ESP), Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding).  
Web Security: SSL/TLS Essential Protocol-computing the keys, authentication of client, PKI as deployed by SSL Attacks fixed in v3.

**Assignment List:**

- 1) Explain Port Scanning via virtual network environment accessible through a VPN connection.
- 2) Extend Network Intrusion Detection via virtual network environment accessible throughout a VPN connection.

- 4) Describe Public Key Security Experimenting with RSA, Encryption as well as Decryption.
- 5) Explain Host - Based Intrusion Detection with virtual network environment accessible through a VPN connection.
- 6) Summarize Man-in-the-Middle Attacks with example.
- 7) Define Remote buffer overflow attack.
- 8) Explain Logic-based Authentication and Authorization.
- 9) State Android security auditing with Genymotion virtual machine and Burp Suite proxy.
- 10) Illustrate Capturing and monitoring android network traffic.

**Text Books:**

- 1) Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
- 2) William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
- 3) Wade Trappe, Lawrence C Washington, " Introduction to Cryptography with coding theory", 2nd ed, Pearson, 2007.

**Reference Books:**

- 1) *Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.*
- 2) *Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.*
- 3) *Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.*
- 4) *Bruce Schneier and Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.*
- 5) *Man, Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.*

**Syllabus for Unit Test:**

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## Elective: 4) Semantic Web Mining

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 02 Hrs/Week</b>	<b>End Semester Examination</b>	<b>Theory: 02</b>
	<b>Internal Assessment</b>	<b>: 60 Marks</b>
		<b>: 40 Marks</b>

### Course Objectives:

- 1) Understand a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.
- 2) Understand the basics of Information retrieval and Web search with special emphasis on web crawling.
- 3) Apply the use of machine learning approaches for Web Content Mining.
- 4) Understand the role of hyper links in web structure mining.
- 5) Learn the various aspects of web usage mining.

### Course Prerequisites:

**Students should have knowledge of**

- 1) Concepts of data mining.
- 2) Concepts of Web Technology/Web Engineering.

### Course Outcome:

**Students will be able to:**

- 1) Build a sample search engine using available open source tools.
- 2) Identify the different components of a web page that can be used for mining.
- 3) Apply machine learning concepts to web content mining.
- 4) Implement Page Ranking algorithm and modify the algorithm for mining information.
- 5) Design a system to harvest information available on the web to build recommender systems.
- 6) Analyze social media data using appropriate data/web mining techniques and modify an existing search engine to make it personalized.

### UNIT-I Introduction: (06 Hours)

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming. The Syntactic and the Semantic Web, Logics of the Semantic Web. The world of the semantic web-WWW-Meta data-Search engine-Search engine for traditional web-Semantic web-Search engine for semantic web-Traditional web to semantic web.

### UNIT-II Semantic Web Technology : (06 Hours)

RDF,- Elements of RDF, Basic Syntax and Fundamental rules of RDF-Aggregation-Distributed information-RDFS-core elements of



RDFS-Ontology-Taxonomy-Inferencing based on RDF schema.  
**OWL:** OWL syntax, OWL and RDF semantics, OWL document, Using OWL to define classes-Set operators-Enumerations-Define propertiesontologymatching-Three faces of OWL-Validate OWL.  
**Swoogle :** FOAF-Semantic markup-Issues-prototype system-Design of Semanticweb search engine-Discovery and indexation-prototype system-case study.

**UNIT-III Web Content Mining & Semantic Web Services; (06 Hours)**

Web Content Mining – Supervised Learning – Decision tree - Naïve Bayesian Text Classification -Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models - Probability-BasedClustering - Evaluating Classification and Clustering – Vector Space Model – Latent semanticIndexing – Automatic Topic Extraction - Opinion Mining and Sentiment Analysis – Document Sentiment Classification. Introduction to web services- SOA, Limitations of web services. Semantic web services- OWL-S-Upper ontology-WSDL-S,OWL-S to UDDImapping ,Design of the search engine,implementations.

**UNIT-IV Web Link Mining : (06 Hours)**

Link mining, common link mining tasks, link-based object ranking  
Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery – Web Crawling -A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers- Topical Crawlers- Evaluation - Crawler Ethics and Conflicts - New Developments

**UNIT-V Structured Data Extraction: (06 Hours)**

Structured Data Extraction: Wrapper Generation – Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning - Automatic Wrapper Generation: Problems - String Matching and Tree Matching - Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks.

**UNIT-VI Web Usage Mining & Semantic Web Applications: (06 Hours)**

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and Pre-Processing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modeling user interests –

Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications- Collaborative Filtering- Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDA Models . Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

### Assignment List:

- 1) Discuss the Meta-Search and Web Spamming concepts in detail.
- 2) Determine the location of a resource with the help of ontologies and reasoning using router.
- 3) What are various steps in designing a search engine? Take a case study of designing your own search engine.
- 4) Design a crawler program to list out the URL's on the page, modify the program for again crawl those founded URL's to find more URL's using High speed computer ( Hint : call the **crawl\_site** function to **crawl** a **URL**. ).
- 5) Write a Script/ program to perform Analysis of User's Browsing Behavior and Their Categorization Using Markov Chain Model.
- 6) What are various applications of semantic web? What are web search agents? Explain in detail.

### Text Books:

- 1) Bing Liu, “ Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)”, Springer; 2nd Edition 2009.
- 2) Guandong Xu ,Yanchun Zhang, Lin Li, “Web Mining and Social Networking: Techniques and Applications”, Springer; 1st Edition.2010.
- 3) “Thinking on the Web” - Berners Lee, Godel and Turing, Wiley inter science, 2008.
- 4) “Social Networks and the Semantic Web”, Peter Mika, Springer, 2007.

### Reference Books:

- 1) *Zdravko Markov, Daniel T. Larose, “Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage”, John Wiley & Sons, Inc., 2007.*
- 2) *Soumen Chakrabarti, “Mining the Web: Discovering Knowledge from Hypertext Data”, Morgan Kaufmann; edition 2002.*
- 3) *Adam Schenker, “Graph-Theoretic Techniques for Web Content Mining”, World Scientific Pub Co Inc , 2005.*
- 4) *Min Song, Yi Fang and Brook Wu, “Handbook of research on Text and Web mining technologies”, IGI global, information Science Reference – imprint of :IGI publishing, 2008.*

### Syllabus for Unit Test:

**Unit Test -1    Unit I, II and III**

**Unit Test -2    Unit IV, V and VI**

## ITL-V

Teaching Scheme	Examination Scheme	Credit Allotted
Practical : 02 Hrs/Week	Practical and Term Work: 50 Marks	Term Work: 01

### Course Objectives:

- 1) Understand emerging Web technologies concepts and tools.
- 2) Understand client side and server side scripting languages and validation techniques.
- 3) Learn database access technologies and state management techniques.
- 4) Develop real life Web applications using ASP.NET and PHP.

### Course Prerequisites:

#### Students should have knowledge of

- 1) Knowledge of programming language C, C++.
- 2) Knowledge of application development tool.

### Course Outcome:

#### Students will be able to:

- 1) Design web applications using ASP.NET.
- 2) Use ASP.NET controls in web applications.
- 3) Implement ASP.NET web applications.
- 4) Design database driven ASP.NET web applications and web services.
- 5) Implement Object handling using Collections and Generics.
- 6) Implement Database Connectivity using LINQ and ADO.NET.

<b>UNIT-I</b>	<b>Introduction of .NET:</b> Evolution of .NET, Benefits of .NET framework, Introduction to Visual Studio, Introducing C#, Namespaces, Classes, Objects and Struts, Object-Oriented Programming, Pointers, Delegates and Events	<b>(06 Hours)</b>
<b>UNIT-II</b>	<b>Data Access with ADO.NET and Working with LINQ:</b> Understanding Databases, Understanding SQL, Understanding ADO.NET, Data Reader, Creating Command Object, Working with DataAdapter,  Defining LINQ Queries, Exploring standard Query Operators, Introducing LINQ to Objects, Introducing LINQ to ADO.NET	<b>(06 Hours)</b>
<b>UNIT-III</b>	<b>Collections and Generics:</b> System.Collections.Concurrent namespace, SortedSet<T> class, Understanding Collections, Collection classes in .NET, Understanding Generics, Generic Collection Classes in .NET, Creating your own Generic Classes	<b>(06 Hours)</b>

**UNIT-IV Threading: (06 Hours)**  
The Thread Class, Difference between Processes and Threads, Working with Thread, Multithreading, Thread Priorities, Thread States, Thread Synchronization, Joining Threads

**UNIT-V Web Applications: (06 Hours)**  
Developing a Web Application, Application Structure and State, Web Forms: Standard Controls, Navigation Controls: Tree View, Menu and Site Map Path, Validation Controls, Introducing Web Parts Controls, Working with Database Controls.

**UNIT-VI Managing Web Applications: (06 Hours)**  
Managing Web Applications: The ASP.NET Configuration File, The process model Configuration, Configuring ASP.NET Applications in IIS  
Working with Login Controls: The Login Control, The LoginView Control, The Login Status Control, The LoginName Control,  
Working with User Profiles: Understanding ProfileProvider Class, Creating Authenticated Profiles, Creating Custom Profile Provider

**Assignment List:**

- 1) Accepting and validating user entered data using ASP.NET.
- 2) Accepting and validating book catalog information using validating controls.
- 3) Write a program to demonstrate session management in ASP.Net.
- 4) Display database contents from SQL server or Oracle database using SQL Command class from ASP.NET.
- 5) Display parameterized data using SqlDataReader and GridView in ASP.NET.
- 6) Database access using DataSet in ASP.NET.
- 7) Displaying data using DataView in ASP.NET.
- 8) Write a program to read, add, update and delete record from database using ADO.Net control SqlDataSource.
- 9) Create a login page in your web application. Login page must have user name and password fields. If user enters correct ID, Password, he must be redirected to the homepage of your website.
- 10) Create a webpage, that allows user to add a new username if user doesn't exist in the database. Also, create a forgot password link, to redirect user to set up his new password on authentication.

**Text Books:**

- 1) .NET 4.5 Programming 6-in-1, Black Book, *Kogent Learning Solutions Inc.*

**Reference Books:**

- 1) *ASP.NET 4.5, Covers C# and VB Codes, Black Book; Kogent Learning Solutions Inc.*
- 2) *C# 2012 Programming Black Book Covers .NET 4.5; Kogent Learning Solutions Inc.*
- 3) *Professional ASP.NET 4.5 in C# and VB; Jason N. Gaylord, Christian Wenz, Pranav Rastogi, Todd Miranda, Scott Hanselman, Scott Hunter; Web Platform Team, Microsoft*
- 4) *Beginning ASP.NET for Visual Studio 2015 Paperback – 18 Apr 2016 by William Penberthy*

## Project Stage - II

<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Practical : 04 Hrs/Week</b>	<b>Oral and Term Work : 50 Marks</b>	<b>Term Work : 08</b>
	<b>Practical and Term Work : 50 Marks</b>	

### Course Objectives:

- 1) To choose the hardware, software needed according to the proposed in the design.
- 2) To check the quality of work and adherence to the requirements by rigorous testing.
- 3) To implement requirements mentioned in the design.

### Course Prerequisites:

#### Students should have knowledge of

- 1) Platform, programming languages.
- 2) Hardware, drivers and tools required at various phases of SDLC.

### Course Outcome:

#### Students will be able to:

- 1) Implement solution for the given problem.
- 2) Learn various ways to tackle the new problem faced during the development of project.
- 3) Implement the code to minimize time and space required by setting new benchmarks.
- 4) Coordinate with project mates to solve the problem.
- 5) Apply integration of software and/or hardware components, APIs, modules.
- 6) Apply concepts learn in Seminar, In-plant training, Project Stage –I to effectively implement the project.

### Guidelines for the project

- 1) Divide the work according to the plan.
- 2) Focus on the solution to excel the research or startup in respective domain.
- 3) Apply deadline, quality checks for every phase of project development.
- 4) Identify novel component to draft patent and copyright accordingly.
- 5) Present the implementation work in research journals and conferences.
- 6) Target to prepare a research proposal to acquire a grant for the institute.

### Exam

Parameter	Marks
<b>Implementation of project according to the work and quality.</b>	<b>10</b>
<b>Validation of Results</b>	<b>10</b>
<b>Contribution in terms of novelty</b>	<b>10</b>
<b>Comments received from journals like IEEE, Springer, Elsevier, ACM, WOS and Scopus indexed journals.</b>	<b>10</b>
<b>Patent, copyright, Application for grant.</b>	<b>10</b>

**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune- 411043**  
**The Structure of the Curriculum: 2014 Course**  
**Choice Based Credit System (CBCS)**

**B. TECH. MECHANICAL: SEMESTER- I & II**



**Bharati Vidyapeeth University**  
**College of Engineering, Pune**  
**Department of Mechanical Engineering**



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**Vision:** To provide mechanical engineers capable of dealing with global challenges

**Mission:** Social transformation through dynamic education

**Programme Educational Objectives (PEOs):**

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

**Programme Outcomes (POs):**

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.



### B. TECH. MECHANICAL: SEMESTER- I (2014 Course)

S.N.	Course	Teaching Scheme (Contact Hrs./ week)			Examination Scheme (Marks)						Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment				Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW				
1.	Engineering Mathematics – I	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Civil Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Graphics *	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Physics	4	2	-	60	20	10	10	25	125	4	1	5
5.	Fundamentals of Electrical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
6.	Professional skill Development – I	2	-	-	50	-	-	-	-	50	2	-	2
7.	Workshop Technology	-	2	-	-	-	-	-	50	50	-	1	1
	<b>Total</b>	19	10	1	350	100	50	50	150	700	19	6	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

\* End Semester examination of duration 4 Hours.

### B. TECH. (MECHANICAL) SEM.-II (2014 COURSE)

S. N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)						Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment				Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW				
1.	Engineering Mathematics – II	3	-	1	60	20	10	10	-	100	3	1	4
2.	Fundamentals of Mechanical Engineering	3	2	-	60	20	10	10	25	125	3	1	4
3.	Engineering Mechanics	4	2	-	60	20	10	10	25	125	4	1	5
4.	Engineering Chemistry	4	2	-	60	20	10	10	25	125	4	1	5
5.	Mechanical Engineering Drawing*	2	4	-	60	20	10	10	25	125	2	2	4
6.	Professional skill Development-II	2	-	-	50	-	-	-	-	50	2	-	2
7.	Production Practice- I	-	2	-	-	-	-	-	50	50	-	1	1
	<b>Total</b>	18	12	1	350	100	50	50	150	700	18	7	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

\* End Semester examination of duration 4 Hours.

Total Credits Sem. I - 25

Total Credits Sem. II -25

Grand Total -50

## Rules for Conducting Tests

### Mode of the test

- In each semester for each subject two tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
  - i) Average marks obtained in two tests shall be considered as provisional marks obtained by the student in the tests.
  - ii) If the candidate appears only for one test during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other test.
  - iii) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
  - iv) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
  - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks
  - ii) There will not be any sub-questions.
- For granting the term it is mandatory to appear for both tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

# Department of Mechanical Engineering

## Syllabus: Semester I

### ENGINEERING MATHEMATICS-I

Designation of Course	Engineering Mathematics-I		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 3 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Tutorial: 01
Tutorial : 01 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	4

<b>Course Prerequisites:-</b>	Student should have Basic Knowledge of Algebra
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Solve the consistency of any type of systems.</li> <li>2. Find the roots of equations using DeMoiver's theorem and to locate imaginary points using argand diagram.</li> <li>3. Apply Leibnitz's rule to find <math>n^{\text{th}}</math> derivative.</li> <li>4. Test convergence and divergence of infinite series.</li> <li>5. Compute total derivative.</li> <li>6. Compute maxima and minima of any function of two variables.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Matrices</b>	<b>(8 Hrs.)</b>
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley - Hamilton Theorem. Application to problems in Engineering.		
<b>Unit 2</b>	<b>Complex Numbers And Applications</b>	<b>(8 Hrs.)</b>
Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.		
<b>Unit 3</b>	<b>Differential Calculus and Expansion Of Functions</b>	<b>(8 Hrs.)</b>
Successive Differentiation, $n^{\text{th}}$ Derivatives of Standard Functions, Leibnitz's Theorem. Taylor's Series and Maclaurin's Series.		
<b>Unit 4</b>	<b>Differential Calculus and Infinite Series</b>	<b>(8 Hrs.)</b>
Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits. Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.		
<b>Unit 5</b>	<b>Partial Differentiation And Applications</b>	<b>(8 Hrs.)</b>

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.		
<b>Unit 6</b>	<b>Jacobian and Maxima And Minima</b>	<b>(8 Hrs.)</b>
Jacobians and their applications, Chain Rule, Functional Dependence. Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.		

### Text Books/ Reference Books

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7th edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42th edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008).
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8th edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6th edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2nd edition (2002).

### Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## FUNDAMENTALS OF CIVIL ENGINEERING

Designation of Course	Fundamentals of Civil Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	4

<b>Course Prerequisites:-</b>	Basics of Science, measurements and Mathematics
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Different building components and material</li> <li>2. Classification of surveying</li> <li>3. Leveling of the ground</li> <li>4. Planning of building</li> <li>5. Methods of irrigation and water supply</li> <li>6. Different methods of transportation</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Civil Engineering Scope And Applications.</b>	<b>(6 Hrs.)</b>
Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.		
<b>Unit 2</b>	<b>Surveying</b>	<b>(6 Hrs.)</b>
Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.		
<b>Unit 3</b>	<b>Building Planning And Bye Laws</b>	<b>(6 Hrs.)</b>
Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures and Intelligent buildings.		
<b>Unit 4</b>	<b>Foundations and Earthquakes</b>	<b>(6 Hrs.)</b>
Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.		
<b>Unit 5</b>	<b>Irrigation And Water Supply</b>	<b>(6 Hrs.)</b>
Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.		
<b>Unit 6</b>	<b>Infrastructure</b>	<b>(6 Hrs.)</b>
Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of		

railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.

### **Term Work**

#### **Experiments**

##### **Any ten experiments from the following:**

1. Study and use of prismatic compass and measurement of bearings.
2. Study and use of Dumpy level and reduction of levels by collimation plane method.
3. Area measurement by Digital Planimeter.
4. Drawing plan and elevation of a residential bungalow.
5. Study of features of topographical maps.
6. Assignment on collection of information on Civil Engineering materials.
7. Assignment on types of foundations.
8. Assignment problem on irrigation and hydropower structures.
9. Assignment on study of flow chart of water and sewage treatment.
- 10 Assignments on types of transportation systems.

#### **Text Books/ Reference Books**

1. “Surveying- Vol I” - S.K. Duggal, Tata McGraw Hill Publication.
2. “Built Environment” – Shah, Kale, Patki, , Tata McGraw Hill Publication
3. “Building Construction” – Dr. B.C. Punmia , Laxmi Publication
4. “Irrigation and water Power Engineering” - Dr. P.N. Modi, Standard Publishers, New Delhi
5. “Text book of Transportation Engineering “- Arora, Charotar Publishers.
6. Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7. Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication

#### **Unit Tests-**

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

## ENGINEERING GRAPHICS

Designation of Course	Engineering Graphics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	50 Marks	
	Total	150 Marks	05

<b>Course Prerequisites:-</b>	Basic fundamentals of Mathematics
<b>Course Outcomes:-</b>	Different engineering curves and dimensioning. Differentiate I <sup>st</sup> angle and III <sup>rd</sup> angle projection Method in orthographic. To interpret views of the object and to draw by using Isometric projection method. Projection of Lines and its traces. Projection of different planes. Projection of solids and its sections.

### Course Contents

<b>Unit 1</b>	<b>Lines and Dimensioning in Engineering Drawing and Engineering Curves</b>	<b>(08 Hrs.)</b>
Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.		
<b>Unit 2</b>	<b>Orthographic Projection</b>	<b>(08 Hrs.)</b>
Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.		
<b>Unit 3</b>	<b>Isometric Projections</b>	<b>(08 Hrs.)</b>
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.		
<b>Unit 4</b>	<b>Projections of Points and Lines</b>	<b>(08 Hrs.)</b>
Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines,		
<b>Unit 5</b>	<b>Projections of planes</b>	<b>(08 Hrs.)</b>
Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP		
<b>Unit 6</b>	<b>Projection of Solids and Section of Solids</b>	<b>(08 Hrs.)</b>
Projection of prism, pyramid, cone and cylinder by rotation method. Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.		



**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets. Assignment 05 Problems on each unit in A3 size Drawing Book

**Sheets**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points.
3. Projections of Points and Lines and planes.
4. Orthographic Projections.
5. Isometric views.
6. Projection of Solids.

**Text Books/ Reference Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India.
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
4. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005.
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005.
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988.

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## ENGINEERING PHYSICS

Designation of Course	Engineering Physics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	25 Marks	
	Total	125 Marks	5

<b>Course Prerequisites:-</b>	Basics knowledge of Science and fundamentals Laws
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Interpret the properties of charged particles to develop modern instruments and express the mechanism of fusion and fission.</li> <li>2. Interpret the basics of semiconductors and its uses to develop devices such as diode.</li> <li>3. Express knowledge of nanoscience to develop new electronic devices.</li> <li>4. Express the concept of transverse waves. Associate the wave nature of light and apply it to measure stress, pressure and dimension etc.</li> <li>5. Analyze the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non Destructive Testing.</li> <li>6. Define behavior of quantum particles in different types of potentials.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Modern Physics and Nuclear Physics</b>	<b>(08 Hrs.)</b>
Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph. Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron.		
<b>Unit 2</b>	<b>Solid State Physics and Superconductivity</b>	<b>(08 Hrs.)</b>
Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics. Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.		
<b>Unit 3</b>	<b>Thermodynamics And Nanoscience</b>	<b>(08 Hrs.)</b>
Zeroth law of thermodynamics, first law of thermodynamics, determination of $J$ by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics. Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles(Physical and chemical), synthesis of		

colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.		
<b>Unit 4</b>	<b>Optics – I, Interference, Diffraction</b>	<b>(08 Hrs.)</b>
Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC. Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.		
<b>Unit 5</b>	<b>Optics – II, Polarization, Lasers</b>	<b>(08 Hrs.)</b>
Introduction, Double refraction and Huygens's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD. Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.		
<b>Unit 6</b>	<b>Architectural Acoustics, Quantum Mechanics</b>	<b>(08 Hrs.)</b>
Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies. Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non-rigid box.		

### Term Work

#### Experiments

##### Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3.  $e/m$  by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajous figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewster's law.

#### Assignments

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Text Books/ Reference Books**

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

**Unit Tests**

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

## FUNDAMENTALS OF ELECTRICAL ENGINEERING

Designation of Course	Fundamentals of Electrical Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
Tutorials: -- Hours/ Week	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	04

<b>Course Prerequisites:-</b>	Students should have knowledge of Physics and Mathematics.
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Understand and apply knowledge of basic concepts of work, power, and energy for electrical, mechanical and thermal systems.</li> <li>2. Understand and apply knowledge of Kirchhoff's laws and network theorems to solve electrical networks.</li> <li>3. Describe construction, principle of operation, specifications and</li> <li>4. Applications of capacitors and batteries.</li> <li>5. Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer.</li> <li>6. Define basic terms of single phase and three phase ac circuits and supply systems.</li> <li>7. Know and use electrical safety rules.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Basic concepts</b>	<b>(06 Hrs.)</b>
Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems.		
<b>Unit 2</b>	<b>Network Theorems:</b>	<b>(06 Hrs.)</b>
Voltage source and current sources, ideal and practical, Kirchhoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.		
<b>Unit 3</b>	<b>Electrostatics</b>	<b>(06 Hrs.)</b>
Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series & parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction & working.		
	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hrs.)</b>
Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit Faraday's law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency & Regulation by direct load test.		
<b>Unit 5</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hrs.)</b>

AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar & rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.

<b>Unit 6</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hrs.)</b>
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Basic layout of distribution system, Types of Wiring System & Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.

### Term Work:

The term work shall consist of record of minimum eight exercises / experiments

1. Determination of resistance temperature coefficient.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Kirchhoff's Laws.
5. Verification of Maximum power transfer Theorem.
6. Time response of RC circuit.
7. Study of R-L-C series circuits for  $X_L > X_C$ ,  $X_L < X_C$  &  $X_L = X_C$ .
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer.
10. a) Voltage and current ratios
11. b) Efficiency and regulations
12. Study of a Residential (L.T.) Bill.

### Text Books/ Reference Books

1. B. L. Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd., New Delhi.
2. V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.
3. I.J. Nagrath and Kothari - "Theory and problems of Basic Electrical Engineering", Prentice Hall.
4. Edward Hughes - "Electrical Technology"- Seventh Edition, Pearson Education Publication.
5. H. Cotton - "Elements of Electrical Technology", C.B.S. Publications.
6. John Omalley Shawn - "Basic circuits analysis" Mc Graw Hill Publications.
7. Vincent Del Toro - "Principles of Electrical Engineering", PHI Publications.

### Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## WORKSHOP TECHNOLOGY

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Theory: 00 Practical: 01
Practical:- 2 Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	50 Marks	
	Total	50 Marks	01

<b>Course Prerequisites:-</b>	Basic knowledge of hand tools used in day to day life.
<b>Course Outcomes:-</b>	Students should be able to understand 1. Basic Manufacturing Processes used in the industry. 2. Importance of safety.

### Course Contents

<p><b>Carpentry-</b> Introduction to wood working, kinds of woods, hand tools &amp; machines, Types joints, wood turning. Pattern making, types of patterns, contraction, draft &amp; machining allowances</p> <p><b>Fitting-</b> Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.</p> <p><b>Sheet Metal Practice</b> -Introduction to primary technology processes involving bending punching and drawing various sheet metal joints, development of joints.</p> <p><b>Joining-</b> Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.</p> <p><b>Forging</b> -Hot working, cold working processes, forging materials, hand tools &amp; appliances, Hand forging, Power Forging.</p> <p><b>Moulding</b> -Principles of moulding, methods, core &amp; core boxes, preparation of foundry sand, casting, Plastic moulding.</p> <p><b>Plumbing-</b> (Demonstration Common for Electrical &amp; Non electrical Group) Types of pipe joints, threading dies, Pipe fittings.</p>
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#### Term Work

Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the above topics.

## PROFESSIONAL SKILLS DEVELOPMENT-I

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	50 Marks	02

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic communication in tenses (past, present, future).
2.	Awareness of common words (adjectives used in daily verbal communication).
3.	Basic idea of sentence formation and thereby paragraph building and writing.
4.	Communication according to daily and varied contextual scenarios.
5.	Basic communication model/channel (sender, receiver and feedback), Active and passive listening skills.
6.	Basic social etiquettes and knowledge of group work and communication that will enhance their professional growth.
Course Objectives	
The Professional Skills Development course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The English language topics for this semester focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.	
Course Outcomes	
The student should be able to	
1.	Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.
2.	Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments.
3.	The ability to process their ideas and thoughts(verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing.
4.	Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.
5.	Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication. Learn the 7 different types of listening skills; differentiate effective listening skills and understand the importance of it through 5 activities held in class and implement them in professional life.
6.	Understand the importance of team work, team motivation and effective team communication for further implementation in the corporate life. They should also be able to identify concretely between team and group dynamics.



<b>Course Contents</b>		
<b>Unit I</b>	<b>Essential Grammar – I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Application of Tenses: Usage of past, present and future according to context.</li> <li>• Activities/games for tenses</li> </ul>	
<b>Unit II</b>	<b>Vocabulary – I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Vocabulary building <ul style="list-style-type: none"> <li>▪ Adjectives- physical attributes, Intellectual qualities,</li> <li>▪ Words describing vacations.</li> </ul> </li> <li>• Application of the vocabularies.</li> <li>• Activities: Story telling/ Poem building (Using those words)</li> </ul>	
<b>Unit III</b>	<b>Written Communication - I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Paragraph writing: <ul style="list-style-type: none"> <li>▪ Structure of paragraphs,</li> <li>▪ Mnemonics to build Paragraph,</li> <li>▪ Coherence and Unity of paragraphs.</li> </ul> </li> </ul>	
<b>Unit IV</b>	<b>Situational Conversation – I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Application of grammar according to context.</li> <li>• Situation based conversation</li> <li>• Activities: Conversation based on context(personal and professional)</li> </ul>	
<b>Unit V</b>	<b>Fundamental Communication Skills - I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Importance of effective communication.</li> <li>• Types of communication.</li> <li>• Verbal, Non-verbal communication.</li> <li>• Barriers of communication.</li> <li>• Activities: Extempore</li> <li>• Listening Skills</li> <li>• Importance of listening skills.</li> <li>• Types of listening skills.</li> <li>• Difference between hearing and listening.</li> <li>• Activities: Word ball Game. Chinese Whisper</li> </ul>	
<b>Unit VI</b>	<b>Interpersonal Skills – I</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Introduction to Interpersonal skills.</li> <li>• Group Dynamics.</li> <li>• Introduction to Team work.</li> <li>• Difference between a group and a team.</li> <li>• Importance of group/team in an organization.</li> <li>• Activities on team and group dynamics.</li> </ul>	
<b>Text Books</b>		
1.APAART: Speak Well 1 (English language and communication)		
2.APAART: Speak Well 2 (Soft Skills)		
<b>Reference Books</b>		
1.English vocabulary in use – Alan Mc’Carthy and O’dell		
2.Business Communication – Dr. Saroj Hiremath		

# Department of Mechanical Engineering

## Syllabus: Semester II

### ENGINEERING MATHEMATICS-II

Designation of Course	Engineering Mathematics-II		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Tutorial: 01
Tutorials: 01Hour/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	04

<b>Course Prerequisites:-</b>	Student must have basic knowledge of calculus.
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. To develop an ability to solve differential equations of first order and first degree.</li> <li>2. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling.</li> <li>3. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems.</li> <li>4. To develop an ability to represent periodic function as Fourier Series.</li> <li>5. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves.</li> <li>6. To develop an ability to apply methods to find area and volume by double and triple integration.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Differential Equations (DE)</b>	<b>(08 Hrs.)</b>
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.		
<b>Unit 2</b>	<b>Applications Of Differential Equations</b>	<b>(08 Hrs.)</b>
Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.		
<b>Unit 3</b>	<b>Fourier Series And Integral Calculus</b>	<b>(08 Hrs.)</b>
Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis. Reduction formulae, Beta and Gamma functions.		
<b>Unit 4</b>	<b>Integral Calculus And Curve Tracing</b>	<b>(08 Hrs.)</b>
Differentiation Under the Integral Sign, Error functions. Tracing of Curves, Cartesian, Pola and Parametric Curves. Rectification of Curves.		

<b>Unit 5</b>	<b>Solid Geometry</b>	<b>(08 Hrs.)</b>
Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.		
<b>Unit 6</b>	<b>Multiple Integrals And Their Applications</b>	<b>(08 Hrs.)</b>
Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.		

#### Assignments

1. Differential Equations.
2. Application of DE.
3. Fourier's Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

#### Text Books/ Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

#### Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## FUNDAMENTALS OF MECHANICAL ENGINEERING

Designation of Course	Fundamentals of Mechanical Engineering		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	4

<b>Course Prerequisites:-</b>	Students should have the basic knowledge of thermodynamics.
<b>Course Outcomes:-</b>	<p>Able to understand-</p> <ol style="list-style-type: none"> <li>1. The fundamentals of thermal engineering.</li> <li>2. Working of power producing and absorbing devices.</li> <li>3. Different energy sources and fundamental laws of heat transfer.</li> <li>4. The basic properties of fluid and materials.</li> <li>5. The different mechanical devices and mechanisms.</li> <li>6. Machine tools and manufacturing processes.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Thermodynamics:</b>	<b>(06 Hrs.)</b>
Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)		
<b>Unit 2</b>	<b>Introduction to I.C. Engines, turbines, refrigeration, compressors &amp; pumps:</b>	<b>(06 Hrs.)</b>
Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, Steam turbines, gas turbines. (Theoretical study using schematic diagrams) Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump.(Theoretical study using schematic diagrams)		
<b>Unit 3</b>	<b>Energy Sources &amp; Heat transfer:</b>	<b>(06 Hrs.)</b>
Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power. (Theoretical study using schematic diagrams) Statement and explanation of Fourier's law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.		
<b>Unit 4</b>	<b>Properties of fluids &amp; Properties of Materials and their Applications:</b>	<b>(06 Hrs.)</b>
Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, Regimes in fluid mechanics. Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.		
<b>Unit 5</b>	<b>Mechanical devices &amp; Mechanisms:</b>	<b>(06 Hrs.)</b>
Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, types of friction clutch,		

Power transmission shafts, axles, keys, bush and ball bearings. Slider crank mechanism, Four bar chain mechanism, inversions of single slider crank chain mechanism, Geneva mechanism, Ratchet and Paul mechanism.		
<b>Unit 6</b>	<b>Machine Tools, Introduction to manufacturing processes and Their Applications:</b>	<b>(06 Hrs.)</b>
Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine. Casting, Sheet metal forming, Sheet metal cutting, Forging, Metal joining processes.		

### Text Books/ Reference Books

1. Thermodynamics an Engineering Approach, Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc, 2005, 6<sup>th</sup> edition.
2. Applied Thermodynamics for Engineering Technologists, T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. I.C. Engines Fundamentals, J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian.
4. Internal Combustion Engine, V. Ganeshan, Tata McGraw-Hill, 3<sup>rd</sup> edition.
5. Strength of Materials, H. Ryder, Macmillians, London, 1969, 3<sup>rd</sup> edition.
6. Mechanics of Materials, Johston and Beer TMH, 5<sup>th</sup> edition.
7. Mechanisms and Machine Theory, Ambekar A.G., Prentice-Hall of India, 2007.
8. Theory of Machines, S.S. Rattan, Tata McGraw- Hill, 2<sup>nd</sup> edition.
9. A Textbook of production engineering. P.C. Sharma, S. Chand Publication, New Delhi, 2<sup>nd</sup> edition.
10. Fluid Mechanics & Fluid Power. D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8<sup>th</sup> edition

### Unit Tests

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit- IV, V, VI

## ENGINEERING MECHANICS

Designation of Course	Engineering Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical: 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	05

<b>Course Prerequisites:-</b>	<p>The Students should have knowledge of</p> <ol style="list-style-type: none"> <li>1. Scalar and Vector</li> <li>2. Newton's law of motion</li> <li>3. Law of friction</li> <li>4. Concept of physical quantities, their units and conversion of units</li> <li>5. Concept of differentiation and integration</li> </ol>
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Calculate resultant and apply conditions of equilibrium.</li> <li>2. Analyze the truss and calculate friction force.</li> <li>3. Calculate centroid and moment of inertia.</li> <li>4. Solve problem on rectilinear motion.</li> <li>5. Solve problems on curvilinear motion.</li> <li>6. Use D'alembert's principle, Work Energy principle and Impulse Momentum principle for particle.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hrs.)</b>
Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.		
<b>Unit 2</b>	<b>Truss and Friction</b>	<b>(06 Hrs.)</b>
Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.		
<b>Unit 3</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hrs.)</b>
Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.		
<b>Unit 4</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hrs.)</b>
Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.		
<b>Unit 5</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hrs.)</b>
Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.		
<b>Unit 6</b>	<b>Kinetics of a Particle</b>	<b>(06 Hrs.)</b>
D'alembert's Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.		

**Term Work:**

A) The term-work shall consist of minimum five experiments from list below.

1. Determination of reactions of Simple and Compound beam.
2. Study of equilibrium of concurrent force system in a plane.
3. Determination of coefficient of friction for Flat Belt.
4. Determination of coefficient of friction for Rope.
5. Study of Curvilinear motion.
6. Determination of Coefficient of Restitution.

B) The term-work shall also consist of minimum five graphical solutions of the problems on topics.

**Text Books/ Reference Books**

- 1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R. C., McMillan Publication.
- 2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.
- 3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K. G., New Age International (P) Ltd.
- 4). "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
- 5) "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.
- 6) "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.
- 7) "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.
- 8) "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.
- 9) "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## ENGINEERING CHEMISTRY

Designation of Course	Engineering Chemistry		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical - 2 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	25 Marks	
	Total	125 Marks	05

<b>Course Prerequisites:-</b>	The Students should have Basics knowledge of Science and fundamentals Laws.
<b>Course Outcomes:-</b>	<p>At the end of the course, a student will be able to,</p> <ol style="list-style-type: none"> <li>1. Analyze the methods involved in improving quality of water for domestic and industrial purposes.</li> <li>2. Express the crystal structure through X-ray diffraction technique to examine the internal structure of crystal.</li> <li>3. Demonstrate the properties and applications of fossil fuels and derived fuels.</li> <li>4. Define the fundamental principles of corrosion and methods used for minimizing corrosion.</li> <li>5. Interpret the basic concepts of electrochemical techniques and its applications in society.</li> <li>6. Develop the skills for correct stereo chemical assignment and interpretation in complex organic molecules.</li> </ol>

### Course Content

<b>Unit 1</b>	<b>Water</b>	<b>(06 Hrs.)</b>
Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process		
<b>Unit 2</b>	<b>Material Chemistry</b>	<b>(06 Hrs.)</b>
Crystallography: Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical. Cement: Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.		
<b>Unit 3</b>	<b>Fuels</b>	<b>(06 Hrs.)</b>
Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter. Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.		
<b>Unit 4</b>	<b>Corrosion And Its Prevention</b>	<b>(06 Hrs.)</b>
Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment. Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.		



<b>Unit 5</b>	<b>Electrochemistry</b>	<b>(06 Hrs.)</b>
Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions. Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.		
<b>Unit 6</b>	<b>Stereochemistry</b>	<b>(06 Hrs.)</b>
Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules, Conformations :- conformations of ethane, conformations of n-butane		

### Term Work

#### Experiments

##### Any Ten experiments from the following:

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

#### Assignments

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism:- cis and trans isomerism, E and Z isomers
12. Fuel cells

#### References / Text Books:

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31<sup>st</sup> Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications

13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## MECHANICAL ENGINEERING DRAWING

Designation of Course	Mechanical Engineering Drawing		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 02 Hours/ Week	End Semester Examination	60 Marks	Theory: 02 Practical: 02
Practical - 04 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	40 Marks	
	Term Work/ Oral	25 Marks	
	Total	125Marks	4

<b>Course Prerequisites:-</b>	Students should have the basic knowledge of engineering graphics.
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. To draw different free hand sketches in machine parts.</li> <li>2. Representation of dimensions of machine components.</li> <li>3. Different Auto CAD commands.</li> <li>4. Orthographic projection using Auto CAD.</li> <li>5. Isometric projection using Auto CAD.</li> <li>6. Development of different solids using AutoCAD.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Freehand Sketching</b>	<b>(06 Hrs.)</b>
Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.		
<b>Unit 2</b>	<b>Dimensioning Practice</b>	<b>(06 Hrs.)</b>
Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988)		
<b>Unit 3</b>	<b>Introduction to Computer Aided Drafting</b>	<b>(06 Hrs.)</b>
Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer		
<b>Unit 4</b>	<b>Orthographic Projections [ By Using AutoCAD]</b>	<b>(06 Hrs.)</b>
Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.		
<b>Unit 5</b>	<b>Isometric Projections [ By Using AutoCAD]</b>	<b>(06 Hrs.)</b>
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.		
<b>Unit 6</b>	<b>Development of Lateral Surfaces (DLS) of Solids. [ By Using AutoCAD]</b>	<b>(06 Hrs.)</b>
Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.		

**Term Work**

1. Sheet (Half Imperial 4sheets)
2. Dimensioning Practices no. of sheets -2
3. Free Hand sketch no. of sheets-2
4. Four AutoCAD Printout
5. Introduction to AutoCAD commands
6. Orthographic by using AutoCAD
7. Isometric Projections by using AutoCAD
8. Development of Lateral surface by using AutoCAD

**Text Books/ Reference Books**

1. N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing house, Anand, India.
2. D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd.
3. P.S. Gill, Engineering drawing S.K.Kataria and sons. Delhi-110006.
4. N.D. Bhatt, Machine Drawing, Chartor Publishing house, Anand, India.
5. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New
6. Delhi.
7. Fredderock E. Giesecke, Alva Mitchell & others, Principles of Engineering Graphics,
8. Maxwell McMillan Publishing.

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit IV, V, VI

## Professional Skills Development-II

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	50 Marks	02

Course Pre-requisites		
The Students should have knowledge of		
1.	Basic knowledge of the parts of speech in English.	
2.	Vocabulary covered in the previous semester along with basic knowledge of verbs & adverbs.	
3.	Basic awareness of the need of speaking skills within social circle.	
4.	The elements of team dynamics done during the previous semester with proper application.	
5.	Basic awareness of the concepts of feedback, criticism.	
6.	The various common conflicts that may arise at varied situations.	
Course Objectives		
	The Professional Skills Development course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals. The soft skills topics for this semester are intended to develop student's expertise on public speaking skills and to deal positively with criticism and so as to effectively present their personalities.	
Course Outcomes		
The student should be able to		
1.	Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators. They will be able to learn 20-25 common errors made in parts of speech and also use 10 modal verbs efficiently during professional communication.	
2.	Differentiate between vocabulary used as adjectives, verbs and adverbs and be able to use the 60-70 words for their daily conversation.	
3.	Overcome the fear of speaking and will be aware of the 3 types of public speaking necessary according to the contemporary requirements. They would be able to deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.	
4.	Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.	
5.	Analyze themselves relating to their hobbies and strengths and hence set realistic goals in terms of personal and professional growth. They will be able to identify at least 5-7 strengths and a couple of goals to be achieved that will enable their lives to be directed appropriately.	
6.	Apply 5-6 positive strategies to resolve conflicts arising during team work	
Course Contents		
Unit I	Essential Grammar – II	(4 Hrs.)
	<ul style="list-style-type: none"> <li>• Auxiliaries</li> <li>• Importance of auxiliary verb in formal communication.</li> <li>• Group Activities</li> </ul>	

	<ul style="list-style-type: none"> <li>• Parts of Speech</li> </ul>	
<b>Unit II</b>	<b>Vocabulary- II</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Vocabulary related to Adjectives</li> <li>• Vocabulary related to verbs and adverbs</li> <li>• Adjectives, verbs, Adverbial vocabulary –Usage</li> <li>• Application of the above taught vocabulary through activities</li> </ul>	
<b>Unit III</b>	<b>Fundamental Communication Skills – II</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Public speaking skills</li> <li>• Effective public speaking skills</li> <li>• Types of public speaking</li> <li>• Overcoming stage fear</li> <li>• Do's&amp; Don't's of public speaking</li> <li>• Importance of Body language in Public speaking</li> <li>• Importance of the audience in Public speaking</li> <li>• Activity – Extempore Speaking, Manuscript speech</li> </ul>	
<b>Unit IV</b>	<b>Interpersonal skills-II</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Team Work</li> <li>• Team communication.</li> <li>• Factors which ensure effective &amp; smooth team communication</li> <li>• Team conflict resolution-ways &amp; methods</li> <li>• Case studies/activities</li> </ul>	
<b>Unit V</b>	<b>Self-Awareness</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Perceptions, beliefs</li> <li>• Analyzing achievements, goals, hobbies</li> <li>• Handling criticism</li> <li>• Developing positive attitudes</li> </ul>	
<b>Unit VI</b>	<b>Conflict Resolution</b>	<b>(4 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Various conflicts that could be encountered in a work scenario.</li> <li>• Causes of conflicts in work scenario.</li> <li>• Ways and methods for conflict resolution.</li> <li>• Do's and Don'ts for conflict resolution.</li> </ul>	
<b>Text Books</b>		
1.APAART: Speak Well 1 (English language and communication)		
2.APAART: Speak Well 2 (Soft Skills)		
<b>Reference Books</b>		
1.English vocabulary in use – Alan Mc'Carthy and O'dell		
2.Business Communication – Dr. Saroj Hiremath		

## PRODUCTION PRACTICE-I

Designation of Course	Production Practice-I		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical: 01
Practical:- 2 Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	50 Marks	
	Total	50 Marks	1

<b>Course Prerequisites:-</b>	Basic knowledge of various machine tools.
<b>Course Outcomes:-</b>	<p>Students should be able to understand</p> <ol style="list-style-type: none"> <li>1. Understand machine tools, mechanism and accessories used in various production processes</li> <li>2. Make the job of turning &amp; taper turning operation using lathe</li> <li>3. Perform Forging and grinding of lathe tool with one knife and other end vee</li> <li>4. Prepare simple solid pattern involving wood turning</li> <li>5. Perform Welding using gas/arc welding process</li> <li>6. Understand Sand Casting process</li> </ol>

### Course Contents

Each candidate shall be required to complete and submit the following term work:

**A. Jobs:**

Plain and Taper turning – one job

Forging and grinding of lathe tool with one knife and other end vee – one job

Making a simple solid pattern involving wood turning – one job

Welding (gas or arc) – one job

Sand Molding – one job

**B. Journal & Demonstration:**

Assignments on machine tools will be in the form of a journal based on demonstrations on machine tools. This should include sketches and relevant descriptions as given below:

**1) Block Diagrams (Any Two)**

- a) Lathe
- b) Universal milling machine
- c) Radial drilling machine
- d) Cylindrical grinder.

**2) Mechanisms (Any Two)**

- a) All geared headstock of a center lathe.
- b) Spindle arbor (assembly) drive of milling machine
- c) Crank and slotted lever quick return drive of shaping machine.
- d) Spindle assembly in a drilling machine.

**3) Accessories (Any Two)**

- a) Taper turning attachment for a center lathe.
- b) Universal dividing head.
- c) Milling cutters.

## **Rules regarding ATKT, Continuous Assessment and award of Class Standards for Passing**

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
  - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.  
OR
  - The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

### **Rules of ATKT**

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

### **Award of Class for the Degree Considering CGPA**

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:



Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A <sup>+</sup>	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B <sup>+</sup>	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune- 411043**  
**The Structure of the Curriculum: 2014 Course**  
**Choice Based Credit System (CBCS)**

**B. TECH. MECHANICAL: SEMESTER- III & IV**



**Bharati Vidyapeeth University**  
**College of Engineering, Pune**  
**Department of Mechanical Engineering**



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**Vision:** To provide mechanical engineers capable of dealing with global challenges

**Mission:** Social transformation through dynamic education

**Programme Educational Objectives (PEOs):**

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

**Programme Outcomes (POs):**

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

**B. TECH. MECHANICAL: SEMESTER- III (2014 Course)**

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Solid Mechanics	4	-	-	60	20	10	10	-	-	100	4	-	4
2.	Fluid Mechanics	4	2	-	60	20	10	10	-	50	150	4	1	5
3.	Engineering Thermodynamics	3	2	-	60	20	10	10	50	-	150	3	1	4
4.	Engineering Mathematics III	3	-	-	60	20	10	10	-	-	100	3	-	3
5.	Computer Programming and Simulation	3	2	-	60	20	10	10	-	50	150	3	1	4
6.	Professional skill Development-III	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice- II #	-	2	-	-	-	-	-	-	50	50	-	1	1
	<b>Total</b>	21	08	0	400	100	50	50	50	150	800	21	4	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

# Practical examination of duration 3 Hours.

**B. TECH. (MECHANICAL) SEM.-IV (2014 COURSE)**

S.N	Course	Teaching Scheme (Contact Hrs./week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Mechanisms of Machines*	4	2	-	60	20	10	10	50	-	150	4	1	5
2.	Manufacturing Process	3	-	-	60	20	10	10	-	-	100	3	-	3
3.	Material Science	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Turbomachinery	3	-	-	60	20	10	10	-	-	100	3	-	3
5.	Numerical. Methods. and Optimization Techniques	3	2	1	60	20	10	10	--	50	150	3	2	5
6.	Professional skill Development -IV	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice – III #	-	2	-	-	-	-	-	-	50	50	-	1	1
	<b>Total</b>	20	8	1	400	100	50	50	50	150	800	20	5	25

L: Lectures, P/D: Practical/ drawing, T: Tutorial, TH: Theory, TW: Term work

\* End Semester examination of duration 4 Hours.

# Practical examination of duration 3 Hours.

Total Credits Sem. III– 25

Total Credits Sem. IV – 25

Grand Total - 50

## Rules for Conducting Tests

### Mode of the test

- In each semester for each subject two tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
  - i) Average marks obtained in two tests shall be considered as provisional marks obtained by the student in the tests.
  - ii) If the candidate appears only for one test during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other test.
  - iii) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; these marks will be final marks obtained by the student. No scaling up is permitted.
  - iv) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper pattern for tests
  - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks
  - ii) There will not be any sub-questions.
- For granting the term it is mandatory to appear for both tests conducted in each semester.
- Roll nos. allotted to students shall be the examination nos. for the tests.

# Department of Mechanical Engineering

## Syllabus: Semester III

### SOLID MECHANICS

Designation of Course	Solid Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory:- 04 Practical:- 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	00 Marks	
	Total	100 Marks	05

<b>Course Prerequisites:-</b>	<ol style="list-style-type: none"> <li>1. Engineering Mathematics</li> <li>2. Engineering Mechanics</li> <li>3. Engineering Science</li> </ol>
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Stresses and strains in different materials.</li> <li>2. Shear force and bending movement of loading elements.</li> <li>3. Principal stresses and strain.</li> <li>4. Torsional, bending and axial force on the shaft.</li> <li>5. Bending stresses and shear stresses in the machine elements.</li> <li>6. Design of simple machine components.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Simple stresses &amp; strains</b>	<b>(08 Hrs.)</b>
Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials. Various strengths of material- Yield strength, Ultimate tensile strength etc, Concept of 3D stress state. Interrelation between elastic constants, Proof stress & True stress & strain. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self-weight. Temperature stresses in simple & composite members. Strain energy due to axial load (gradual, sudden & impact), strain energy due to self-weight.		
<b>Unit 2</b>	<b>Principal stresses &amp; strains</b>	<b>(08 Hrs.)</b>
Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow) <b>Theories of elastic failure:</b> Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum strain theory – their applications & limitations.		
<b>Unit 3</b>	<b>Shear Force &amp; Bending Moment Diagrams</b>	<b>(08 Hrs.)</b>
Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending movement & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading Diagram & SFD from BMD. Slope & deflection of beams - relation between		

BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases		
<b>Unit 4</b>	<b>Torsion and Buckling of columns</b>	<b>(08 Hrs.)</b>
Stresses, strain & deformations in determinate shafts of solid & hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts. Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions. Limitations of Euler's formula, Rankine's formula, safe load on columns		
<b>Unit 5</b>	<b>Stresses in Machine Elements</b>	<b>(08 Hrs.)</b>
Bending stresses : Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections( rectangular, I,T,C ) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations. Shear stresses : Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web		
<b>Unit 6</b>	<b>Design Process</b>	<b>(08 Hrs.)</b>
Machine Design, Traditional design methods, Basic procedure of Machine Design, Forming Design specifications, Design for: 1) functional requirement, 2) customer orientation 3) Safety requirement & 4) Analysis for use. Requisites of design engineer, Design of machine elements, Sources of Design data, Use of Design data book, Use of standards in design, Selection of preferred sizes, Design Synthesis, Creativity in design. Use of internet for gathering information & Consideration of energy requirement, product life cycle & design for environment. <b>Design of Simple Machine parts:</b> Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams (for circular cross-section only).		

#### Text Books/ Reference Books

1. Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing co. Ltd. 1981.
2. James Gere, Mechanics of Materials, Thomson Learning
3. S Ramamrutham, Strength of Materials
4. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication
5. J. E. Shigley, Mechanical Engineering Design, McGraw Hill

#### Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI



## FLUID MECHANICS

Designation of Course	Fluid Mechanics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:- 03 Practical:- 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

<b>Course Prerequisites:-</b>	Student should have knowledge of <ol style="list-style-type: none"> <li>1. Fundamentals of Mechanical engineering.</li> <li>2. Analysis of forces and moments.</li> <li>3. Laws of motion, kinetics and kinematics.</li> </ol>
<b>Course Outcomes:-</b>	Able to understand- <ol style="list-style-type: none"> <li>1. Behaviour of fluids.</li> <li>2. Use of appropriate pressure measuring devices.</li> <li>3. Application of Bernoulli's energy equation.</li> <li>4. Difference between laminar and turbulent flow.</li> <li>5. Calculate losses in the piping system.</li> <li>6. Dimensional analysis results and boundary layer theory.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Fluid Kinematics:</b>	<b>( 06 Hrs.)</b>
Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational. Stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates, flow net.		
<b>Unit 2</b>	<b>Fluid Statics:</b>	<b>( 06 Hrs.)</b>
H Hydrostatic law, Pascal's law, Pressure at a point, Total Pressure, Centre of pressure, Liquid pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimedes Principle, Buoyancy and stability of floating and submerged bodies, Metacentric height.		
<b>Unit 3</b>	<b>Fluid Dynamics:</b>	<b>( 06 Hrs.)</b>
Introduction to Navier-Stoke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to Pitot tube, Venturimeter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch .(Without considering Velocity of Approach)		
<b>Unit 4</b>	<b>Laminar Flow &amp; Flow around Immersed Bodies:</b>	<b>( 06 Hrs.)</b>
Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates. Introduction to CFD Methodology (Elementary Treatment).Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil.		
<b>Unit 5</b>	<b>Flow Through Pipes:</b>	<b>( 06 Hrs.)</b>
TEL, HGL , Energy losses through pipe, Darcy-Weisbach equation, Moody diagram, Minor losses in pipes, pipes in series and parallel, Syphon, Transmission of power, Water hammer in pipes ,		
<b>Unit 6</b>	<b>Turbulent Flow, Boundary Layer &amp; Dimensional Analysis:</b>	<b>( 06 Hrs.)</b>

Turbulent Flow, Velocity Distribution, Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar sub layer, Separation of Boundary Layer and Methods of Controlling. Dimensions of physical quantities, dimensional homogeneity, Buckingham pi Theorem, Important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).

**Text Books/ Reference Books**

1. Dr. P.N. Modi and Dr. S.M. Seth, “Hydraulics and Fluid Mechanics including Hydraulic Machines”, Standard Book House.
2. Dr. R.K. Bansal, “Fluid Mechanics and Hydraulic Machines – I”, Laxmi Publication Pvt. Ltd., New Delhi.
3. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.
4. Garde R. J. and Mirajgaonkar, Engineering Fluid Mechanics, Nem Chand & Bros, Roorkee, SCITECH, Publication (India) Pvt. Ltd.
5. Cengel & Cimbla Fluid Mechanics, TATA McGraw-Hill.
6. Irving Shames, “Mechanics of Fluid”, McGraw Hill Publication.

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit- IV, V, VI

## ENGINEERING THERMODYNAMICS

Designation of Course	Engineering Thermodynamics		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:03 Practicals:01
Practical: 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

<b>Course Prerequisites:-</b>	<ol style="list-style-type: none"> <li>1. Knowledge of basic concept of thermodynamics</li> <li>2. Knowledge of basic gas laws</li> <li>3. Knowledge of pumps and compressors</li> </ol>
<b>Course Outcomes:-</b>	<p>Able to understand-</p> <ol style="list-style-type: none"> <li>1. The concepts of Carnot theorem to applications such as heat pump and refrigerator.</li> <li>2. The important phenomenon of heat and work.</li> <li>3. Various performance parameters and their estimations in respect to trials on Boiler.</li> <li>4. The knowledge about the phenomenon of steam generation and properties of steam.</li> <li>5. Basic concepts of thermodynamics and their application to energy conversion device like Compressors.</li> <li>6. Knowledge of fuels and combustion and availability.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Second Law of Thermodynamic and Entropy:</b>	<b>(06 Hrs.)</b>
<p>Second Law of Thermodynamics: Limitations of first law of thermodynamics, heat engine, refrigerator and heat pump, Kelvin-Planck's statement &amp; Clausius statement, equivalence of Kelvin-Planck's and Clausius statements, perpetual motion machine of second kind, Carnot cycle &amp; Carnot heat engine. Entropy: Entropy as a property, second law analysis for entropy, Clausius inequality, principle of increase of entropy, irreversibility</p>		
<b>Unit 2</b>	<b>Steam Generators:</b>	<b>(06 Hrs.)</b>
<p>Classification, constructional details of process and power boiler, boiler mountings and accessories, equivalent evaporation, boiler efficiency, energy balance, boiler controls, boiler draught.</p>		
<b>Unit 3</b>	<b>Ideal Gas and Properties of Steam and Vapour Power Cycle:</b>	<b>(06 Hrs.)</b>
<p>Ideal Gas definition, Gas Laws: Boyle's law, Charle's law, Avagadro's Law, Equation of State, Specific Gas constant and Universal Gas constant, Ideal gas processes- on P-V and T-S diagrams, Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-V, T-S and Mollier diagram for steam., Non flow and steady flow vapor processes, work transfer &amp; heat transfer, use of P-V, T-S, H-S diagrams for steam, determination of dryness fraction, and study of calorimeters. Vapour Power Cycle: Carnot cycle using steam, ideal Rankine cycle, calculation of thermal efficiency, specific steam consumption, work ratio, comparison of Carnot and Rankine cycle, and effect of superheat.</p>		
<b>Unit 4</b>	<b>Single Stage and Multi stage Reciprocating Air Compressor:</b>	<b>(06 Hrs.)</b>

Uses of compressed air, classification, constructional details of single stage compressor, computation of work done, isothermal work done, isothermal efficiency, effect of clearance, volumetric efficiency, FAD, theoretical and actual indicator diagrams, method of improving volumetric efficiency. Need of multi staging, multi stage compressor, work done, volumetric efficiency, condition for maximum efficiency, intercooling, actual indicator diagram.		
<b>Unit 5</b>	<b>Rotary Compressor:</b>	<b>(06 Hrs.)</b>
Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotodynamic compressors, static and total head, work done efficiencies, surging, and choking, stalling, characteristics curves for rotodynamic compressors. Selection of compressors for various applications.		
<b>Unit 6</b>	<b>Fuels and Combustion and Availability:</b>	<b>(06 Hrs.)</b>
Mass fraction, mole fraction, combustion equation, theoretical air, excess and deficient air, stoichiometric and actual air to fuel ratio, analysis of products of combustion, gravimetric and volumetric analysis and their conversions, method to determine flue gas analysis - CO, CO <sub>2</sub> , O <sub>2</sub> , HC, NO <sub>x</sub> , smoke. Availability: High and low grade energy, available and unavailable energy, loss of available energy due to heat transfer through a finite temperature difference.		

### Term work

1. Determination of calorific value using bomb calorimeter.
2. Demonstration of exhaust gas analysis by using any commercially available test rig.
3. Test on reciprocating air compressor to determine volumetric efficiency, isothermal efficiency and FAD.
4. Determination of dryness fraction using any commercial available test rig.
5. Study of boiler mounting and accessories
6. Study of package boiler / modern boiler
7. Report on visit to any process industry, which uses boiler.
8. Performance test on rotary air compressor/ blower.
9. Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance sheet.
10. Study of rotary type positive displacement compressor.

### Assignments

Assignment based on each unit

### Text Books

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications
2. P. L. Ballany, Thermal Engineering, Khanna Publications
3. V. P. Vasandani and D. S. Kumar, Heat Engineering Metropolitan book Company, New Delhi
4. R.K.Rajput, Engineering Thermodynamics, EVSS Thermo Laxmi Publications
5. Y. Cengel & Boles, Thermodynamics -An engineering approach, Tata McGraw Hill Publications
6. Kothandarman & Domkundwar, Thermodynamics & Heat Engines
7. Rayner Joel, Engineering Thermodynamics, ELBS Longman
8. Hawkins G. A., "Engineering Thermodynamics", John Wiley and Sons.

### Unit Tests-

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V, VI

## ENGINEERING MATHEMATICS –III

Designation of Course	Engineering Mathematics -III		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory : 03
Practical:- -- Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	--- Marks	
	Total	100 Marks	03

<b>Course Prerequisites:-</b>	Students should have basic knowledge of: <ol style="list-style-type: none"> <li>1. Differential calculus</li> <li>2. Integral calculus</li> <li>3. Basics of statistics</li> <li>4. Basics of Probability</li> </ol>
<b>Course Outcomes:-</b>	Able to understand- <ol style="list-style-type: none"> <li>1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.</li> <li>2. Apply theorems to compute the Laplace transform, inverse Laplace transforms. Form mathematical modeling of systems using PDE.</li> <li>3. Apply statistical methods to numerical data.</li> <li>4. Calculate Correlation and Regression coefficient.</li> <li>5. Use basics of probability to solve problems.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Linear Differential Equations (LDE)</b>	<b>(06 Hrs.)</b>
LDE with constant coefficients, Method of variation of parameters, Homogeneous Equations, Cauchy's and Legendre's DE. Simultaneous & Symmetric Simultaneous DE. Application to mechanical systems		
<b>Unit 2</b>	<b>Laplace Transform (LT)</b>	<b>(06 Hrs.)</b>
LT of standard functions, properties and theorems, Inverse LT, method of finding Inverse LT , Application of LT to solve LDE. Fourier Transform (FT): Fourier Integral theorem, Fourier transform Fourier Sine & Cosine transform, Inverse Fourier Transform		
<b>Unit 3</b>	<b>Partial Differential Equations (PDE)</b>	<b>(06 Hrs.)</b>
Basic concepts, modeling: Vibrating String, Wave equation. Method of separation of variables, Use of Fourier series, Heat equation: one and two dimensional heat flow equations, Solution by Fourier Transforms, modeling Membrane two dimensional wave equation		
<b>Unit 4</b>	<b>Measures of central value</b>	<b>(06 Hrs.)</b>
Arithmetic mean, median and mode, geometric mean and harmonic mean. Measure of central tendency, dispersion, mean deviation, standard deviation, skewness, Moments and qurtosis.		
<b>Unit 5</b>	<b>Correlation and Regression</b>	<b>(06 Hrs.)</b>
Significance of the study of correlation, types of correlation, coefficient of correlation, difference between correlation and regression. Regression equations, standard error of estimate.		

<b>Unit 6</b>	<b>Probability and Distribution</b>	<b>(06 Hrs.)</b>
Basics of probability, conditional probability, bayes theorem, mathematical expectations, random variable and probability distribution, Poisson, normal distribution. Testing of hypothesis- Z test, chi square test and goodness of fit, F test.		

**Term work-**

1. Linear Differential Equations
2. Transforms
3. Partial Differential Equations
4. Measures of central value
5. Correlation and Regression
6. Probability and Distribution

**Assignments**

Assignment based on each unit

**Text Books**

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

**Unit Tests-**

Unit Test-I	Unit-I,II ,III
Unit Test-II	Unit-IV,V, VI

## COMPUTER PROGRAMMING & SIMULATION

Designation of Course	Computer Programming & Simulation		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory : 03 Practical:-01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

<b>Course Prerequisites:-</b>	Basic knowledge of statistics and probability MATLAB basics
<b>Course Outcomes:-</b>	Able to understand- <ol style="list-style-type: none"> <li>1. Concept of model</li> <li>2. Simulation basics</li> <li>3. Probability concepts</li> <li>4. Simulation of mechanical engineering problems</li> <li>5. Discrete Simulation</li> <li>6. Simulation Experimentation.</li> </ol>

### Course Contents

<b>Unit 1</b>		<b>(06 Hrs.)</b>
	Physical model, Mathematical model, Types of mathematical model, Dynamic Versus Static Models, Continuous-Time Versus Discrete-Time, Dynamic Models, Quantitative Versus Qualitative Models, Mechanical system modeling examples.	
<b>Unit 2</b>		<b>(06 Hrs.)</b>
	Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study Simulation and analytical methods, Basic nature of simulation, The simulation process, Types of system simulation, Generation of random numbers .Monte Carlo Simulation.	
<b>Unit 3</b>		<b>(06 Hrs.)</b>
	Basic Probability Concepts, Discrete Random Variable, Expected Value and Variance of a Discrete Random Variable, Measure of Probability Function, Continuous Random Variable, Exponential Distribution, Mean and Variance of Continuous Distribution, Normal Distribution.	
<b>Unit 4</b>		<b>(06 Hrs.)</b>
	Introduction, Simulation of Pure pursuit problem, exponential growth model, simulation of water reservoir system, Trajectory simulation, suspension system, simulation of pendulum.	
<b>Unit 5</b>		<b>(06 Hrs.)</b>
	Discrete Simulation, Continuous System Simulation. Simulation of Queuing Systems, Inventory Control Models	
<b>Unit 6</b>		<b>(06 Hrs.)</b>
	Introduction, development of simulation experiments, principles of verification, validation and accreditation, Simulation experimentation, classical experimental design, validation of simulation experiments, evaluation of simulation experiments.	

**Term work**

Following assignment using MATLAB

1. Creating a One-Dimensional Array (Row / Column Vector) Creating a Two-Dimensional Array
2. Performing matrix manipulations – Concatenating, Indexing, and Sorting Normal Distribution
3. Simulation of water reservoir system
4. Trajectory simulation
5. Suspension system
6. Simulation of pendulum
7. Simulation of any one Discrete Simulation, Continuous System Simulation, Simulation of Queuing Systems, Inventory Control Models.

**Assignments**

Assignment based on each unit

**Text Books/ Reference Books**

1. Robert E. Shannon, “System Simulation The art and science”, Prentice Hall, New Jersey, 1995.
2. D.S. Hira, “System Simulation”, S. Chand and company Ltd, New Delhi, 2001.
3. Geoffrey Gordon, System Simulation; Prentice Hall.
4. Robert E. Shannon ; System Simulation: The Art and Science ;Prentice Hall
5. J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control
6. M Close and Dean K. Frederick; Modeling and Analysis of Dynamic Systems ;Houghton Mifflin

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI



## PROFESSIONAL SKILLS DEVELOPMENT-III

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic math's and reasoning, the rules of English and comprehensive ability
2.	Basic awareness of phrasal verbs used in spoken communication and knowledge of verbs and other words used in professional life.
3.	Basic writing techniques taught to them in the first semester.
4.	The strengths and achievements analyzed during self-awareness session taught in the second semester. They should also be able to identify their long term and short term goals.
5.	Basic knowledge and idea about leaders and leadership qualities.
6.	Basic awareness of PowerPoint presentation and paper presentation and also should be fluent in English.
Course Objectives	
The Professional Skills Development course which is a combination of aptitude and soft skills aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The English and soft skills section focuses on the higher aspects of soft skills such as grooming them on leadership, presentation, business communication which would enable them to project themselves as professionals in the corporate sector and/or otherwise.	
Course Outcomes	
The student should be able to	
1.	Solve the aptitude test in the recruitment exam and competitive exam by applying short techniques and solve the question in less amount of time. They would be able to handle around 15-20 topics of math's and reasoning and 50 rules of parts of speech.
2.	Present themselves with finesse by using around 25-20 idioms and phrases relevant to corporate communication as well as spoken English. They will also learn 50-60 words and other words that are specifically used in meetings, group discussions, presentation and other corporate events.
3.	Process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 500-750 words for essay writing along with limited words for technical writing and report writing.
4.	Identify themselves in terms of their strengths. Weaknesses and opportunities available to them for the career growth. They would also learn to overcome their weakness and convert into strengths and also make utilization of the opportunity vis-à-vis their strength. They would also learn to set realistic short/long term goals relevant to them through the SMART goal mnemonic.
5.	Differentiate between the different types of leaders and groom themselves to be potential leaders. Based on their qualities and strengths they would learn 5 types of leadership styles and mould themselves according to that. They would also learn 10-15 leadership traits.

6.	Prepare PowerPoint presentation and paper presentation effectively by focusing on body language, tone of communication and audiences' needs. They would also learn to handle the questions in an effective and smart way.
<b>Course Contents</b>	
<b>Unit I</b>	<b>Aptitude (Maths, Logical Reasoning, English)</b> <span style="float: right;"><b>(18 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Maths <ul style="list-style-type: none"> <li>▪ Enjoy maths + Number system</li> <li>▪ Number system</li> <li>▪ Percentage, profit and loss</li> </ul> </li> <li>• Logical Reasoning <ul style="list-style-type: none"> <li>▪ Coding, Decoding, Number series,</li> <li>▪ Blood relation Directions, cubes &amp; dices</li> </ul> </li> <li>• English <ul style="list-style-type: none"> <li>▪ Vocabulary-1</li> <li>▪ Confusing words-1(Homonyms)</li> </ul> </li> </ul>
<b>Unit II</b>	<b>Essential Grammar - III</b> <span style="float: right;"><b>(6 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Idioms and phrases</li> <li>• Usage of Idioms &amp; phrases in daily conversation</li> <li>• Activities</li> <li>• Academic word list- Words to be used in business communication</li> </ul>
<b>Unit III</b>	<b>Written Communication- II</b> <span style="float: right;"><b>(4 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Essay writing</li> <li>• Mnemonics to develop ideas and write essays</li> <li>• Structure of essays</li> <li>• Technical writing</li> <li>• Report writing</li> </ul>
<b>Unit IV</b>	<b>SWOT Analysis</b> <span style="float: right;"><b>(6 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Introduction to SWOT</li> <li>• Importance to SWOT</li> <li>• Individual &amp; Organizational SWOT Analysis</li> <li>• Identifying strengths, weaknesses, threats &amp; opportunities</li> <li>• Short term goals&amp; Long term goals, Career planning</li> </ul>
<b>Unit V</b>	<b>Interpersonal Skills - III</b> <span style="float: right;"><b>(4 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Introduction to leadership skills</li> <li>• Importance of leadership skills</li> <li>• Types of leadership skills</li> <li>• Are leaders born or made?</li> </ul>
<b>Unit VI</b>	<b>Presentation Skills</b> <span style="float: right;"><b>(4 Hours)</b></span>
	<ul style="list-style-type: none"> <li>• Introduction to PowerPoint presentation</li> <li>• Structure &amp; flow of presentation</li> <li>• Importance of body language</li> <li>• Presentation by students-evaluation&amp; feedback by trainers</li> </ul>
<b>Text Books</b>	
<b>1. APAART: Verbal Ability</b>	
<b>2. APAART: Logical Reasoning</b>	
<b>3. APAART: Quantitative Aptitude</b>	
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>	

**5. APAART: Speak Well 2 (Soft Skills)**

**1. APAART: Verbal Ability**

## PRODUCTION PRACTICE-II

Designation of Course	Production Practice-II		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical:- 01
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
Practical:- 4 Hours/ Week	Term Work	50 Marks	
	Total	50 Marks	01

<b>Course Prerequisites:-</b>	Should have knowledge Production Practice-I
<b>Course Outcomes:-</b>	Students should able to understand <ol style="list-style-type: none"> <li>1) Welding Techniques,</li> <li>2) Pattern Making</li> <li>3) Mould Making</li> </ol>

### Course Contents

<p>Each candidate shall be required to complete and submit the following jobs:</p> <ol style="list-style-type: none"> <li>1. Welding-TIG / MIG OR Arc Welding (One Job)</li> <li>2. Pattern making:             <ul style="list-style-type: none"> <li>A solid pattern consisting of wood turning or a core box. (One Job)</li> <li>It should follow the colour code in pattern making</li> </ul> </li> <li>3. Sand Testing.(Any Two)</li> <li>3. Sand Moulding (One Job)</li> </ol> <p><b>Note</b> Practical examination of 3 hours duration based on above term work will be Conducted at the end of semester.</p>
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# Department of Mechanical Engineering

## Syllabus: Semester IV

### MECHANISMS OF MACHINES

Designation of Course	Mechanisms OF Machines		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04 Practical: 01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work/ Oral	50 Marks	
	Total	150 Marks	05

<b>Course Prerequisites:-</b>	<ol style="list-style-type: none"> <li>1. Engineering Mathematics</li> <li>2. Engineering Mechanics</li> </ol>
<b>Course Outcomes:-</b>	Learners can - Define various components of mechanisms. <ol style="list-style-type: none"> <li>1. Construct/Compose mechanisms to provide specific motion.</li> <li>2. Draw velocity and acceleration diagrams of various mechanisms</li> <li>3. Carry out force analysis of engine mechanism.</li> <li>4. Synthesize the mechanism.</li> <li>5. Analyze engine mechanism for static and dynamic force analysis.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Basic Kinematics:</b>	<b>(08 Hrs.)</b>
	Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach criterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Pantograph, Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.	
<b>Unit 2</b>	<b>Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-I</b>	<b>(08 Hrs.)</b>
	Relative velocity method: Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms. Relative acceleration method: Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms. Instantaneous center of rotation (ICR) method: Definition of ICR, Types of ICRs, Methods of locating ICRs, Kennedy's Theorem, Body and space centrode.	
<b>Unit 3</b>	<b>Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-II</b>	<b>(08 Hrs.)</b>
	Velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration. Klein's construction	
<b>Unit 4</b>	<b>Kinematic Analysis of Mechanisms : Analytical Methods</b>	<b>(08 Hrs.)</b>
	Analytical method for displacement, velocity and acceleration analysis of slider cranks mechanism. Position analysis of links with vector and complex algebra methods, Loop closure equation, Chace solution, Velocity and acceleration analysis of four bar and slider crank mechanisms using vector and complex algebra methods. Hooke's joint, Double Hooke's joint.	

<b>Unit 5</b>	<b>Introduction to Synthesis of Linkages</b>	<b>(08 Hrs.)</b>
Steps in synthesis process: Type, number and dimensional synthesis. Tasks of Kinematic synthesis: Path, function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanical and structural errors, Branch defect and order defect, Crank Rocker mechanisms. Graphical synthesis: Two and three position synthesis using relative pole method and inversion method for single slider crank and four bar mechanism, three position motion synthesis of four bar Mechanism. Analytical synthesis: Derivation of Freudenstein's equation, three position function generation using Freudenstein's equation.		
<b>Unit 6</b>	<b>Static and Dynamic Force Analysis</b>	<b>(08 Hrs.)</b>
Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, bifilar suspension, Trifilar suspension. Dynamics of reciprocating engines: Two mass statically and dynamically equivalent system, correction couple, static and dynamic force analysis of reciprocating engine mechanism (analytical method only), Crank shaft torque, Introduction to T- $\theta$ diagram.		

### Term work

Any two of the following experiments shall be performed

1. To determine the mass moment of inertia of a connecting rod using a compound pendulum method.
2. To determine the mass moment of inertia of a flat bar using bifilar suspension method.
3. To determine the angular displacements of input and output shafts of single Hooke's joint for different shaft angles and verification of the results using computer programme.

### Drawing Assignments (4 sheets of ½ imperial size)

1. To study and draw (any four) mechanisms for practical applications such as: Straight line mechanisms like Peaucellier Mechanism, Hart's Mechanism, Watt's Mechanism and Grasshopper Mechanism etc., for various link positions.
2. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons or ICR (Based on Unit 2).
3. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component or Klein's construction (Based on Unit 3).
4. Two problems based on graphical three position function generation, using either relative pole method or inversion method.

### Assignments

The following two assignments shall be completed and record to be submitted in the form of journal.

1. Computer programming for velocity and acceleration analysis of slider cranks mechanism.
2. One problem on velocity and acceleration analysis using:
3. Vector algebra and Complex algebra and comparison of results

### Text Books/ Reference Books

1. Rattan S. S., "Theory of Machines", Tata McGraw Hill.
2. Ballaney P. L., "Theory of Machines", Khanna Publishers, Delhi.
3. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.
4. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, Inc.
5. Ghosh Amitabh and Malik A.K., "Theory of Machines and Mechanisms", East-west Press.

6. Groover M.P., "Industrial Robotics", McGraw Hill International.
7. Hall A.S., "Kinematics and Linkages Design", Prentice-Hall.
8. Hartenberg and Denavit, "Kinematic Analysis and Synthesis of Mechanisms".
9. Erdman, A. G. & Sandor, G.N., "Mechanism design, Analysis and synthesis", Vol 1, Prentice –Hall of India.
10. Erdman, A. G. & Sandor, G.N., "Advance Mechanism design", Vol 2, Prentice –Hall of India.

**Unit Tests-**

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

## MANUFACTURING PROCESSES

Designation of Course	Manufacturing Processes		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60Marks	Theory: 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

<b>Course Prerequisites:-</b>	1.Basic knowledge of manufacturing Processes 2.Basic Knowledge of Joining and Castings 3.Basic knowledge of Materials
<b>Course Outcomes:-</b>	1. Understand the pattern, mould, and casting and choose the best casting process for a specific product. 2.Understand the different Hot and Cold working process 3. Choose the proper process for different joining cases. 4.Perform different operations on turning and boring machines 5. Understand and Perform different operations on the drilling and milling machines. 6.Specify and select suitable grinding process for required application

### Course Contents

<b>Unit 1</b>	<b>Expendable mould and permanent mould casting processes:</b>	<b>(08 Hrs.)</b>
	Sand casting, Types of pattern materials, pattern making allowances, core prints, Moulding sand- properties and testing, Hand and machine moulding, core, core making melting and pouring, Melting furnaces- Cupola, fuel fired, electric arc, Induction furnaces, Defects in casting, lost foam process, Shell moulding, Investment casting. Die casting low pressure permeant mould castings hot and cold chamber processes, Centrifugal casting, Semi-centrifugal casting. Centrifuging, Continuous casting	
<b>Unit 2</b>	<b>Hot working processes, Cold working processes</b>	<b>(08 Hrs.)</b>
	<b>A) Hot working processes:</b> Principle, rolling, forging - drops, press, upset. Rolling, forging- extrusion, drawing, spinning, effect of hot working. <b>B) Cold working processes</b> Cold rolling, swaging, forging extrusion- forward backward impact. Roll forging, tube drawing, wire drawing, spinning, shot peening, high energy rate forming, sheet metal, working- types of press, drives, different operations, and types of dies.	
<b>Unit 3</b>	<b>Joining process:</b>	<b>(08 Hrs.)</b>
	<b>a) welding process-</b> i) Arc welding – theory SMAW, GTAW, GMAW, FCAW, Submerged arc welding stud welding. ii) Resistance welding- Theory, spot, seam, projection welding processes. iii) Gas welding iv) Friction welding, ultrasonic welding, thermit welding, electron beam and laser welding.	



<b>b) Use of adhesives for joining.</b>		
Classification of adhesives, types of adhesives and their applications, surface preparation and various joints		
<b>Unit 4</b>	<b>Turning , boring related process</b>	<b>(08 Hrs.)</b>
Introduction, function, types, construction accessories operations, thread cutting, single and multi-start thread cutting, different tools, tool materials, Tool Geometry, concept of speed, feed, depth of cut, Introduction to boring machines general arrangement and nature of work done.		
<b>Unit 5</b>	<b>Drilling ,milling machines</b>	<b>(08 Hrs.)</b>
<b>A) Drilling :</b>		
Fundamentals of drilling process, twist drill geometry, tool holders, Types of drilling machines, drilling operations. Types of drills, reaming process.		
<b>B) milling machines:</b>		
Fundamentals of milling process, cutters-types and geometry, Operations performed on milling machines. Dividing head, methods of indexing. Gear train calculations for helical and cam milling		
<b>Unit 6</b>	<b>Abrasive machining processes, Plastics &amp; Plastic Moulding</b>	<b>(08 Hrs.)</b>
<b>A) Abrasive machining processes:</b>		
Abrasive machining, abrasives -types, size and geometry, Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults, Honing, lapping, super finishing, buffing, burnishing process.		
<b>B) Plastics &amp; Plastic Moulding:</b>		
Moulding characteristics of plastic, Moulding process- compression, transfer, and injection blow moulding. Mould design- Materials and construction, bulk factor, shrinkage, moulding parameters, moulding machines, extruders		

#### Text Books/ Reference Books

1. Chapman W.A.J.: "Workshop Technology" volume I, II, III. ELBS.
2. Hajara Choudhary S. K., Bose S. K.: "Elements of Workshop technology" – Volume I, II.
3. Begman: Manufacturing processes.
4. HMT: production technology. TMH Publishing Co. New Delhi.
5. Roy A. Lindberg: Processes and metables of manufacturing fourth edition practice Hall of India New Delhi.
6. Manufacturing process, P C Pandey

#### Unit Tests-

Unit Test-I	Unit- I, II, III
Unit Test-II	Unit- IV, V, VI

## MATERIAL SCIENCE

Designation of Course	Material Science		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory:03 Practical:01
Practical:- 02 Hours/Week	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	50 Marks	
	Total	150 Marks	04

<b>Course Prerequisites:-</b>	1.Knowledge of basic concept of Physics and chemistry 2. Basic information of engineering materials. 3. Basic knowledge of manufacturing processes.
<b>Course Outcomes:-</b>	1. basics of crystal structure, Mechanism of plastic deformation and Annealing and re- crystallization 2.how to measure different types of mechanical properties 3. Use of equilibrium diagrams in selections of alloys for different applications. 4.details about steels and cast irons its properties and applications 5.how to select nonferrous materials for different components 6.basics of corrosion and Prevention of corrosion by different methods

### Course Contents

<b>Unit 1</b>	<b>Study of Engineering materials and Plastic Deformation:</b>	<b>(08 Hrs.)</b>
classification of Engineering materials , Introduction to Nonmetallic materials, Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Polycrystalline metals, , Work Hardening ,Cold and hot working, Annealing and re -crystallization.		
<b>Unit 2</b>	<b>Mechanical Testing of Metals:</b>	<b>(08 Hrs.)</b>
Study of destructive testing, Tensile test , Engineering stress and true stress strain, Numerical based on Evolution of properties, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing		
<b>Unit 3</b>	<b>Study of Equilibrium Diagrams</b>	<b>(08 Hrs.)</b>
Related terms and their definitions, Hume Ruther's rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and its effects		
<b>Unit 4</b>	<b>Study of Steel and Cast Irons.</b>	<b>(08 Hrs.)</b>
Production of steel and cast Irons, Allotropy of Iron, Iron and Iron Carbide Equilibrium Diagram, Classification of Steels, Specifications of steels, Plain Carbon steel, Applications and microstructure of steels, Study of cast iron, Classification and applications of cast irons, Properties and manufacturing methods, Effect of alloying elements, Alloy cast irons etc.		
<b>Unit 5</b>	<b>Study of Non Ferrous Materials</b>	<b>(08 Hrs.)</b>
Introduction, Copper and it's alloy, Alpha and alpha beta brasses, Zinc Equivalent , Copper Nickel alloy, Bronzes,		

Aluminum and its alloy, Precipitation and age hardening, Dispersion strengthening, Nickel and its alloy, Metals at High and Low Temperature, Bearing Materials etc.		
<b>Unit 6</b>	<b>Corrosion and Prevention:</b>	<b>(08 Hrs.)</b>
Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.		

### Term work

#### List of Experiments: (Any Eight)

1. Tensile test to determine strength and other mechanical properties.
2. Hardness test Brinell and Vickers.
3. Rockwell and Poldi hardness test.
4. Study of Microstructure of plain carbon steel.
5. Study of Microstructure of cast irons.
6. Magnetic Particle test.
7. Liquid penetrate test.
8. Ultrasonic Test.
9. Eddy Current test
10. Visual inspection of casting and welded components.
11. Study of nonferrous material and alloys.

#### Practical Examinations:

Term work and Practical Examinations will be based on above syllabus.

### Assignments

1. Density calculations on crystal structure and miller indices for crystal structure.
2. Draw different types of curves such as, Tensile stress strain, S N curves, Creep curves, brittle transient temperature curves.
3. Draw the equilibrium diagram from given data. find out the different types of phases.
4. Draw the Fe-Fe<sub>3</sub>C equilibrium diagram and microstructure of steels specimens.
5. Draw the microstructures of brasses and bronzes. Give list of some applications of non-ferrous materials.
6. Collect different type of old components and study the corrosion on it also study the prevention processes also.

### Text Books

1. "Material Science and Physical Metallurgy", Dr. V. D Kodgere, Everest Publication, Pune.
2. "Physical Metallurgy", S H Avner, McGraw Hill Publication.
3. "Material science and metallurgy", O P Khanna, Khanna Publication, Delhi.
4. "Material Science and Engineering", R K Rajput S K Kataria and Sons Publication, Delhi.

### Unit Tests-

Unit Test-I	Unit-I,II III
Unit Test-II	Unit-IV, V, VI

## Turbo Machinery

Designation of Course	Turbo Machinery		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03
	Unit Test	20 Marks	
	Assignments	10 Marks	
	Internal Evaluation	10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

<b>Course Prerequisites:-</b>	The Students should have 1.Basic knowledge of pumps 2.Basic knowledge of Turbines 3.Knowledge of energy conversion devices
<b>Course Outcomes:-</b>	Able to understand- 1 Introduction of Turbo Machinery and Impulse Water Turbines 2 Reaction Water Turbines 3 Steam Turbines 4 Centrifugal Pumps 5 Centrifugal Compressor 6 Axial Compressor

### Course Contents

<b>Unit 1</b>	<b>Introduction of Turbo Machinery</b>	<b>(08 Hrs.)</b>
Impulse-momentum principle ,fixed and moving flat plates, curved vanes , with jet striking at the centre of vane and jet striking tangentially on to the vane, Impact of jet on hinged plates ,Impact of jets on series of flat plates and vanes, water wheels, velocity triangles and their analysis, work done and efficiency calculations. Impulse Water Turbines: Main components and constructional features of Pelton wheel, Concept of centrifugal head, general energy equation for turbine, Velocity diagrams and analysis, Important non-dimensional parameters such as speed ratio, jet ratio, flow ratio, Condition for maximum hydraulic efficiency.		
<b>Unit 2</b>	<b>Reaction Water Turbines</b>	<b>(08 Hrs.)</b>
Classifications, Francis, Propeller, Kaplan Turbines, construction features, velocity diagrams and analysis, DOR, draft tubes- types and analysis, cavitations causes and remedies, specific speed, performance characteristics and governing of reaction turbines, selection of turbines.		
<b>Unit 3</b>	<b>Steam Turbines</b>	<b>(08 Hrs.)</b>
Steam nozzles: types and applications, Equation for velocity and mass flow rate [Elementary treatment only] Steam Turbines: Classifications (Axial and Radial), construction details, compounding of steam turbines, velocity diagrams and analysis of Impulse and reaction turbines (single & multi stage), governing, performance characteristics, selection of turbines.		
<b>Unit 4</b>	<b>Centrifugal Pumps</b>	<b>(08 Hrs.)</b>
Classification, components of centrifugal pump, various terms associated with centrifugal pump, various heads, velocity triangle and their analysis, effect of outlet blade angle, capitation, NPSH, Thomas Cavitations factor,		

priming of pumps, installation, specific speed, Performance characteristics of centrifugal pump, Axial thrust, maintenance, trouble and remedies, series and parallel operation of pumps, system resistance curve, water hammer problem in pumping system, selection of pumps.		
<b>Unit 5</b>	<b>Centrifugal Compressor</b>	<b>(08 Hrs.)</b>
Classification of rotodynamic compressors, blowers, fans. Centrifugal compressor: Construction, flow process on T-S Diagram, velocity diagram and Euler's work, slip factor and its effect on work input, actual work input, dimension parameters, pre-whirl losses, surging, choking, stalling characteristics		
<b>Unit 6</b>	<b>Axial Compressor</b>	<b>(08 Hrs.)</b>
Construction, stage velocity triangles and its analysis, enthalpy entropy diagram, dimensionless parameters, flow through the blade rows, pressure rise across the stage, stage losses and efficiencies, performance characteristics		

### Term Work

1. Study and trial on a Pelton wheel and plotting of main / operating characteristics.
2. Study and trial on a Francis turbine and plotting of main / operating characteristics.
3. Study and trial on a Kaplan turbine and plotting of main / operating characteristics
4. Study and trial on a Centrifugal pump and plotting of operating / and variable speed characteristics.
5. Study of different types of nozzles
6. Study of axial flow compressors/ centrifugal air blower
7. Study of multi-staging of steam turbines
8. Trial on centrifugal air compressor
9. Design of a complete pumping system installation using standard tables, charts supplied by pump manufacturers.
10. Visit to Hydroelectric power stations and writing a report based on the visit.
11. Visit to water pumping station and writing a report based on visit.

### Assignments

Assignments Six Assignments based on above syllabus

### Text Books

- 1 P. N. Modi and Dr. S. M. Seth, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi.
- 2 R. K. Rajput, "Hydraulic Machines", S.Chand Publishers, New Delhi.
- 3 Turbines, Compressors & Fans, S.M. Yahya, Tata-McGraw Hill.
- 4 Turbomachines, B. U. Pai, Wiley India.
- 5 Fluid Mechanics & Hydraulic Machines S.C. Gupta 1e Pearson Education.
- 6 Thermal Turbo machines, Dr. Onkar Singh, Wiley India.
- 7 Fluid Mechanics and Hydraulic Machines by R.K.Bansal.
- 8 Basic concepts in Turbo machinery by Grant Ingram.

### Unit Tests-

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-IV, V, VI

## NUMERICAL METHODS AND OPTIMIZATION TECHNIQUES

Designation of Course	Numerical Methods and Optimization Techniques		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical:01 Tutorial:01
Practical:- 02 Hours/ Week	Unit Test	20 Marks	
	Assignments	10 Marks	
Tutorials:- 01 Hours/ Week	Internal Evaluation	10 Marks	
	Term Work/ Oral	50 Marks	
	Total	150 Marks	05

<b>Course Prerequisites:-</b>	Students should have basic knowledge of: <ol style="list-style-type: none"> <li>1. Basics of statistics</li> <li>2. Basics of Probability</li> </ol>
<b>Course Outcomes:-</b>	Able to understand- <ol style="list-style-type: none"> <li>1. Form mathematical modeling of systems using differential equations</li> <li>2. Ability to solve linear differential equations with constant coefficient.</li> <li>3. Apply statistical methods to numerical data.</li> <li>4. Calculate Correlation and Regression coefficient.</li> <li>5. Able to do optimization of engineering problems.</li> <li>6. Able to complete Multivariate Variable Optimization for any problem</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Roots of Equations:</b>	<b>(08 Hrs.)</b>
Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error. Bracketing methods-Bisection and False position method. Open methods, Newton Raphson method		
<b>Unit 2</b>	<b>Linear Algebraic Equation:</b>	<b>(08 Hrs.)</b>
Navie Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers.		
<b>Unit 3</b>	<b>Curve Fitting and Interpolation:</b>	<b>(08 Hrs.)</b>
Least-Square Regression-Linear regression,. Interpolation-Newton's divided difference interpolating polynomial. Lagrange's interpolating polynomial		
<b>Unit 4</b>	<b>Numerical differentiation and Integration:</b>	<b>(08 Hrs.)</b>
Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, derivatives of unequally spaced data. Engineering Applications. Ordinary Differential Equations: Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations		
<b>Unit 5</b>	<b>Single Variable Optimization</b>	<b>(08 Hrs.)</b>
Optimum problem formulation, Engineering optimization problem, Optimality Criteria, Bracketing methods, region-Elimination method, Point Estimate Method, Gradient Based method		
<b>Unit 6</b>	<b>Multivariate Variable Optimization</b>	<b>(08 Hrs.)</b>
Optimality criteria, Unidirectional search, Direct search method- Evolutionary optimization, simplex search, Gradient Based Methods- Steepest Descent method, Newton's method.		

#### Term work

Minimum six program on from each unit using Matlab.

**Text Books/ Reference Books**

1. Optimization for Engineering Design: Algorithms and Examples By Kalyanmoy Deb, Prentice-Hall of India Private Limited, New Delhi.
2. Introduction to Optimum Design, Jasbir S Arora, Elsevier Academic Press.
3. Numerical Methods for Engineers, Steven Chaptra and Raymond Canale, McGraw Hill.
4. Numerical Methods for Scientific and Engineering Computations, M. K. Jain, S.R.K. Ayengar and R. K. Jain.

**Unit Tests-**

Unit Test-I	Unit-I, II, III
Unit Test-II	Unit-III, IV, VI

## PROFESSIONAL SKILLS DEVELOPMENT-IV

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

Course Pre-requisites	
The Students should have knowledge of	
1.	Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2.	An overall idea about the difference in personal and professional communication in terms of vocabulary used.
3.	Knowledge of writing skills, importance of professionalism in emails and letters.
4.	They should be aware of concepts of self-esteem, self-assessment and its importance in setting long term and short term goals.
5.	Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6.	Body language and importance of non-verbal communication to maintain professionalism.
Course Objectives	
	The Professional Skills Development 4 is an extension of PSD- 3 with focus on the remaining topics of Maths and Logical reasoning. The further complex concepts of Aptitude and Grammar aims to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-4 focuses on the higher aspects of soft skills such as grooming them on corporate etiquettes and various formats of email/ letter writing so that can present themselves as professionals further both in oral and written communication.
Course Outcomes	
The student should be able to	
1.	Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar relevant from the recruitment point of view.
2.	Use appropriate words in the right context both academically and professionally. Students would have approximately around 80-100 words from the academic word list prescribed in the syllabus.
3.	Understand the importance of email etiquettes and distinguish between the format of formal and informal emails/letters. They would be able to draft professional mails and letters like job application letters, cover letters, and apology emails with proper structure and words which are necessary in the corporate life.
4.	Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
5.	Understand the major concepts of leadership like coaching, mentoring. They would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life.
6.	Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector. They would also learn various strategies and conversational techniques to handle telephonic interviews confidently.



<b>Course Contents</b>		
<b>Unit I</b>	<b>Aptitude (Maths, Logical Reasoning, English)</b>	<b>(18 Hours)</b>
	<ul style="list-style-type: none"> <li>• Maths <ul style="list-style-type: none"> <li>▪ Simple Interest and Compound Interest</li> <li>▪ Ratio, Proportion and Average</li> <li>▪ Mixture and Allegation</li> </ul> </li> <li>• Logical Reasoning <ul style="list-style-type: none"> <li>▪ Data Interpretation</li> <li>▪ Data Sufficiency</li> </ul> </li> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar I</li> <li>▪ Vocabulary - Analogies</li> </ul> </li> </ul>	
<b>Unit II</b>	<b>Essential Grammar - IV</b>	<b>(4 Hours)</b>
	<ul style="list-style-type: none"> <li>• Vocabulary – Academic word List</li> </ul>	
<b>Unit III</b>	<b>Written Communication- III</b>	<b>(6 Hours)</b>
	<ul style="list-style-type: none"> <li>• Email writing and etiquettes – formal and informal email writing, format of various types of email, do’s and don’ts of email writing</li> <li>• Letter writing – formal letters, job application letter, and cover letter.</li> <li>• Essay writing – mnemonics top develop ideas and write essays, structure of essays</li> </ul>	
<b>Unit IV</b>	<b>Self-Awareness and Conflict Resolution</b>	<b>(4 Hours)</b>
	<ul style="list-style-type: none"> <li>• Self-assessment &amp; Perception &amp; attitudes.</li> <li>• Analyzing skills &amp; weaknesses and habits.</li> <li>• Developing positive attitude &amp; handling criticism positively</li> <li>• Handling conflicts in the personal and corporate sector</li> <li>• Causes of conflicts in work scenario.</li> <li>• Ways and methods for conflict resolution</li> </ul>	
<b>Unit V</b>	<b>Interpersonal Skills - III</b>	<b>(6 Hours)</b>
	<ul style="list-style-type: none"> <li>• Mentoring, Difference between Leadership and Management</li> <li>• Leading with examples</li> <li>• Time management -The Time Management Matrix, Pareto Principle</li> </ul>	
<b>Unit VI</b>	<b>Aptitude (Maths, Logical Reasoning, English)</b>	<b>(4 Hours)</b>
	<ul style="list-style-type: none"> <li>• Maths <ul style="list-style-type: none"> <li>▪ Simple Interest and Compound Interest</li> <li>▪ Ratio, Proportion and Average</li> <li>▪ Mixture and Allegation</li> </ul> </li> <li>• Logical Reasoning <ul style="list-style-type: none"> <li>▪ Data Interpretation</li> <li>▪ Data Sufficiency</li> </ul> </li> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar I</li> <li>▪ Vocabulary - Analogies</li> </ul> </li> </ul>	
<b>Text Books</b>		
<b>1. APAART: Verbal Ability</b>		
<b>2. APAART: Logical Reasoning</b>		
<b>3. APAART: Quantitative Aptitude</b>		
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>		
<b>5. APAART: Speak Well 2 (Soft Skills)</b>		
<b>1. APAART: Verbal Ability</b>		

## PRODUCTION PRACTICE-III

Designation of Course	Production Practice-III		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- -- Hours/ Week	End Semester Examination	-- Marks	Practical: 01
	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
Practical:- 2 Hours/ Week	Term Work	50 Marks	
	Total	50 Marks	01

<b>Course Prerequisites:-</b>	Student should have basic knowledge of welding, soldering, Lathe Machine.
<b>Course Outcomes:-</b>	<ol style="list-style-type: none"> <li>1. Able to perform different Gear Cutting operations</li> <li>2. Able to perform different operations on automatic lathe machine.</li> <li>3. Able to do machining of components covering all operations on Lathe</li> <li>4. Able to perform CNC Turning</li> </ol>

### Course Contents

<p>Each Candidate shall be required to complete and submit the following jobs (Any Two)</p> <ol style="list-style-type: none"> <li>1. One Composite job consisting of 3 to 4 pieces as below Machining of components covering all operations on Lathe (Including Internal and external threading, Taper Matching, Knurling )One Job Grinding operation on Above (Turning ) Job</li> <li>2. Gear Cutting One Job</li> <li>3. One job on CNC Machine. (Turning).</li> <li>4. One job on Single Spindle Automate Lathe</li> </ol> <p><b>Note</b> Write a journal/term book based on above syllabus.</p>
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## **Rules regarding ATKT, Continuous Assessment and award of Class**

### **Standards for Passing**

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
  - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.
- OR
- The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

### **Rules of ATKT**

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

### **Award of Class for the Degree Considering CGPA**

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:

Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A <sup>+</sup>	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B <sup>+</sup>	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

**Bharati Vidyapeeth Deemed University**  
**College of Engineering, Pune- 411043**  
**The Structure of the Curriculum: 2014 Course**  
**Choice Based Credit System (CBCS)**

**B. TECH. MECHANICAL: SEMESTER- V & VI**



**Bharati Vidyapeeth University**  
**College of Engineering, Pune**  
**Department of Mechanical Engineering**



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**Vision:** To provide mechanical engineers capable of dealing with global challenges

**Mission:** Social transformation through dynamic education

**Programme Educational Objectives (PEOs):**

Graduates will be able,

- To fulfill need of industry with theoretical and practical knowledge
- To engage in lifelong learning and continued professional development
- To fulfill social responsibilities

**Programme Outcomes (POs):**

- a. To apply knowledge of mathematics, science and engineering fundamentals for solving engineering problems
- b. To identify the need, plan and conduct experiments, analyze data for improving the mechanical processes
- c. To design and develop mechanical systems considering social and environmental constraints.
- d. To design and develop a complex mechanical system using advanced mathematical and statistical tools and techniques
- e. Use of information technology (IT) tools for prediction and modeling of routine activities to enhance the work performance
- f. To know social responsibilities while doing professional engineering practice.
- g. To become familiar with eco-friendly, sustainable and safe work environment.
- h. To take into account professional ethics while designing engineering systems.
- i. Able to work efficiently as a group leader as well as an individual.
- j. To communicate in written and verbal form with subordinates and supervisors
- k. To apply project and finance management techniques in multidisciplinary environments.
- l. To create interest for higher education and updating the knowledge.

**B. TECH. MECHANICAL: SEMESTER- V (2014 Course)**

S. N.	Course	Teaching Scheme (Contact Hrs. /week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem. Exam.	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Machine Design –I*	3	2	-	60*	20	10	10	50	--	150	3	1	4
2	Theory of Machines	4	2	-	60	20	10	10	50	--	150	4	1	5
3.	Advanced Computer Graphics & Solid Modelling	3	2	-	60	20	10	10	--	50	150	3	1	4
4.	Heat and Mass Transfer	4	2	-	60	20	10	10	50	--	150	4	1	5
5.	Advanced Manufacturing Processes	3	--	-	60	20	10	10	--	--	100	3	--	3
6.	Professional skill Development-V	4	--	-	100	-	-	-	--	--	100	4	--	4
	<b>Total</b>	21	08	0	400	100	50	50	150	50	800	21	4	25

\* End Semester examination of duration 4 Hours.

**B. TECH. MECHANICAL: SEMESTER- VI (2014 Course)**

S. N.	Course	Teaching Scheme (Contact Hrs. /week)			Examination Scheme (Marks)							Total Credits		
		L	P/ D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/ OR	TW/ PR				
1.	Machine Design –II*	4	2	--	60*	20	10	10	50	--	150	4	1	5
2.	Refrigeration Air Conditioning	3	2	--	60	20	10	10	50	--	150	3	1	4
3.	Internal Combustion Engines	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Mechanical Measurement & Metrology	4	2	--	60	20	10	10	--	50	150	4	1	5
5.	Elective -I	3	--	--	60	20	10	10	--	--	100	3	--	3
6.	Professional skill Development-VI	4	--	--	100	-		-	--	--	100	4	--	4
	<b>Total</b>	21	8	--	400	100	50	50	100	100	800	21	4	25

\* End Semester examination of duration 4 Hours.

Total Credits Sem. V – 25

Total Credits Sem. VI – 25

Grand Total - 50

Elective-I

- 1) Machine Tool Design
- 2) Energy Audit and Management
- 3) Reliability Engineering
- 4) Design of Pumps, Blowers and Compressors
- 5) Management Information System



## MACHINE DESIGN-I

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	04

**Course Prerequisite:-** Student should have knowledge of

1. Fundamentals of engineering Drawing
2. Analysis of forces
3. Utilizing the principles of drafting and strength of materials.

**Course Objective:-**

1. Ability to analyze the stress and strain of mechanical components and understand, identify and quantify failure modes for mechanical part.
2. Ability to decide optimum design parameters for mechanical systems.
3. Enhancement in proficiency of CAD software for designing Mechanical systems and to generate production drawing.
4. Ability to understand basics of fluctuating load.

**Course Outcomes:-** Learner will able to-

1. understand the basics of machine design
2. design of shafts, keys and couplings
3. design of power screws
4. design of springs
5. design of welded and riveted joints
6. understand basics of fluctuating load for static and dynamic loading

<b>Unit 1</b>	<b>Basic Concept of Machine Design</b>	<b>(06 Hrs.)</b>
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Traditional types of design methods, basic procedure of machine design, introduction to use of standards in design, selection of preferred series, introduction to aesthetic and ergonomic consideration in design. Engineering materials- properties, designation, and selection of material. Weighted point method. Castiglione's theorem.

<b>Unit 2</b>	<b>Design of Shafts, Keys &amp; Couplings</b>	<b>(06 Hrs.)</b>
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Shaft design on strength basis, shaft design on torsional rigidity basis, ASME code of shaft design, keys – saddle, sunk, feather, woodruff, square, flat, Kennedy key, key design, design of splines, types of couplings, muff coupling, flange coupling, flexible bush pin type coupling.

<b>Unit 3</b>	<b>Design of Power Screws</b>	<b>(06 Hrs.)</b>
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Forms of threads, differential & compound screw, design of square & trapezoidal threads, self-locking screw, design of power screws, screw jack, recirculating ball screw, design of bolted joint.

**Unit 4 Design of Springs (06 Hrs.)**

Types, materials, stress & deflection equations for helical, tension & compression spring, torsional and multi leaf springs, styles of ends, nipping of leaf spring, shot peening, spring in series & parallel, concentric springs,

**Unit 5 Design of Welded & Riveted Joints (06 Hrs.)**

Design of welded joint: advantages, limitations, butt & fillet welds, parallel & transverse fillet welds, axially loaded unsymmetrical welded joint, eccentric loading in plane of weld, welded joint subjected to bending & torsional moment, basic types of riveted joints, different parameters of a riveted joints, uses of riveted joints, failure of riveting joint, strength of riveting joint and efficiency of riveting joints.

**Unit 6 Design for Fluctuating Load (06 Hrs.)**

Stress concentration - causes & remedies, fluctuating stresses, fatigue failures, S-N curve, endurance limit, notch sensitivity, endurance strength modifying factors, design for finite and infinite life, cumulative damage in fatigue failure, Soderberg, Gerber, Goodman, modified Goodman diagrams, fatigue design of components under combined stresses.

**Term Work**

Term work shall consist of two design projects by using AutoCAD/manually. Design projects should be in the form of system design comprising of machine elements studied in syllabus. Design data book should be used extensively. Four assignments on remaining topics.

**Text Books**

- 1) Shigley J. E. and Mischke C. R., "Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
- 2) Spotts M. F. and Shoup T.E., "Design of Machine Elements", Prentice Hall International
- 3) Bhandari V. B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
- 4) Juvinal R. C., "Fundamentals of Machine Components Design", John Wiley and Sons.

**Reference Books**

- 1) Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc.
- 2) Willium C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.
- 3) Hall A. S., Holowenko A. R. and Laughlin H. G., "Theory and Problems of Machine Design", Schaum's Outline Series.
- 4) Sharma C. S. and Purohit Kamlesh, "Design of Machine Elements", PHI Learning Pvt. Ltd.
- 5) D. K. Aggarwal & Sharma P. C., "Machine Design", S.K Kataria and Sons
- 6) Gope P. C., "Machine Design: Fundamentals and Applications", PHI Learning Pvt. Ltd.
- 7) "Design Data- P. S. G." College of Technology, Coimbatore.

8) Bhandari, V. B. "Machine Design data book", Tata McGraw Hill Publication Co. Ltd.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## THEORY OF MACHINES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

**Course Prerequisite:-** Student should have knowledge of

1. Fundamentals of engineering mechanics
2. Analysis of forces and moments
3. Kinematics
4. Algebra and trigonometry

**Course Objective:-**

1. To acquaint with working principles of clutches and its constructional details.
2. To study working and types of brakes and dynamometers.
3. To acquaint with working principles and applications of gyroscope and governors.
4. To demonstrate different types of gear trains and its applications.

**Course Outcomes:-** Learner will able to-

1. analyze gears.
2. select gears
3. analyze and select gear trains.
4. apply the working principles of clutches and its constructional details and analyze working of brakes and dynamometers.
5. can decide the shape of cam profile
6. demonstrate working mechanism of different types of governors and analyze gyroscopic effect on various applications

### Unit 1 Kinematics of Spur Gears (08 Hrs.)

Classification and applications of gears, terminology of gearing, law of gearing, velocity of sliding, conjugate action, forms of teeth, path of contact, arc of contact, interference, undercutting, methods to avoid interference and undercutting, effect of centre distance variation, friction between gear teeth, involutometry.

### Unit 2 Kinematics of Helical, Bevel and Worm Gears (08Hrs.)

**Helical gears:** Terminology, virtual number of teeth, torque transmitted,

**Spiral gears:** terminology and efficiency.

**Worm gears & bevel gears:** Terminology, geometrical relationships, tooth forces, torque transmitted.

**Unit 3 Inertia of Geared Systems and Gear Trains****(08Hrs.)**

Inertia of gear systems, types of gear trains - simple, compound, reverted and epicyclic gear trains, analysis of epicyclic gear trains, torque on sun and planet gears, compound epicyclic gear trains, bevel epicyclic gear trains.

**Unit 4 Friction, Clutches, Brakes & Dynamometers****(08Hrs.)****Friction:**

Friction and types of friction, laws of friction, Friction in turning pairs, Friction circle, Friction axis, Friction in 4 bars and single slider crank mechanism.

**Friction clutches:**

Pivot and collar friction, plate clutches, cone clutch, centrifugal clutch, torque transmitting capacity.

**Brakes & dynamometers:**

Different types of brakes, Shoe brakes, External and internal shoe brakes, Block brakes, Band brakes, Band and block brakes, Braking torques, Different types of absorption and transmission type dynamometers.

**Unit 5 Cams & Followers****(08 Hrs.)**

Types of cams and followers, analysis follower, of standard motions to the for a determination of cam profiles analysis of cams given follower motions, circular arc with specified contours- cam, tangent cam,

Eccentric cam, methods of control: pressure angle, radius of curvature and undercutting, kinematically equivalent system, jump phenomenon. Introduction to advanced cam curves.

**Unit 6 Gyroscopes and Introduction to Governors****(08Hrs.)**

Gyroscopes, concept of gyroscopic action, gyroscopic couple, effect of gyroscopic couple on ship, airplanes, and vehicles. Introduction to Governors, Types centrifugal governor (Watt, Porter, and Hartnell governor only), controlling force, governor effort and governor power with numerical treatment, sensitivity, stability, isochronism and hunting, friction, insensitiveness. (No Numerical Treatment)

**Term Work:**

The term work shall consist of the following experiments:

1. To draw conjugate profile for any general type of gear tooth.
2. To generate involute gear tooth profile and to study the effect of undercutting and rack shift using model.
3. To study various types of gearboxes such as: Industrial gear box, Synchromesh gearbox, Differential gearbox, or PIV gearbox.
4. To measure transmitted torque and holding torque of an epicyclic gear train.
5. To study the slip in belt drives.
6. To draw cam profiles for various types of follower motions.
7. To verify gyroscopic couple.
8. To determine the characteristic curves for centrifugal governor and to find its coefficient of insensitiveness and stability.

**Text Books**

1. Ratan S. S., "Theory of Machines", Tata McGraw Hill
2. Beven T, " Theory of Machines", Longman Publication
3. Ballaney P. L. "Theory of Machines", Khanna Publications

**Reference Books**

1. Hannah and Stephans, "Mechanics of Machines", Edward Arnolde Publication.
2. Shigley J. E. and Uicker, J. J., "Theory of Machines and Mechanisms", International Edition, MacGraw Hill Inc.
3. Jagdish Lal, "Theory of Machines ", Metrapolitan Book Co. Pvt. Ltd. N. Delhi.
4. Khurmi, R. S. and Gupta, J. K." Theory of Machines", Eurasia Publishing House (Pvt.) Ltd., New Delhi.
5. Ghosh Malik, "Theory of Mechanism and Machines", East-West Pvt. Ltd.
6. Dr.V. P. Singh, "Theory of machine", Dhanpatrai and Son.
7. C. S. Sharma & Kamesh Purohit," Theory of Machine and Mechanism", PHI.
8. David H. Myszka, "Machines and Mechanism", PHI.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV,V and VI

## ADVANCED COMPUTER GRAPHICS & SOLID MODELLING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract..	50 Marks	01
	Total	150 Marks	04

**Course Prerequisite:-**

1. Knowledge of basic concept of Engineering Graphics.
2. Basic knowledge of Mechanical Engineering drawing.
3. Basic knowledge of Computer Hardware and AutoCAD Software.

**Course Objective:-**

1. To introduce new and exciting field of Intelligent CAD with particular focus on engineering product design.
2. To develop a holistic view of initial competency in engineering design by modern computational methods.
3. To expose the student to contemporary computer design tools for mechanical engineers.
4. To prepare the student to be an effective user of a CAD system.
5. Model the 3-D geometric information of machine components including assemblies, and automatically generate 2-D production drawings.
6. Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.

**Course Outcomes:-**

Able to understand-

1. Algorithms to generate, points, lines, circles ellipse and different polygons
2. Basic transformations in 2D modelling
3. Different transformations in 3D modelling
4. Geometric modelling of curves
5. Parametric representation of analytic and synthetic surfaces
6. Basics of solid modelling and data exchange in CAD/CAM

**Unit 1    Output primitives    (06 Hrs.)**

Points and Lines, Line Drawing Algorithms-DDA Algorithm, Bresenham's Line Drawing Algorithms, Thick Line Segments. Circle and Ellipse Generation Algorithm. Polygon-Polygon Filling, Flood Fill, Boundary Fill, Scan Line Fill.

**Unit 2    Two Dimensional Transformations    (06 Hrs.)**

Basic Transformation – Translation, Rotation, Scaling, Reflection, Shear, Matrix Representation and Homogeneous Co-Ordinates. Composite Transformations.

**Unit 3    Three-Dimensional Transformations    (06 Hrs.)**

Introduction to 3D, Translation, Rotation, Scaling, Reflection, Shear, Affine and Perspective Geometry. Orthographic, Axonometric, Oblique Projection.

**Unit 4 Geometrical Modeling (06 Hrs.)**

Mathematical Representation of Curves, Wire Frame Model, Wire Frame Entities.  
Parametric Representation of Analytic Curves- Lines, Circles, Ellipses. Parametric Representation of Synthetic Curves- Hermit, Cubic-Splines, Bezier Curve, B-Spline Curve.  
Curve Manipulation: Displaying, Evaluating Points on Curve, Blending Segmentation.  
Surface Manipulation: Displaying, Evaluating Points & Curve on Surfaces, Segmentation, Trimming, Intersection, Projection and Transformations.

**Unit 5 Surface Modeling (06 Hrs.)**

Surface Models, Surface Entities, Surface Representation.  
Parametric Representation of Analytic Surfaces- Plan Surfaces, Ruled Surfaces, Surface of Revolution, Tabulated Cylinder.  
Parametric Representation of Synthetic Surfaces- Hermit, Bi-cubic Surfaces, Bezier Surfaces, B-spline Surfaces.

**Unit 6 Solid Modeling (06 Hrs.)**

Solid Models, Solid Entities, Solid Representation, Fundamentals of Solid Modeling, Boundary Representation, Constructive Solid Geometry, Sweep Representation.  
CAD/CAM Data Exchange: Evaluation of data exchange formation, IGES data representation & Structure, PDES Data representation, STEP Architecture.

**Term Work:**

The term work shall consist of record of eight experiments from the following:

1. DDA Line Drawing Algorithm.
2. 2 D Transformation.
3. 3D Transformation.
4. Assignment on 2-D sketching with geometrical and dimensional constraints using any commercially used solid modeling software.
5. Assignment on parametric solid modeling of a machine component using various commands and features of the software.
6. Assignment on solid modeling of the parts of a machine (min. 5 components).
7. Assignment on assembly modeling of the parts modeled in assignment 6 using proper mating conditions and generation of exploded view.
8. Generation of production drawings of the parts and assembly with appropriate tolerancing.

**Reference Books**

1. Ibrahim Zeid and R. Siva-Subramaniam – “CAD/CAM- Theory and Practice”, Tata McGraw Hill, Publishing Co. 2009.
2. Rao P. N., “CAD/CAM”, Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, “Computer Graphics Principles and Practice”, Second edition, Addison–Wesley, 2000.
4. Martenson, E. Micheal, “Geometric Modelling”, John Wiley & Sons, 1995.
5. Hill Jr, F.S., “Computer Graphics Using OpenGL”, Pearson Education, 2003.



6. Rao Singeresu S., "Engineering Optimization-Theory and Practice", New Age International Limited Publishers, 2000.
7. Ray C. Johnson. "Optimum Design of Mechanical Elements", Wiley, John & Sons, 1981.
8. Radhakrishnan P., Subramanyam S., "CAD/CAM/CIM", New Age International.
9. Ramamurti V., "Computer Aided Mechanical Design and Analysis", Tata McGraw Hill-1992.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## HEAT AND MASS TRANSFER

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

- Course Prerequisite:-**
1. Knowledge of basic concepts in Physics.
  2. Basic information of Thermodynamics.
  3. Basic knowledge of Fluid Mechanics

- Course Objective:-**
1. The student should understand the scope, objective and application of heat and mass transfer and its applications.
  2. They will also learn the three major modes of heat transfer *viz.*, conduction, convection, and radiation. In addition to these three main modes of heat transfer, students will also learn the phenomena of heat transfer during phase change

- Course Outcomes:-**
- Able to understand-
1. Formulate basic equations for heat transfer problems.
  2. Concept of thermal insulation in one dimensional steady state heat conduction
  3. Analysis of extended surfaces and concept of unsteady heat conduction
  4. Concept of heat transfer by forced and natural convection
  5. Various laws related to thermal radiation and concepts of condensation and boiling
  6. Preliminary analysis of heat exchangers and concept of mass transfer

### Unit 1 Introduction and Basic Concepts

**(08 Hrs.)**

Overview of subject, Modes of heat transfer, Applications of heat transfer in different fields of engineering, Fourier's law of conduction, Newton's law of cooling, Stefan-Boltzmann's law of radiation, Isotropic and anisotropic

materials, Three dimensional heat conduction equation in Cartesian coordinate for anisotropic material for steady state condition, and reduction to Fourier equation, Laplace equation and Poisson's equation, Three dimensional heat conduction equation in cylindrical and spherical coordinates (no derivation), Thermal diffusivity.

#### **One dimensional steady state heat conduction:**

One dimensional steady state heat conduction through a plane wall, cylindrical wall and sphere, Analogy between heat flow and electricity, heat conduction through a composite slab, cylinder and sphere, Overall heat transfer coefficient, Concept of thermal resistance and conductance.

**Unit 2 Thermal Insulation (08 Hrs.)**

Purpose of insulation, critical radius of Insulation, Economic thickness of Insulation, Thermal contact resistance, thermal conductivity and its variation with temperature for metals, non-metallic solids, gases and liquids, one dimensional problems of variable thermal conductivity.

**One Dimensional Steady State Heat Conduction with Internal Heat Generation:**

Symmetrical boundary condition in plane wall, conduction in solid, hollow cylinder and sphere, practical problems of heat generation.

**Unit 3 Extended Surfaces (08 Hrs.)**

Heat transfer through extended surfaces, Classification of fins, Derivation of differential equation for fins with constant cross sectional area with insulated tip boundary conditions, Effectiveness and efficiency of a fin, design of thermo well.

**Unsteady state heat conduction :**

System with negligible internal resistance, Biot & Fourier numbers, Criteria for neglecting internal temperature gradient, Concept of time constant

**Unit 4 Convection (08 Hrs.)**

Introduction to hydrodynamic and thermal boundary layer, Laminar & turbulent flow over & closed conducts, convection heat transfer coefficients & order of magnitude, Dimensional analysis of free & forced convection, physical significance of the dimensionless parameters, Nusselt's number, Reynold's number, Prandtl's number, Grashoff's number, Stanton number, Rayleigh number.

**Forced Convection**

Empirical correlations for heat transfer in laminar and turbulent flow over a flat plate and in a circular pipe, Concept of hydraulic diameter, reference temperature.

**Natural Convection**

Flow patterns, Empirical correlations for free convection, heat transfer over horizontal, vertical plate.

**Unit 5 Thermal Radiation (08 Hrs.)**

Fundamental concepts, Black body radiation, Kirchoff's law, Planck's distribution law, Wein's displacement law, Stefan Boltzmann law, Surface emission, relative properties of a surface, Grey, black and real surface, solid angle and intensity of radiation, Lambert's Cosine law, Heat exchange by radiation between two finite black surfaces, Radiation shape factor, use of shape factor charts, Irradiation, radiosity, Electrical network, Heat exchange between two infinitely parallel planes and cylinders, Radiation shields.

**Condensation and Boiling**

Film and drop-wise condensation, heat transfer coefficient for laminar film condensation on vertical and inclined plate (descriptive treatment), Correlations for condensation on and inside tubes, modes of pool boiling, critical heat flux, pool boiling.

**Unit 6 Heat Exchangers (08 Hrs.)**

Classification, Applications of heat exchangers, Heat exchanger analysis, Logarithmic Mean Temperature Difference for parallel and counter flow heat exchangers, LMTD correction factors, fouling factor. The effectiveness: NTD method for parallel and counter flow heat exchangers, design considerations for heat exchangers

**Mass Transfer:**

Introduction, modes of mass transfer, analogy between heat and mass transfer, mass diffusion (mass and mole basis), Fick’s law of diffusion

**Term Work:**

Term work shall consist of any eight experiments

1. Determination of thermal conductivity of insulating powder.
2. Determination of thermal conductivity of metal rod.
3. Determination of thermal conductivity of different materials in composite wall.
4. Temperature distribution along a length of a fin and determination of fin effectiveness and fin efficiencies.
5. Determination of film heat transfer coefficient on a hollow vertical tube heated from inside.
6. Determination of film heat transfer coefficient for turbulent flow inside a pipe.
7. Determination of emissivity of a non-black surface.
8. Determination of Stefan-Boltzmann constant.
9. Performance of a parallel flow and counter flow heat exchanger.
10. Calibration of thermocouple.
11. Demonstration of a heat pipe.
12. CFD simulation of conduction or convection problem.

**Text Books**

1. Incropera F. P., Dewitt D. P., “Fundamentals of Heat and Mass Transfer”, John Wiley.
2. Cengel Y. A. and Ghajar A. J., “Heat and Mass Transfer – Fundamentals and Applications”, Tata McGraw Hill Education Private Limited.
3. Sukhatme S. P., “A Textbook on Heat Transfer”, Universities Press.
4. Mills A. F., “Basic Heat and Mass Transfer”, Pearson.

**Reference Books**

1. Venkatesan S. P., “Heat Transfer”, Ane Books Pvt. Ltd.
2. Holman J. P., “Fundamentals of Heat and Mass Transfer”, McGraw – Hill publication.
3. Nag P. K., “Heat & Mass Transfer”, McGraw Hill Education Private Limited.
4. Thirumaleshwar M., “Fundamentals of Heat and Mass Transfer”, Pearson Education India.
5. Sachdeva R.C., “Fundamentals of Engineering Heat and Mass Transfer”, New Age Science

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## ADVANCED MANUFACTURING PROCESSES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal	10 Marks	
	Evaluation	10 Marks	
	Total	100 Marks	03

**Course Prerequisite:-** Student should have knowledge of

1. Conventional manufacturing Processes
2. Engineering Drawings and design
3. Engineering materials and its properties

**Course Objective:-** Provide knowledge of sheet metal working, non-conventional processes, NC/CNC machine, robotics and processing of materials.

**Course Outcomes:-** Learner will be able to understand

1. Various concepts related to sheet metal working
2. Design of jigs and fixtures
3. Various non-conventional machining processes
4. Concepts of CNC programming and robotic applications in manufacturing industries
5. Concept of various heat treatment processes for altering the mechanical properties of steels and alloys
6. Different methods of manufacturing of components by power metallurgy and composite materials

### Unit 1 Sheet Metal Working (06 Hrs.)

Study of various press tools and presses, Study of various processes like Piercing, Notching forming, drawing, coining *etc.* Elements of dies and punches. Types of dies – simple, compound, combination and progressive dies and punches for various press working operations such as punching, blanking, drawing, bending, forming, coining *etc.* Calculations of clearances, centre of pressure, forces, press tonnage, blank size, number of draws, strip layout, sheet utilization, ratio. Methods of reducing forces. Design of simple blanking die, Progressive die, & Deep Drawing die.

### Unit 2 Jigs and Fixtures (06 Hrs.)

Definitions, elements, Basic principles and guide lines for design. Location, types of locators and their selection. Clamping, basic principles, types and their selection, indexing methods. Design of drilling jigs. Design of milling & Turning fixtures.

### Unit 3 Non-Conventional Machining (06 Hrs.)

Concept of non-conventional machining. Study of processes like, Electrochemical Machining, Electro Discharge Machining, Abrasive Jet Machining, Plasma Machining, LASER Machining, and Ion beam Machining, Ultrasonic Machining, Electron Beam Machining with reference to process capabilities, working principle, Material removal rate, Advantages and limitations.

**Unit 4 C. N. C. Machine Tools & Robotics**

**(06 Hrs.)**

Principle of operation of CNC, Types, Features, Direct numerical control (DNC) and its applications. NC part programming, axes nomenclature of CNC machines. Manual part programming using. Computer aided part programming using APT. Types of Robots, construction and operation of robots, robot axes and configuration, robot applications, robot selection and economic justification. FMS, FMC and Adaptive Control.

**Unit 5 Heat Treatment of Steels and Alloys**

**(06 Hrs.)**

Iron and Iron Carbide Equilibrium Diagram, Transformation product of Austenite, Martensitic transformation, Time- Temperature. Transformation curve, Heat treatment of steels, Annealing, Normalizing, Hardening and tempering, Hard ability, Jominy End quench test, Surface hardening heat treatments, Carburizing, Nitriding, Carbonitriding, Induction and flame hardening, Tool steels, Classification, Properties and application of tool steels, Heat treatment of tool steels.

**Unit 6 Powder Metallurgy , Ceramics and Composite Manufacturing**

**(06 Hrs.)**

Important characteristics and methods of powder production, different techniques - pressing, extruding, isostatic moulding, fiber metal process, sintering and hot pressing.

Introduction to composite materials, basic concepts, constituent materials for composites, advantages, limitations of composites and application of composites. Manufacturing of Composites: Introduction, molding process for polymer matrix composites, metal matrix composites, ceramic matrix composites.

**Text Books**

1. Kodgere V. D., "Material Science and Physical Metallurgy", Everest Publication, Pune
2. Donaldson, Lacain and Goold, "Tool Design", Tata McGraw Hill
3. Kempster M. H. A., "Introduction to Jigs and Fixtures Design", Viva Books Ltd.
4. ASTME, "Tools Engineering Handbook"
5. Sharma P. C., "Production Engineering", Khanna Publication
6. Hoffman, "Introduction to Jigs and Fixture", Galgotia Publishers
7. Radhakrishnan P. and Subramanyan CAD/ CAM/CIM Wiley Eastern Ltd.
8. Rao P. N., Tiwari N. K. and Kundra T. K., "Computer Aided Manufacturing", Tata McGraw Hill
9. Groover M. P., "Automation, Production System and Computer Integrated Manufacturing",

**Reference Books**

1. Amstead B. H., Philip F, Ostwald and Myron L, Begeman, "Manufacturing Processes" John Wiley and sons, eighth edition.
2. Benidict G. F., "Advanced Manufacturing Processes": Marcel Dekker Publisher
3. Cook N. "Manufacturing Analysis", Addison- Wesley Publishing Co., 1966.
4. Weller, "Non-traditional Machining Process": SME Publications.
5. Mishra P. K., "Non-Conventional Machining Process", Narosa Publication.
6. "Production Technology: HMT Ltd", McGraw-Hill Pub. 1986.
7. "Machining Data Handbook: 3<sup>rd</sup> (Third) edition" Machinability Data Center Technical Staff, 1980

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## PROFESSIONAL SKILLS DEVELOPMENT-V

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

### Course Pre-requisites

The Students should have knowledge of

1. Basic concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. An overall idea about vocabulary, Public speaking skills taught in the last semester
3. Knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on handling criticism and the concept of conflicts.
5. Awareness of the interpersonal skills like team work and its importance in the corporate sector.

### Course Objectives

The Professional Skills Development 5 is an extension of PSD- 4 with focus on the remaining topics of Aptitude, Reasoning and Grammar. The further complex concepts of Aptitude and Grammar aims to acquaint them with the topics and also provide them techniques to solve the question with tricks/methods in a very short period. The English communication and soft skills section of PSD-5 focuses on the higher aspects of soft skills training students on how to handle Group Discussions during placement process and other topics such as grooming them on how to handle conflicts effectively in the corporate scenario and also the correct attitude/approach to solve problems collectively from a team's perspective and also individually.

### Course Outcomes

#### The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics of tenses and Sub- verb agreement relevant from the recruitment point of view.
2. Use Mnemonics, and learn appropriate strategies to handle complex topics in GDs and ways to handle them. Students would learn the appropriate ways of stating opinions, disagreeing or communicating during the Group Discussion Process.
3. Apply various strategies of conflict resolution through amicable way to settle team conflicts/disputes. They would learn to handle criticism and feedback in a positive way as an individual as well as a team.
4. Students would learn effective time management strategies- Pareto principle (the 80-20 rule of time management) and apply them in the corporate life. It would be a continuation of the topic covered during the previous semester PSD-4
5. Learn to handle Case studies effectively and incorporate the right approach towards Case Studies asked during the recruitment process.
6. Apply 5-6 positive strategies to resolve conflicts arising during team work

### Course Contents

Unit I	Aptitude (Maths, Logical Reasoning, English)	(24 Hrs.)
	<ul style="list-style-type: none"> <li>• Maths                             <ul style="list-style-type: none"> <li>▪ Time, Speed &amp; Distance</li> <li>▪ Time &amp; Work</li> <li>▪ Simple Interest &amp; Compound Interest in continuation</li> <li>▪ Maths Revision</li> </ul> </li> <li>• Logical Reasoning                             <ul style="list-style-type: none"> <li>▪ Data Interpretation</li> <li>▪ Data Sufficiency</li> <li>▪ Set Theory &amp; Syllogisms</li> <li>▪ Reasoning Revision</li> </ul> </li> </ul>	



	<ul style="list-style-type: none"> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar – II – (Adjective, Verb, Sub- Verb Agreement)</li> <li>▪ Grammar- (Tenses)</li> <li>▪ Vocabulary</li> <li>▪ Verbal Ability- Revision</li> </ul> </li> </ul>	
<b>Unit II</b>	<b>Soft Skills &amp; English Communication</b>	<b>(24 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Situational Conversation</li> <li>• Situational Writing</li> <li>• GD Orientation</li> <li>• Mock GD-1</li> <li>• Mock GD-2</li> <li>• Mock GD-3</li> <li>• Conflict Resolution</li> <li>• Problem Solving Skills</li> <li>• Time- Management Skills</li> <li>• Handling Case Studies</li> <li>• Management Games</li> <li>• Business Meeting Etiquettes</li> </ul>	
<b>Text Books</b>		
<b>1. APAART: Verbal Ability</b>		
<b>2. APAART: Logical Reasoning</b>		
<b>3. APAART: Quantitative Aptitude</b>		
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>		
<b>5. APAART: Speak Well 2 (Soft Skills)</b>		

# Department of Mechanical Engineering

## Syllabus: Semester VI

### MACHINE DESIGN-II

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	05

#### Course Prerequisite:-

Student should have knowledge of

1. Fundamentals of engineering Drawing
2. Analysis of forces
3. Utilizing the principles of drafting and strength of materials.
4. Basics of kinematics of gears in transmission system

#### Course Objective:-

1. Reinforce the philosophy that real engineering design problems are open-ended
2. Give practice in longer open-ended problems using design methodology
3. Enable students to apply engineering tools/techniques to product design
4. Broaden skills in team work, critical thinking, communication, planning and scheduling through design projects
5. Enable students to consider safety, ethical, legal, and other societal constraints in execution of their design projects
6. Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements

#### Course Outcomes:-

Learner will able to-

1. understand the concept of design for various manufacturing processes in Mechanical Engineering
2. understand the various concepts related to design of spur gears
3. understand the various concepts related to design of helical gears
4. the procedure for selection of different types of rolling contact bearings for different applications
5. understand the various concepts related to sliding contact bearings
6. technical details about belts, ropes and chain drives

#### Unit 1 Design For Manufacture

(08 Hrs.)

General principles of design for manufacture & assembly (DFM & DFME), Principles of design of casting & forging, Design for machining, Design for powder metallurgy, Design for welding.

#### Unit 2 Design of Spur Gears

(08 Hrs.)

Gear drives, Classification of gears, Selection of types of gears, Standard system of gear tooth.

Spur Gears: Number of teeth & face width, Types of gear tooth failure, Desirable properties & selection of gear materials, Force analysis, Beam strength, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength, Estimation of module based on beam

& wear strength, Gear design for maximum power capacity, Estimation of dynamic tooth load by velocity factor, Spott's equation, Buckingham's equation, Methods of gear lubrication. Introduction to Gear design standards like AGMA, IS.

**Unit 3 Design of Helical Gears (08 Hrs.)**

Transverse & normal module, virtual number of teeth, Force analysis, Beam & wear strength, Effective load on gear tooth, Estimation of dynamic load by velocity factor, Spott's equation, Buckingham's equation.

**Unit 4 Rolling Contact Bearing (08 Hrs.)**

Equivalent bearing load, Load life relationship, Selection of bearing life, Selection from manufacturer's catalog, Taper roller bearing, Design for cyclic load & speed, Bearing with probability of survival other than 90%, Lubrication & mounting construction materials, Selection of oil seals & gaskets, Pre loading, Types of failure of bearings and its remedies.

**Unit 5 Sliding Contact Bearing (08 Hrs.)**

Basic modes for lubrication, Viscosity. Effect of temperature on viscosity, Viscosity index, Additives, Greases, Selection of lubricants. Viscous flow through rectangular slot, Load carrying capacity & flow requirement of hydrostatic step bearing, Energy losses, Hydrodynamic lubrication, Reynolds equation, Sommerfield number, Raimondi & Boyd's method, Temperature rise in hydrodynamic bearings, Parameters of bearing design, Length to diameter ratio, Unit bearing pressure, Radial clearance,

Minimum oil film thickness, Constructional details of bearings, Bearing materials & their selection, Sintered metal bearings, Comparison of rolling & sliding contact bearing.

**Unit 6 Belts, Ropes and Chain Drives (08 Hrs.)**

Materials and construction of flat and V belts, geometric relationships for length of belt, power rating of belts, concept of slip & creep, initial tension, effect of centrifugal tension, maximum power condition, selection of flat and V belts from manufacturer's catalogue, belt tensioning methods, relative advantages and limitations of flat and V belts, construction and applications of timing belts .Wire Ropes (Theoretical Treatment Only): Construction of wire ropes, lay of wire ropes, stresses in wire rope, selection of wire ropes, rope drum construction and design. Chain Drives (Theoretical Treatment Only): Types of power transmission chains, Geometry of chain Polygonal effect of chain, Modes of failure for chain, Lubrication of chains

**Term Work:**

1. Term work shall consist of two design projects by using Autocad/manually. Design projects should be in the form of system design comprising of machine elements studied in syllabus. Design data book should be used extensively.
2. Four assignments- based on remaining topics.
3. Report- Industrial visit to gear manufacturing unit.

**Text Books**

1. Shigley J. E. and Mischke C.R., "Mechanical Engineering Design", McGraw Hill

Publication Co. Ltd.

2. Spotts M. F. and Shoup T. E., "Design of Machine Elements", Prentice Hall International
3. Bhandari V. B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
4. Juvinal R. C., "Fundamentals of Machine Components Design", John Wiley and Sons.

#### Reference Books

1. Black P. H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc.
2. William C. Orthwein, "Machine Components Design", West Publishing Co. and Jaico Publications House.
3. Hall A.S., Holowenko A. R. and Laughlin H.G., "Theory and Problems of Machine Design", Schaum's Outline Series.
4. Sharma C. S. and Kamlesh Purohit, Design of Machine Elements, PHI Learning Pvt. Ltd.
5. Aggarwal D. K. & Sharma P.C., "Machine Design", S. K. Kataria and Sons
6. P. C. Gope, "Machine Design: Fundamentals and Applications", PHI Learning Pvt. Ltd.
7. "Design Data - P.S.G." College of Technology, Coimbatore.
8. Bhandari, V. B., "Machine Design data book", Tata McGraw Hill Publication Co. Ltd.
9. Mahadevan K., Balveera Reddy K., "Design Data Handbook for Mechanical Engineers", CBS Publishers

#### Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## REFRIGERATION AND AIR CONDITIONING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	50 Marks	01
	Total	150 Marks	04

**Course Prerequisite:-**

1. Knowledge of basic concepts in heat transfer.
2. Basic information of thermodynamics.
3. Basic knowledge of fluid mechanics.

**Course Objective:-**

1. To study fundamental principles and different methods of refrigeration and air conditioning.
2. Study of various refrigeration cycles and evaluate performance using Mollier charts and/ or Refrigerant property tables.
3. Comparative study of different refrigerants with respect to properties, applications and Environmental issues.
4. Understand the basic air conditioning processes on psychometric charts, calculate cooling load for its applications in comfort and industrial air conditioning.
5. Study of the various equipment-operating principles, operating and safety controls employed in refrigeration air conditioning systems.

**Course Outcomes:-**

Able to understand-

1. Different methods of refrigeration systems.
2. Simple vapour compression system and different multi-pressure systems
3. Vapour absorption system and different types of refrigerants
4. Various psychometric processes used in air conditioning
5. Different components of refrigeration and air conditioning systems
6. Details of ducts for air conditioning system

**Unit 1 Methods of Refrigeration**

**(06 Hrs.)**

Ice refrigeration, evaporative refrigeration, refrigeration by expansion of air, refrigeration by throttling of gas, vapour refrigeration system, steam jet refrigeration system, refrigeration by using liquid gases, Thermoelectric and ultrasound refrigeration.

**Air refrigeration system:** Definition, refrigeration load, unit of refrigeration, Reverse Carnot cycle, Bell Coleman cycle, Methods of air refrigeration systems, simple air cooling system, boot strap system, reduced ambient system, regenerative system.

**Unit 2 Simple Vapour Compression System**

**(06 Hrs.)**

Limitations of air refrigeration system, development of vapour compressor cycle, effect of operating parameters on VCC, use of P-H charts, actual vapour compression cycle.

**Multi Pressure Systems** Introduction to multistage compression, two stage compression with flash gas removal, with liquid intercooler, Cascade systems.

### Unit 3 Vapour Absorption System

(06 Hrs.)

Introduction, Simple Vapour absorption system, practical vapour absorption system, COP of an ideal vapour absorption system, Water ammonia system, Electrolux refrigerator, Lithium-Bromide absorption System, Comparison between VCC and VAC (no mathematical treatment).

**Refrigerants:** Desirable properties of refrigerants, classification of refrigerants, secondary refrigerants, alternative refrigerants for CFC's, HCFC'S, ozone depletion potential (ODP), Global warming Potential (GWP).

### Unit 4 Psychrometry

(06 Hrs.)

Introduction, Psychrometric terms, Use of Psychrometric charts, Psychrometric processes, adiabatic saturation temperature, evaporative cooling, by pass factor of coil, efficiency of coil, adiabatic mixing of two air streams, Air washers, Thermodynamics of human body with environment effective temperature, comfort chart, factors influencing human comfort.

### Unit 5 Air Conditioning Systems

(06 Hrs.)

Definition, factors, equipment used, classification, all air system, all water system, air water system, unitary and central air conditioning, in filtration and ventilation loads, concepts of SHF, RSHF, ERSHF, ADP.

#### **Components of Refrigeration and Air Conditioning System:**

Compressors, condensers, evaporators, expansion devices such as capillary tubes, automatic expansion valves, thermostatic expansion valves and controls such as thermostats, humidistat, Solenoid, Installation, charging, testing and maintenance, study of modern trends in RAC

### Unit 6 Ducts

(06 Hrs.)

Introduction, classification of ducts, duct material, pressure in ducts, flow through duct, pressure losses in duct, friction losses, dynamic losses, air flow through simple duct system, equivalent diameter, for determination of duct size.

**Food Preservation:** Cold storage, control and modified atmosphere (CAMA) storages, mobile refrigeration and air conditioning, refrigerant piping selection, pressure drop, valves, fitting, insulating materials.

### Term Work:

The term work shall consist of record of any eight experiments from the following:

1. Test on vapour compression test rig.
2. Test on air conditioning test rig.
3. Test on ice plant test rig.
4. Study of non-conventional refrigeration system.
5. Determination of cooling load of air conditioning system (case study).
6. Determination of refrigeration load in cold storage (case study / visit).
7. Study of installation /operation/maintenance practices for refrigeration system.
8. Visit to any refrigeration or air conditioning plant.
9. Trial on heat pump test rig
10. Test on vapour absorption test rig.

11. Market survey of various refrigerating & air conditioning systems which include the equipments with related specifications, manufacturer, cost. ( minimum 3 to 4 equipments)
12. Determination of energy efficiency of refrigeration or air conditioning system.

**Text Books/ Reference Books**

1. Arora C. P., “Refrigeration and Air Conditioning”, Tata McGraw Hill
2. Arora S. C., Domkundwar S., “Refrigeration and Air Conditioning”, Dhanpat Rai and Company
3. Dossat Ray I, “Principal of Refrigeration”, Wiley Eastern Limited
4. Manohar Prasad, “Refrigeration and Air Conditioning”, Wiley Eastern Limited
5. Khurmi R. S. and Gupta J. K., “Refrigeration and Air Conditioning”, Eurasia Publication House (P) Ltd. New Delhi
6. Stocker W. F. and Jones J. W., “Refrigeration and Air Conditioning”, McGraw Hill International Editions

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## INTERNAL COMBUSTION ENGINES

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract.	50 Marks	01
	Total	150 Marks	04

**Course Prerequisite:-**

1. Knowledge of basic concept heat transfer.
2. Basic information of thermodynamics.

**Course Objective:-** The student should understand the scope, objective and application of internal combustion engines.

**Course Outcomes:-** Able to -

1. Know constructional Features of I. C. Engine.
2. Understand fuel supply systems of C. I. and S. I. engines.
3. Acquire knowledge of different systems required for running of I.C. engines
4. Test the thermal and emission performance of I. C. Engines
5. Understand the phenomena of combustion in S. I. and C. I. engines
6. Understand norms for measurement of emissions from I. C. engines

<b>Unit 1</b>	<b>Constructional Features of Reciprocating I. C. Engine</b>	<b>(06 Hrs.)</b>
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Engine components, Engine classification

**Cycle Analysis of I. C. Engines:**

Fuel air cycle analysis, Comparison of P-V diagram of air standard cycles, Fuel air cycle & actual cycle

<b>Unit 2</b>	<b>Fuel Supply Systems</b>	<b>(06 Hrs.)</b>
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**S. I. Engines:**

Carburetion, Mixture requirements, Essential parts of modern carburetor, Carburetors used on automobiles, Calculation of A/F ratio, M.P.F.I. system for modern automobile engines.



**C. I. Engines:**

Functional requirements of an injection system, Typical arrangement of solid injection system, Types of fuel injection system, Fuel pump & fuel injectors, Quantity of fuel & size of nozzle orifice.

**Unit 3 I. C. Engine Systems (06 Hrs.)****Ignition System:**

Battery & coil ignition system, Magneto ignition system, Electronic ignition system, Advantage over mechanical contact breaker point system.

**Engine Cooling System:**

Air cooling, Water cooling, Thermostatic radiators

**Lubrication System:**

Dry sump lubrication, Wet sump lubrication – Fully pressurized, Oil filters

**Governing System:**

Quality governing, Quantity governing, Hit & miss governing

**Unit 4 Testing & Performance of I. C. Engine (06 Hrs.)**

Determination of brake power, Indicated power, Friction power, Determination of brake thermal efficiency, Mechanical efficiency, Volumetric efficiency, Energy balance, Performance characteristics.

**Supercharging:**

Objects of supercharging, Effects on performance, Limits, Methods of supercharging & turbocharging, Limitation of turbocharging.

**Unit 5 Combustion in S. I. Engines (06 Hrs.)**

Stages of combustion, Effect of engine variables on ignition lag & flame propagation, Abnormal combustion: Theories, Effects & Controlling measures, Combustion chambers for S. I. engines.

**Combustion in C. I. Engines:**

Stages of combustion, Ignition delay & factors influencing delay period, Diesel knock & its control, Combustion chambers for C. I. engines.

**Unit 6 Emissions & Pollution Control (06 Hrs.)**

Emissions from S. I. and C. I. engines & their harmful effects, Catalytic converters, Contemporary & proposed emission norms, BHARAT STAGE- I to IV emission norms, EGR system.

**Fuels:**

Types of fuels for I. C. engines, Rating of S. I. & C. I. engine fuels, Alternative fuels for I. C. engines & future trends, Hybrid vehicles.

**Term Work:**

1. Study of carburetor / MPFI system
2. Study of fuel pump & injector.
3. Trial on multi cylinder petrol engine – Morse Test.
4. Trial on diesel engine to determine energy balance & variable load performance.
5. Variable speed trial on petrol / diesel engine.
6. Trial on computerized I. C. engine to plot P – è diagram.
7. Trial / demonstration of smoke meter & exhaust gas analyzer.
8. Study of battery, magneto & electronic ignition system.
9. Study of superchargers & turbochargers.
10. Study of combustion chambers in S. I. & C. I. engines.
11. Study of recent hybrid cars in market

**Reference Books**

1. Ganesan V., Internal Combustion Engines, Tata McGraw Hill Publishing House
2. M. L. Mathur & R. P. Sharma, A Course in I. C. Engines, Dhanpat Rai & Sons
3. V. M. Domkundwar, A Course in I. C. Engines, Dhanpat Rai & Co.
4. Shrinivasan, Automobile Engines, Tata McGraw Hill Publishing House – CBS Publication

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## MECHANICAL MEASUREMENT & METROLOGY

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 04 Hours / Week	End Semester Examination	60 Marks	04
Practical:- 02 Hours / Week	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Pract.	50 Marks	01
	Total	150 Marks	05

<b>Course Prerequisite:-</b>	<p>Student should have knowledge of</p> <ol style="list-style-type: none"> <li>1. Students should have Basic knowledge of Mechanical terms Force, Pressure, Temperature, and Electronics terms like as Voltage, Resistance and Current.</li> <li>2. Students should have Basic knowledge of Measuring Units, Mathematics, and Various Measurement terms.</li> </ol>
<b>Course Objective:-</b>	<p>Student should be able to</p> <ol style="list-style-type: none"> <li>1. Use various precision measuring instruments <i>viz.</i> Vernier caliper, micrometer <i>etc.</i></li> <li>2. Acquire knowledge of different sensors and transducers</li> <li>3. Acquire knowledge of tolerances, gauges and measurement of surface finish</li> </ol>
<b>Course Outcomes:-</b>	<p>Learner will be able to...</p> <ol style="list-style-type: none"> <li>1. Understand static and dynamic characteristics of measurement systems</li> <li>2. Know different devices used for linear and angular measurement</li> <li>3. Measure temperature, pressure, strain and fluid flow using different sensors for various applications</li> <li>4. Using of concepts like limits, fits and tolerances for designing the limit gauges.</li> <li>5. Use displacement, velocity, position, force, torque, level sensors for specific applications</li> <li>6. Measure various screw thread or gear tooth parameters using specific equipment.</li> </ol>

### Unit 1 Introduction to Measurement systems

(08 Hrs.)

Significance of Measurements, Mechanical Measurements, Classification of Measuring Instruments, Generalized Measurements Systems.

**Static Characteristics of Measurement Systems:** Sensitivity, Calibration, Accuracy, Linearity, Static Error, Precision, Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span, Range.

**Dynamic Characteristics of Measurement Systems:** Speed of response and measuring lag, fidelity and dynamic error, overshoot, dead time and dead zone. Standard test inputs: Step, Ramp, Impulse and Sinusoidal Inputs.

**Errors in Measurements:** Types & Sources of Errors and Uncertainty Analysis in Measurements. Probable Errors.

**Unit 2 Introduction to Metrology (08 Hrs.)**

Meaning of metrology & its Importance.

**Linear Measurement :**

Standards - line standard, end standard, wave length standard, classification of standards, precision, and non-precision measuring instrument, slip gauges, Different types of Vernier, Micrometer, Dial Gauges. Concept of Magnification.

**Angular Measurement:**

Sine bar, Sine center, Uses of sine bar, angle gauge, Auto Collimator, Angle Dekkor, angle slip gauges, Constant Deviation Prism.

**Unit 3 Sensors and Transducers (08 Hrs.)**

Concept of sensors and transducers. Significance of Transducers in Measurement and Instrumentation System. Classification and Selection Parameters of Transducers. Basic components of DAQ, Concept of signal conditioning.

**Strain Measurement:** Theory & Classification of Strain gauges, Gauge Factor, Temperature compensation, Wheatstone Bridge Circuit.

**Temperature measurement:** Resistance Temperature Detector(RTD), Thermocouples & Laws of thermocouples, Resistance Thermometers & Thermistors, Optical Pyrometers

**Pressure measurement:** Diaphragm Pressure Gauge, Bourdon Tube, Bellows, McLeod Gauge, Piezoelectric Sensor, Tactile Sensor

**Flow measurement:** Hot Wire anemometer, Thermal flow meters, Electromagnetic flow meter, Ultrasonic Flow meter, Turbine Meter

**Unit 4 Tolerances and Gauging (08 Hrs.)**

**Limits, Fits, Tolerances:**

Meaning of limit, Fits and Tolerance, Cost-Tolerance relationship, concept of Interchangeability, Indian Standard System (ISS).

**Design of Limits Gauges:**

Types, Uses, Taylor's principle, Design of limit gauges. Inspection of geometric parameters: Straightness, Parallelism, Concentricity, Squareness and circularity.

**Comparators**

Uses, types, advantages and disadvantages of various types of comparators.

**Advances in Metrology:** Introduction of CMM, Types of CMM

**Unit 5: Measurement of Velocity, Displacement, Force, Torque, Level and Acceleration (8 Hrs.)**

**Displacement, Velocity and Position Sensors:** Potentiometer, LVDT, Hall Effect Sensor, optical encoders, Proximity Sensors, Tacho-generator.

**Force and Torque Measurement:** Load Cell and its different types, Torque measurement using strain gauges, Torsion Meter.

**Acceleration Sensors:** Displacement Seismic Accelerometer, Strain gauge

Accelerometer, Piezoelectric Accelerometer, Potentiometric Accelerometer

**Level measurement & Thickness Measurement:** Electrical Methods (Resistive & Capacitive), Laser Level Sensor, Ultrasonic Liquid Level Detector. Thickness measurement using contact and non-contact type

devices.

**Unit 6 Measurement of Surface finish, Screw Thread, Gear Metrology (08 Hrs.)**

**Surface Finish Measurement:**

Surface texture, Meaning of RMS and CLA values, Tomlinson's Surface meter, Taylor-Hobson surface meter, grades of roughness, specifications

**Screw Thread Metrology:**

External screw threads terminologies, floating carriage instruments, pitch and flank measurement of external screw thread, application of Tool Makers Microscope, use of profile projector.

**Gear Metrology:**

Spur gear parameters, gear tooth thickness measurement, gear tooth Vernier caliper, constant chord method, span micrometer, base tangent comparator.

**Interferometry:**

Introduction, flatness testing by interferometry, NPL flatness interferometer. Study of measuring machines, recent trends in engineering metrology.

**Term Work:**

1. Study & Calibration of Thermocouples (J & K-Type)/RTD(PT-100)
2. Study & Calibration of Pressure Measurement, & Vacuum Measurement
3. Measurement of Load/Force using Load Cells
4. Displacement & Angle measurement using LVDT & Encoder Sensor
5. Study of Different Switches & Relays
6. Vibration Measurement using Accelerometer.
7. Level Measurement using Capacitive Transducer.
8. Study of Data Acquisition System and Interfacing of sensors with computer using DAQ Cards (NI DAQ Card)
9. Study of Linear and Non Linear Measuring Instruments.
  - i) Measurement of the surface roughness.
  - ii) Measurement of angle by sine bar/sine center.
  - iii) Measurement of optical surface using Interferometer.
  - iv) Measurements of screw tread parameters using Floating Carriage Micrometer.
  - v) Measurement of gear tooth thickness using gear tooth vernier caliper and span micrometer
  - vi) Study and experiment on profile projector/Tool makers microscope
  - vii) Industrial visit to Automation Company and Inspection & Quality control division of any Industry with detail report.

**Text Books**

1. Ramchandran K. P., Vijayaraghavan G. K., Balasundaram M. S., "Mechatronics: Integrated Mechanical Electronic Systems", John Wiley & Sons, 2008.
2. Bolton W., "Mechatronics - A Multidisciplinary approach", 4<sup>th</sup> Edition, Prentice Hall, 2009.
3. Kumar D. S., "Mechanical Measurement & Control", Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007
4. Singh M. D. and Joshi J. G., "Mechatronics", 3<sup>rd</sup> Edition, Prentice Hall, New Delhi, 2009.
5. Beckwith T. G., Marangoni R. D., Lienhard J. H., "Mechanical Engineering Measurements", Pearson Prentice Hall, 2007
6. Jain R. K., "Engineering Metrology", Khanna Publishers

7. Hume K. J., "Engineering Metrology", Macdonald, 1950
8. Sharp K. W. B., "Practical Engineering Metrology", Pitman Publication, 1970
9. Kuber S. S., "Metrology and Quality Control", Nirali Prakashan

**Reference Books**

1. Doebelin Ernesto, "Measurement Systems", McGraw Hill International Publication Co. New York, 4<sup>th</sup> Edition, 1990.
2. Sawhney A. K. and Sawhney P., "Mechanical Measurement and Control", Dhanpat Rai and Company Pvt. Ltd., New Delhi, 12<sup>th</sup> Edition, 2010.
3. Figliola R. S., Beasley D. E., "Theory and design for mechanical measurements", Wiley India Edition.
4. Alciatore & Histan, "Introduction to Mechatronics and Measurement System", 4<sup>th</sup> Edition, Mc-Graw Hill publication, 2011.
5. Bishop (Editor), "Mechatronics – An Introduction", CRC Press, 2006.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## MACHINE TOOL DESIGN

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

- Course Prerequisite:-**
1. Basic knowledge of Mechanisms and Mechanical elements.
  2. Well conversant with different types of Machine Tools.
  3. Basic knowledge of Materials.

**Course Objective:-** To be able to design the various elements of machine tools.

- Course Outcomes:-**
1. Understand the fundamentals of machine tool design.
  2. Select the type of gear box for applications in machine tool and design the sliding cluster gear box.
  3. Understand the design considerations for machine tool structures
  4. Select the guide ways and design the power screws.
  5. Design the spindle, select the spindle bearings and use acceptance test.
  6. Design of cams for single spindle automate and maintenance and repair of machine tool.

### Unit 1 Introduction to Machine Tool Drives and Mechanisms (06 Hrs.)

General Principles of Machine Tool Design: Working and Auxiliary Motions in Machine Tools. Parameters Defining. Working Motions of a Machine Tool. Machine Tool Drives. Hydraulic Transmission and its Elements. Mechanical Transmission and its Elements. Techno-Economical Prerequisites for Undertaking the Design of New Machine Tool. General Requirements of Machine Tool Design. Engineering Design Process Applied to Machine Tools. Layout of Machine Tools, Modular Concept of Machine tool design.

### Unit 2 Regulation of Speed and Feed Rates (06 Hrs.)

Aim of speed and feed rate regulation. Stepped regulation of Speed: Design of speed box – Design of Feed Box – Machine Tool Drives using Multiple

Speed Motions–Special Cases of Gear Box Design–General Recommendations for Developing the Gearing Diagram–Step less Regulation of Speed and Feed Rates, VFD and VVFD drives-Design Considerations. Motors: three phase induction motors-stepper motor, servo motor and universal motor.

### Unit 3 Design of Machine Tool Structures (06 Hrs.)

Functions of Machine Tool Structures and their requirements – Design criteria for machine tool structures – Materials of machines Tools structures  
 – Static and Dynamic stiffness – Profiles of machine tool structures – Basic Design procedure of machine tool structures – Design of Beds – Design of Columns – Design of Housings – Design of Bases and Tables – Design of Cross Rails, Arms, Saddles and carriages – Design of Rams.

**Unit 4 Design of Guide-ways and Power Screws (06 Hrs.)**

Functions and types of Guide-ways – Design of Slide-ways – Design criteria and calculations for slide-ways – Guide-ways operative under liquid friction conditions. Design of Anti-Friction Guide-ways – Combination Guide ways –Protecting devices for slide-ways

Design of power screws (Sliding & Rolling friction), Preloading of power screws.  
 Design with reference to advanced machine tools.

**Unit 5 Design of Spindles and Spindle Supports (06 Hrs.)**

Functions of Spindle Unit and requirements – Materials of Spindles – Effect of machine tool compliance on machining accuracy- Design calculations of spindles  
 Anti-friction bearing – Sliding bearings. Preloading of bearings. Bearings selection for machine tools.

**Acceptance tests for Machine Tools:**

Acceptance tests: Object and Procedure for acceptance test, Instruments required, sequence of acceptance test, standard acceptance test chart.ISO 230-1: 1996, ISO-2:2014.

**Unit 6 Automatic Drives for Machine Tools (06 Hrs.)**

Principles of automation. Automatic lathes with mechanical control. Design of cams for automatic screw cutting machines. Automatic loading and feeding of work pieces. Transfer devices in automatic machine tool systems. Modular design and unit heads for machine tools. Automatic in- process gauging.

**Maintenance and repair of Machine Tools:**

Types of Maintenance, Break down and preventive Maintenance, Organization of Maintenance department, Economic aspects of Preventive Maintenance, Restoration techniques.

**Text Books / Reference Books**

1. Basu S. K., “Design of Machine Tools”, Allied Publisher, 1989.
2. Sen G. S. & Bhattacharya, “Principles of Machine Tools”, New Central Book Agency, Calcutta – 1986.
3. Acherkan N., “Machine Tool Design”, Vol. 2 & 3 Mir publishers, Moscow, 1968.
4. Mehta N. K., “Machine Tool Design”, TMII.
5. Russe W. Henke, “Introduction to Fluid Power Circuits and Systems”, Addison Wesley, 1970
6. Koenigs Berger & Tlusty, “Design of Machine Tools”, Pergaman Press 1970.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI



## ENERGY AUDIT AND MANAGEMENT

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Total	150 Marks	03

**Course Prerequisite:-** Student should have knowledge of

1. Basic Physics
2. Basic Electrical Engineering
3. Basic Thermal Engineering
4. Mathematics

**Course Objective:-**

1. Understand basic energy conversion, conservation and management principles
2. Identify sources of energy loss and target savings
3. Understand design of waste heat recovery systems, efficient power cycles and power generation systems
4. To enable students in carrying out life cycle cost analysis and budgeting

**Course Outcomes:-**

1. To understand the need for energy conservation and its management
2. To know procedure for balance of energy and material in different processes
3. To conduct economic analysis of energy conservation measures
4. To understand a system of electrical energy management
5. To understand a system of thermal energy management
6. Conduct energy audits and formulate & implement energy conservation strategies

### **Unit 1 Energy Conservation: (06 Hrs.)**

Energy Conservation and its Importance; Energy Strategy for the Future; The Energy Conservation Act, 2001 and its Features

#### **Energy Management:**

Definition & Objectives of Energy Management; Importance; Indian need of Energy Management; Duties and responsibilities of energy managers.

### **Unit 2 Material and Energy Balance (06 Hrs.)**

Basic Principles, Sankey diagrams, Material balances for different processes, Energy balances, heat balances, Methods for preparing process flow chart, Procedure to carry out the material and energy balance in different processes.

### **Unit 3 Economic Analysis of Energy Conservation Measures (06 Hrs.)**

Retrofit: Power plant retrofit, Home energy retrofit.

Economics: Fundamentals: Cash flows, Inflation Rates, Time Points and Periods, Discount Rates, Cost of Capital, Present value, Taxes, Uncertainty and Risk Economic Measures: Net Present Value, Total Life-Cycle Cost, Revenue Requirements, Internal Rate of Return, Modified Internal Rate of Return, Simple Payback Period, Discounted Payback Period, Benefit-to-Cost Ratios, Savings-to-Investment Ratios, Profitability index estimation

**Unit 4 Electrical Energy Management (06 Hrs.)**

Supply side: Methods to minimize supply-demand gap, renovation and modernization of power plants, reactive power management, HVDC, and FACTS. Demand side: conservation in motors, pumps and fan systems; energy efficient motors. Case Studies on Electrical Energy Management

**Unit 5 Thermal energy Management (06 Hrs.)**

Energy conservation in boilers, steam turbines and industrial heating systems; Application of FBC; Cogeneration and waste heat recovery; Thermal insulation; Heat exchangers and heat pumps; Building Energy Management. Case Studies on Thermal Energy Management

**Unit 6 Energy Audit (06 Hrs.)**

Energy Audit: Types and Methodology; Scope of Energy Audit , Energy Audit Reporting Format; Understanding Energy Costs; Benchmarking and Energy Performance; Matching Energy Usage to Requirement; Maximizing System Efficiency; Fuel and Energy Substitution; Energy Audit Instruments; Duties and responsibilities of energy auditors. Energy Management of Buildings and Energy Audit of Buildings. - Energy management matrix monitoring and targeting Case Studies

**Reference Books**

1. Amlan Chakrabarti, "Energy Engineering and Management", PHI Learning, New Delhi 2012
2. Mirjana Golusin, Sinisa Dodic, Stevan Popov, "Sustainable Energy Management", Academic Press
3. Shaligram Pokharel, "Energy Analysis for Planning and Policy", CRC Press, 2014
4. Trivedi P R, Jolka K R, "Energy Management", Commonwealth Publications, New Delhi
5. Y P Abbi, Shashank Jain, "Handbook on Energy Audit and Environment Management", TERI
6. General Aspects of Energy Management and Energy Audit, Buro of Energy Efficiency
7. Frank Krieth, D Yogi Goswami, "Energy Management and Conservation Handbook", CRC Press
8. Alburth Thumann, William J Younger, Terry Niehus, "Handbook of Energy Audits", 9<sup>th</sup> Ed, Better World Books

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## RELIABILITY ENGINEERING

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

**Course Prerequisite:-** Student should have knowledge of-  
Engineering Mathematics, Probability, Statistics

**Course Objective:-**

1. Understanding of basic principles of Reliability for ensuring sustainable product design.
2. Application to system requirements, design, manufacturing and testing, with real world examples
3. Understand in detail Asset Management, Maintenance, Quality and Productiveness,

**Course Outcomes:-** Student should be able to

1. Understand different measures of reliability
2. Know different probability methods used in reliability engineering
3. Calculate MTTF, MTBF, failure rate and hazard rate.
4. To acquire knowledge of methods for evaluation of reliability of different systems.
5. Understand the concepts of maintainability and availability in reliability engineering
6. Understand the reliability design procedure
7. Know different methods to test reliability of the system.

### Unit 1 Fundamental Concepts of Reliability and Reliability Measures (06 Hrs.)

Brief history, concepts, terms and definitions, applications, the life cycle of a system, concept of failure, typical engineering failures and their causes

**Reliability Measures:** Reliability function– $R(t)$ , cumulative distribution function (CDF)– $F(t)$ , probability density function (PDF) –  $f(t)$ , hazard rate function– $\lambda(t)$ , Mean time to failure (MTTF) and Mean time between failures (MTBF), typical forms of hazard rate function, bathtub curve

### Unit 2 Probability Concepts and Failure Data Analysis (06 Hrs.)

Theory of probability, rules of probability, Introduction to independence, mutually exclusive, conditional probability random variables, discrete and continuous probability distributions. Binomial, normal Comparison of probability distributions - , lognormal, Weibull, exponential, Standard deviation, variance, mean, mode and Central Limit Theorem.

**Failure Data Analysis:** Data collection and empirical methods, estimation of performance measures for ungrouped complete data, grouped complete data, analysis of censored data, fitting probability distributions graphically (Exponential and Weibull) and estimation of distribution parameters.

<b>Unit 3</b>	<b>Reliability Evaluation of Systems</b>	<b>(06 Hrs.)</b>
	Reliability Improvement Redundancy, element redundancy, unit redundancy, standby redundancy -types of stand by redundancy, parallel components single redundancy, multiple redundancies, cut and tie set approach for reliability evaluation. Star and delta method, matrix method (Numerical).	
<b>Unit 4</b>	<b>Maintainability and Availability</b>	<b>(06 Hrs.)</b>
	Concept of maintainability, measures of maintainability, mean time to repair (MTTR), analysis of downtime, repair time distributions, stochastic point processes, maintenance concept and procedures, availability concepts and definitions, important availability measures.	
	Introduction to Reliability allocation or apportionment, reliability apportionment techniques- equal apportionment, AGREE, ARINC, Minimum effort method (Numerical)	
<b>Unit 5</b>	<b>Design for Reliability and Maintainability</b>	<b>(06 Hrs.)</b>
	Reliability design process and design methods, reliability allocation, failure modes, effects and criticality analysis (FMECA), fault tree and success tree methods, symbols used, maintainability design process, quantifiable measures of maintainability, repair versus replacement.	
<b>Unit 6</b>	<b>Reliability Testing</b>	<b>(06 Hrs.)</b>
	Introduction to reliability testing, Stress strength interaction, Introduction to Markov model, Testing for Reliability and Durability - Accelerated Life Testing and Highly Accelerated Life Testing (HALT), highly accelerated stress Screening (HASS)	

### Reference Books

1. Ebling C. E., 2004, "An Introduction to Reliability and Maintainability Engineering", Tata McGraw Hill Education Private Limited, New Delhi.
2. Srinath L. S., 1991, "Reliability Engineering", East West Press, New Delhi.
3. Birolini A., 2010, "Reliability Engineering: Theory and Practice", Springer.
4. Parkhi R. M., "Market Leadership by Quality and Reliability", Vidyanand Publications 2012.
5. Roy B. and Allan R. N., 1992, "Reliability evaluation of engineering systems: concepts and techniques", Springer.
6. Patrick D. T. Newton O'Conner, D., Bromley R., 2002, "Practical Reliability Engineering", John Wiley and Sons.
7. Rao S. S., 1992, "Reliability Based Design. McGraw-Hill
8. Andrew Kennedy, Skilling Jardine, Albert H. C. Tsang, 2006, "Maintenance, Replacement and Reliability: Theory and Applications", CRC/Taylor and Francis.
9. Nachlas Joel A., 2005, "Reliability Engineering: Probabilistic Models and Maintenance Methods" Taylor and Francis.
10. Dhillon B. S., Singh C., 1981, "Engineering Reliability – New Techniques and Applications", John Wiley and Sons.
11. Dhillon B. S., 1999, "Engineering Maintainability", Prentice Hall of India.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## DESIGN OF PUMPS, BLOWERS AND COMPRESSORS

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

<b>Course Prerequisite:-</b>	Student should have knowledge of 1. Fundamentals of fluid mechanics 2. Fundamentals of turbo machinery 3. Fundamentals of thermodynamics	
<b>Course Objective:-</b>	To provide basic concept of design of rotary machines viz. pumps, lowers and compressors.	
<b>Course Outcomes:-</b>	Student must be able to understand- 1. Efficiency, losses, power requirement and operating characteristics of pumps 2. Theoretical concepts related to pumps 3. Thermal and hydraulic design of pumps 4. Theoretical concepts related to fans and blowers 5. Design principles of fans and blowers 6. Design principles of centrifugal and axial compressors	
<b>Unit 1</b>	<b>Review of Principles of Fluid Machinery</b>	<b>(06 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Basic equations of energy transfer between fluid and rotor.</li> <li>• Performance characteristics.</li> <li>• Dimensionless parameters, specific speed, stage velocity triangles, work and efficiency.</li> </ul>	
<b>Unit 2</b>	<b>Theory of Centrifugal Pumps</b>	<b>(06 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Calculation of tangential and axial thrust methods to minimize axial thrust. Impellers, casings, volutes, vane velocity vector diagrams, work done and head developed by pumps.</li> <li>• Efficiency and losses in pumps (mechanical, hydraulic etc.), specific speed.</li> <li>• Calculation of power requirement, NPSH for pump selection, effects of cavitation on pump performance, operating characteristics.</li> </ul>	
<b>Unit 3</b>	<b>Design of Pumps</b>	<b>(06 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Introduction to design procedure of pumps.</li> <li>• Thermal design- selection of materials for high temperature and corrosive fluids.</li> <li>• Hydraulic design- selection of impeller and casing dimension using industrial manuals.</li> </ul>	
<b>Unit 4</b>	<b>Theory of Fans and Blowers</b>	<b>(06 Hrs.)</b>

	<ul style="list-style-type: none"> <li>• Classification of blowers, basics of stationary and moving air, Euler's characteristics, velocity triangles and operating pressure conditions.</li> <li>• Equations for blowers, losses and hydraulic efficiency, flow through impeller casing inlet nozzle, volute, diffusers, and mechanical losses.</li> <li>• Rotor design, airfoil theory, vortex theory, cascade effects, degree of reaction.</li> <li>• Blade twist stage design, surge and stall, stator and casing, mixed flow impellers, applications of blowers and fans.</li> </ul>	
<b>Unit 5</b>	<b>Design of Fans and Blowers</b>	<b>(06 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Design procedure for selection of blowers, stage pressure rise, stage parameters and design parameters.</li> <li>• Design of impeller and casing dimension in aerodynamic design.</li> </ul>	
<b>Unit 6</b>	<b>Theory and Design of Compressors</b>	<b>(06 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Basic theory, classification and application, working with enthalpy- entropy diagram, construction and approximate calculation of centrifugal compressors.</li> <li>• Impeller flow losses, slip factor, diffuser analysis, performance curves of centrifugal compressors.</li> <li>• Basic design features of axial flow compressors; velocity triangles, enthalpy-entropy diagrams, stage losses and efficiency, work done factor, simple stage of axial flow compressors, applications of compressors.</li> </ul>	

#### Reference Books

1. Shepherd, D. G., "Principles of Turbomachinery", Macmillan, 1969.
2. Chruch A. H., "Centrifugal pumps and blowers", John Wiley and Sons, 1980.
3. Yahya S. M., "Turbine, Compressors and Fans", Tata Mc-Graw Hill Publishing Company, 1996
4. Labanoff V. S. and Ross R., "Centrifugal Pumps Design and Applications", Jaico P House.
5. Karassik I., "Pump Hand Book", McGraw-Hill International Edition.
6. Sahu G. K. "Pump" New age international publishers.
7. Tuzson J., "Centrifugal Pump Design", Wiley Publication.
8. Stepanff, A. J., "Blowers and Pumps", John Wiley and Sons Inc., 1965.

#### Unit Tests-

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV,V and VI

## MANAGEMENT INFORMATION SYSTEM

Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 03 Hours / Week	End Semester Examination	60 Marks	03
	Unit Test	20 Marks	
	Assignments Internal Evaluation	10 Marks 10 Marks	
	Term Work / Oral	-- Marks	
	Total	100 Marks	03

<b>Course Prerequisite:-</b>	<ol style="list-style-type: none"> <li>1. A student should be familiar in computer programming.</li> <li>2. A student should be familiar with concept of database.</li> <li>3. A student should be familiar with manufacturing sectors- personnel management, financial management, production management, material management, marketing management.</li> </ol>
<b>Course Objective:-</b>	<p>Student is able to understand</p> <ol style="list-style-type: none"> <li>1. Operations management.</li> <li>2. Role of computers in information systems. Management Information System (MIS)</li> <li>3. Data management-concept and its need.</li> <li>4. Application in Manufacturing sectors</li> </ol>
<b>Course Outcomes:-</b>	<p>The theory should be taught in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.</p> <ol style="list-style-type: none"> <li>1. To understand various basic concepts related to operations management and information system</li> <li>2. To understand computer aided information system and the concept of information communication</li> <li>3. To know the role of decision making in MIS.</li> <li>4. To acquire knowledge of data base management system</li> <li>5. To know the applications of MIS in different departments of an industry</li> <li>6. To use different software for implementation of MIS in industries</li> </ol>

### Unit 1 Introduction (06 Hrs.)

**Operations management:** concept, meaning, definition, scope and functions. Optimization: concept, meaning, definition, need and scope. Types of production, their merits and demerits. Types of operations layouts: features, applications. Types of resources (7M). Data-meaning and types. Information-meaning and types.

**Information system:** need, concept, definition, features, objectives and examples. Need to integrate information systems and optimum utilization of 7M resources.

### Unit 2 Information Systems (06 Hrs.)

Role of computers in information systems. Management Information System (MIS); concept, definition, need & applications.



Computer aided information systems: (such as inventory records, operation schedule, consumables issues, tools issues, inspection and quality control reports, failure frequencies with reasons, efficiency and utility reports, maintenance records, produced power units per day, temperature at certain interval, etc.) need, importance, design considerations, software selection criteria, examples.

Information communication: Communication process; computer networks and its types, structures, need and applications, protocols - types, features, applications.

**Unit 3 Decision Making (06 Hrs.)**

Concept, process behavioral decision making, organizational decision making, MIS and decision making. Building blocks of information system-Input, output, models, technology, database and control blocks. System development life cycle (SDLC) and its approach.

**Unit 4 Data Base Management System (06 Hrs.)**

Data management-concept, need, basic terminology used.

Data base: definition, meaning, importance, approach and architecture. Objectives of database organizations.

Data models: meaning, relationship and association, drawing schema, bubble chart & tree structure for suitable mechanical engineering application. Data Base Management System (DBMS) - definition, scope, importance, awareness about current software packages & their features, Relational Data Base Management System. (RDBMS) - concept, definition, features and applications. Preparation steps/ procedure for creating, storing, editing & retrieval of database on latest available database management software package.

**Unit 5 Applications in Manufacturing Sectors (06 Hrs.)**

Application in Manufacturing sectors- Personnel management, financial management, production management, material management, marketing management, supply chain management.

**Unit 6 System implementation (06 Hrs.)**

Modern software design techniques, verification and validation, methods, performance of software systems, software matrix and models, software standards, introduction to Capability maturity model (CMM), and quality management in software organization.

**Text Books/ Reference Books**

1. Jawadekar W. S., "Management Information System 4/e".
2. O'Brien J. A., "Management Information System 4/e"
3. Burch and Gruditski, "Information system-Theory and practice 5/e".
4. Ian Sommerville, "Software Engineering 6/e".
5. Turban E., Leidner P., et. al., "Information Technology for Management 6/e".
6. Laudon and Laudon, "Management Information System 11/e"
7. Sadagopan S., "Management information system", PHI publication
8. Chary S. N., "Production and operations management". TMGH publication.
9. Buffa E. S. and Sarin R. K., "Modern production & operations management", John Willy & sons publication

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## PROFESSIONAL SKILLS DEVELOPMENT-VI

Designation of Course	Workshop Technology		
Teaching Scheme:	Examination Scheme:		Credits Allotted
Theory:- 4 Hours/ Week	End Semester Examination	100 Marks	Theory: 04 Practical: 00
Practical:- -- Hours/ Week	Unit Test	-- Marks	
	Assignments	-- Marks	
	Internal Evaluation	-- Marks	
	Term Work	-- Marks	
	Total	100 Marks	04

### Course Pre-requisites

The Students should have knowledge of

1. Concepts of Maths, Logical reasoning and English Grammar taught in the last semester.
2. A basic knowledge of Group Discussion, DO's and Don'ts done in the previous sem.
3. Basic knowledge of writing skills, importance of professionalism in emails and letters.
4. Knowledge on the concepts of criticism, feedback and conflicts.
5. Awareness of the interpersonal skills like team work and introduction to Leadership taught during the last semester.
6. Brief idea about professional and business meeting etiquettes.

### Course Objectives

The Professional Skills Development 6 is an extension of PSD- 5 with focus on the remaining topics of Aptitude and Grammar. The further complex concepts of Permutation and Combination, Probability and grammatical topics such as prepositions etc. would be dealt with. The objective here is to acquaint them with the level of complexity presented in recruitment tests and also provide them techniques to solve such question with tricks/methods in a very short period. The English communication and soft skills section of PSD-6 focuses on the other important aspects of soft skills training students such as techniques of effectively handling Personal Interviews during placement process and understand the dynamics of structured Resume and PIs.

### Course Outcomes

#### The student should be able to

1. Learn further concepts of Maths, Logical reasoning and English grammar and apply short cuts/ tricks to solve questions in less time. Learn remaining 25-30 rules of grammar topics such as prepositions, conjunctions etc relevant from the recruitment point of view.
2. Learn to handle vocabulary questions such as synonyms and analogies in recruitment test and other competitive exams
3. Understand and Learn techniques/Strategies of how to handle Personal interviews during recruitment process. Through Mock PIs students would be taught the appropriate ways of answering tricky questions in Interview and would learn the correct body language etc. to be demonstrated in an interview process.
4. They would be acquainted with the differences between CV, Bio- Data and Resume and they would learn the correct format of a Résumé along with methods and styles to make their Resumes interesting.
5. Students would learn to incorporate various rules of written communication in business writing scenario with the appropriate tone and words.
6. Understand the importance of grooming, body language and etiquettes in the corporate sector. They would be able to conduct themselves in a professional and impressive way by conducting themselves according to situations in the professional sector.

### Course Contents

Unit I	Aptitude (Maths, Logical Reasoning, English)	(24 Hrs.)
	<ul style="list-style-type: none"> <li>• Maths                             <ul style="list-style-type: none"> <li>▪ Permutation &amp; Combination</li> <li>▪ Probability</li> <li>▪ Maths Revision -1</li> <li>▪ Maths Revision - 2</li> </ul> </li> <li>• Logical Reasoning                             <ul style="list-style-type: none"> <li>▪ Matching, Selection &amp; Arrangement</li> <li>▪ Clocks &amp; Calendars, Visual Reasoning</li> </ul> </li> </ul>	

	<ul style="list-style-type: none"> <li>▪ Input, Output &amp; Flow Chart.</li> <li>▪ Reasoning Revision- 1</li> <li>▪ Reasoning Revision-2</li> <li>• English <ul style="list-style-type: none"> <li>▪ Grammar – III– (Prepositions&amp; Conjunctions)</li> <li>▪ Grammar- (Articles &amp; Parallelism)</li> <li>▪ Verbal Ability Revision- I</li> </ul> </li> </ul>	
<b>Unit II</b>	<b>Soft Skills &amp; English Communication</b>	<b>(24 Hrs.)</b>
	<ul style="list-style-type: none"> <li>• Resume-I</li> <li>• Resume- II</li> <li>• Mock GD</li> <li>• Mock GD</li> <li>• Personal Interviews-I</li> <li>• Personal Interviews-II</li> <li>• Mock PI</li> <li>• Mock PI</li> <li>• Extempore Speeches, Group Interviews</li> <li>• Written Skills- Revision</li> <li>• Stress Management</li> <li>• Business Writing Tones.</li> </ul>	
<b>Text Books</b>		
<b>1. APAART: Verbal Ability</b>		
<b>2. APAART: Logical Reasoning</b>		
<b>3. APAART: Quantitative Aptitude</b>		
<b>4. APAART: Speak Well 1 (English Language and Communication)</b>		
<b>5. APAART: Speak Well 2 (Soft Skills)</b>		

## **Rules regarding ATKT, Continuous Assessment and award of Class**

### **Standards for Passing**

- For all courses, both in UE (University Evaluation) and IA (Internal Assessment) there are constitute separate heads-of-passing (HoP).
  - The student must obtain a minimum grade point of 5.0 (40% marks) at UE as well as at IA.
- OR
- The student failed in IA can also pass in the course provided he/ she obtains minimum of 25% marks in IA, and GPA (Grade Point Average) for the course is at least 6.0 (50% aggregate). The GPA for the course will be calculated only if the student passes in UE.
- The student who fails at UE in a course has to reapply only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as backlog candidate and clear the HoP.

### **Rules of ATKT**

- A student is allowed to carry backlog of courses prescribed for B. Tech. Sem. I, III, V, VII to B. Tech. Sem. II, IV, VI, VIII respectively.
- A student is allowed to keep term of Sem. III, if he/ she has failed in any number of courses in B. Tech. Sem. I and II.
- A student is allowed to keep term of Sem. V, if he/ she has failed in any number of courses in B. Tech. Sem. III and IV but passed in all courses in Sem. I and II.
- A student is allowed to keep term of Sem. VII, if he/ she has failed in any number of courses in B. Tech. Sem. V and VI but passed in all courses in Sem. III and IV.

### **Award of Class for the Degree Considering CGPA**

A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of the honors at the end of the program are as given below:

Range of the CGPA	Final Grade	Performance Descriptor	Equivalent range of marks (%)
$9.50 \leq 10.00$	O	Outstanding	$80 \leq 100$
$9.00 \leq 9.49$	A <sup>+</sup>	Excellent	$70 \leq 79$
$8.00 \leq 8.99$	A	Very Good	$60 \leq 69$
$7.00 \leq 7.99$	B <sup>+</sup>	Good	$55 \leq 59$
$6.00 \leq 6.99$	B	Average	$50 \leq 54$
$5.00 \leq 5.99$	C	Satisfactory	$40 \leq 49$
Below 5.00	F	Fail	Below 40

**BHARATI VIDYAPEETH DEEMED UNIVERSITY COLLEGE OF ENGINEERING, PUNE**  
**COURSE STRUCTURE 2014 CBCS**

**B. Tech. Mechanical Sem.- VII**

Sr. No.	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1	Mechanical Vibration	3	2	--	60	20	10	10	50	--	150	3	1	4
2	Automatic Control System	3	2	--	60	20	10	10	50	--	150	3	1	4
3	Automobile Engineering	3	--	--	60	20	10	10	--	--	100	3	--	3
4	Industrial Fluid Power	3	--	--	60	20	10	10	--	--	100	3	--	3
5	Elective - II	3	-	--	60	20	10	10	--	--	100	3	--	3
6	Inplant Training	-	--	--	--	--	--	--	50	--	50	--	4	4
7	Project Stage -I	--	2		--	--	--	--	100	--	100	--	4	4
Total		15	06	00	300	100	50	50	250	--	750	15	10	25

**Elective-II Courses:** a) Computational Fluid Dynamics; b) Industrial Engineering & Management; c) Nanotechnology; d) Production Planning & Control  
e) Experimental Methods in Mechanical Engineering

**B. Tech. Mechanical Sem.- VIII**

Sr. No.	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem. Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
8	Power Plant Engineering	4	2	--	60	20	10	10	50	--	150	4	1	5
9	Industrial Product Design	3	2	--	60	20	10	10	50	--	150	3	1	4
10	Optimum Design*	4	2	--	60	20	10	10	50	--	150	4	1	5
11	Elective-III	3	--	--	60	20	10	10	--	--	100	3	--	3
12	Project Stage -II	-	4	--	--	--	--	--	200	--	200	--	8	8
13	Environmental Sciences	3	--	--	100	--	--	--	--	--	100	3	--	3
Total		14	10	00	240	80	40	40	350	--	750	14	11	25

\* End Sem. examination of duration 4 hours

**Elective – III Courses:** a) Industrial Automation & Robotics; b) Cryogenics; c) Project Management & Ethics; d) Total Quality Management;  
e) Finite Element Analysis

## 1. MECHANICAL VIBRATION

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks	Theory: 03 Practical: 01
	Continuous Assessment: 40 Marks	Total: 04
	Term Work/ Oral: 50 Marks	
<b>Course Pre-requisites:</b>		
1.	Student should have knowledge of Fundamentals of Engineering Mechanics	
2.	Student should have knowledge of Engineering Mathematics	
3.	Student should have knowledge of Machine Design and Computer Aided Drafting	
4.	Student should have knowledge of Machine Design –I & II	
5.	Student should have knowledge of Theory of Machine	
<b>Course Objectives:</b>		
1.	To study basic concepts of vibration analysis	
2.	To acquaint with the principles of vibration measuring instruments	
3.	To study balancing of mechanical systems	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Develop mathematical model to represent dynamic system	
2.	Estimate natural frequency of mechanical element/system	
3.	Analyze vibratory response of mechanical element/system	
4.	Estimate the parameters of vibration isolation system	
<b>UNIT - I</b>	<b>Basic Concepts of Vibration</b> Vibration and oscillation, causes and effects of vibrations, Vibration parameters –spring, mass, damper, Damper models, Motion – periodic, non-periodic, harmonic, non- harmonic, Degree of freedom, static equilibrium position, Vibration classification, Steps involved in vibration analysis.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Free Undamped Single Degree of Freedom Vibration System</b> Longitudinal, transverse, torsion vibration system, Methods for formulation of differential equations by Newton, Energy, Lagrangian and Rayleigh’s Method.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>3.1 Free Damped Single Degree of Freedom Vibration System</b> Viscous damped system – under damped, critically damped, over damped; Logarithmic decrement; Coulomb’s damping; Combined	<b>(06 Hours)</b>

	viscous and coulomb's damping. <b>3.2 Equivalent Single Degree of Freedom Vibration System</b> Conversion of multi-springs, multi masses, multi – dampers into a single spring and damper with linear or rotational co-ordinate system	
<b>UNIT - IV</b>	<b>4.1 Forced Single Degree of Freedom Vibratory System</b> Analysis of linear and torsional systems subjected to harmonic force excitation and harmonic motion excitation (excluding elastic damper) <b>4.2 Vibration Isolation and Transmissibility</b> Force Transmissibility, Motion Transmissibility Typical isolators& Mounts <b>4.3 Rotor Dynamics:</b> Critical speed of single rotor, undamped and damped	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>5.1 Free Undamped Multi Degree of Freedom Vibration System</b> Eigen values and Eigen vectors for linear system and torsional two degree of freedom; Holzer method for linear and torsional unbranched system; Two rotors, Three rotors and geared system; Dunkerley's and Rayleigh's method for transverse vibratory system	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Vibration Measurement</b> -Introduction -Vibration measuring parameters- Displacement, Velocity and acceleration -Vibration measuring devices: Accelerometers, Vibration exciters, FFT analyzer, -Introduction to signal analysis: Time domain & Frequency domain analysis of signals. - Noise measurement	<b>(06 Hours)</b>
<b>Term Work/Practicals:</b>		
1. To determine the natural frequency of damped vibration of single degree freedom system and to find it's damping coefficient		
2. To obtain frequency response curves of single degree freedom system of vibration for different amount of damping.		
3.Free vibration of simply supported beam		
4. Free Vibration of a Two-DOF System		
5. Forced vibration of SDOF system		
6. To determine critical speed of shaft with single rotor.		



7. To verify natural frequency of torsional vibration of two rotor system and position of node.	
8. Noise measurement and analysis using vibration Analyzer	
9. To determine natural frequency of vibration of beam using vibration analyzer.	
10. Vibration analysis of mechanical system using MATLAB	
<b>Assignments:</b>	
1. Use and study MATLAB Code for fundamentals of vibration.	
2. Use MATLAB program for vibration analysis with suitable example.	
3. Longitudinal, transverse, torsion vibration system program in MATLAB.	
4. MATLAB Program for Vibration calculations by Using of differential equations in MATLAB.	
5. Study of Free Damped Single Degree of Freedom Vibration System.	
6. Study of Equivalent Single Degree of Freedom Vibration System.	
7. Study of Forced Single Degree of Freedom Vibratory System	
8. Study of Vibration Isolation and Transmissibility	
9. Finding of Eigen values and Eigen vectors for linear system and torsional two degree of freedom by MATLAB program.	
10. Use FFT Analyzer for lathe machine vibration analysis	
11. Study of Noise measurement	
12. Theoretical study of vibration signal analysis.	
<b>Text Books/Reference Books:</b>	
1	Mechanical Vibrations - G. K. Grover Nem Chand & Bros.
2	Mechanical Vibrations 4th edition- S. S. Rao - <i>Pearson Education</i>
3	Fundamentals of Mechanical Vibration - S.Graham Kelly - <i>Tata McGraw Hill 4.</i>
4	Vibration Analysis - P. Srineevasan - Tata McGraw Hill
5	Mechanical Vibrations - Schaum's outline series - S.Graham Kelly- <i>McGraw Hill</i>
6	Theory and Practice of mechanical vibrations - J. S. Rao, K. Gupta - <i>New Age</i>
7	Mechanical Vibrations, J.P. Den Hartog, Mc Graw Hill Book Company Inc.
8	Leonard Meirovitch, Introduction to Dynamics and Conti'oJ. <i>Wiley, New York</i>
9	Benson H. Tongue, Principles of Vibration. <i>Oxford University Press.</i>
10	W. Thomson, Theory of Vibrations with Applications, Second Edition, <i>Pearson Education</i>
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

## 2. AUTOMATIC CONTROL SYSTEM

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	Theory: 03
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	Practical: 01
	Term Work/ Oral: 50 Marks	<b>Total : 04</b>

### Course Pre-requisites:

The Students should have

1.	Knowledge of Mathematics & Science
2.	Knowledge of Basic Electrical Engineering.
3.	Knowledge of Sensors and Measurement System.

### Course Objectives:

1.	Familiarization with Control System Principles and Applications of Control System.
2.	Calculate and Estimate the Stability Measures, Time Response Measures from the Analysis of Mathematical Models of Some Simple Engineering Systems.
3.	Develop Ladder Diagrams using PLC and Apply It for Industrial Automation.

### Course Outcomes:

Students should be able to,

1.	Determine the (absolute) stability of a closed-loop control system using Routh-Hurwitz's stability criterion.
2.	Obtain an overall transfer function of control system by using block diagram algebra methods.
3.	Determine the time response specifications of a control system.
4.	Use analog and digital signal processing for mechatronics applications.
5.	Use Fundamentals of control systems, mechatronics system and able to improve an existing system's performance by using controller action such as PID controllers.
6.	Develop ladder diagram and select PLCs for industrial applications.

### Course Contents

<b>UNIT I</b>	<b>Frequency Domain Modelling and Analysis</b>	<b>(06 Hrs)</b>
	Transfer Function based modeling of Mechanical, Thermal and Fluid System; Concept of Poles & Zeros; Absolute vs Relative Stability; Stability Analysis using Routh Hurwitz Criterion; Mapping of Pole Zero Plot with Damping Factor, Natural Frequency and Unit Step Response.	
<b>UNIT II</b>	<b>Block Diagram Algebra</b>	<b>(06 Hrs)</b>
	Block Diagram Fundamentals, Canonical Form, Rules for Block Diagram Reduction, Reduction of Block Diagram, Reducing to Unity Feedback Systems, Examples on Block Diagram Reduction.	
<b>UNIT - III</b>	<b>System Response</b>	<b>(06 Hrs)</b>
	Introduction of Time Response of Control System, Standard Test Signals, Input-Output Model Equation, Instantaneous, Lagging and Delay Response, Transient Specifications for Unit Step Response,	

	Concept of State, State Variable, State Vector, State Space and State Model.	
<b>UNIT - IV</b>	<b>Signal Conditioning</b>	<b>(06 Hrs)</b>
	Necessity of Signal Conditioning, Passive Circuits, Analog Signal Processing: Operational Amplifiers, Inverting and Non-inverting, Summing, Subtractor, Instrumentation. Digital Signal Processing: Timing Diagrams, Sequential Logic, Flip-Flops, Successive Approximation (SAR) type ADC and R-2R ladder DAC.	
<b>UNIT V</b>	<b>Automatic Control System</b>	<b>(06 Hrs)</b>
	Concept of Automatic Control Systems, Mechatronics System & Its Examples, Mechatronics System Components, Open Loop and Closed Loop System, Effects of Feedback and Basic Characteristic of Feedback Control Systems. Applications of Feedback and Feed-Forward Control System. Basic Control Action and Controllers:-On-Off Control, Proportional, Integral, Derivative and PID.	
<b>UNIT VI</b>	<b>Programmable Logic Controller</b>	<b>(06 Hrs)</b>
	Introduction to PLCs, Basic Structure of a PLC, Principles of Operation, PLC Programming Languages, Ladder diagram, Latching and internal relays, Timers and Counters, Selection of a PLCs for Control System, Application of PLCs for Automatic Control System. Concept of SCADA and its Applications.	

### **Term Work:**

Term work shall consist record of minimum 8 experiments from the following; Out of which Experiment no. 1, Experiment no. 3 and Experiment no. 9 are compulsory.

1. Analysis of following control system parameters using software like MATLAB/SIMULINK
  - a. Plot the pole-zero configuration in s-plane for the given transfer function
  - b. Stability analysis of given control system using Routh-Hurwitz's criterion
  - c. Determine the transfer function for given closed loop system in block diagram representation.
  - d. Plot unit step response of given transfer function and find peak overshoot, peak time, rise time and delay time.
2. Study of applications of Op-Amp Circuits.
3. Study of P, P+I, P+D, P+I+D control actions using any trainer kit / simulation software.
4. Study of XY position control systems.
5. Stabilizing Inverted Pendulum.
6. Study of A/D and D/A Converters.
7. Study the functions and applications of variable frequency drive(VFD).
8. To study AC servomotor and plot its Torque Speed characteristics.
9. Development of applications by using following instructions of the PLC
  - a. Latching
  - b. Timers

	<p>c. Counters</p> <p>d. Logic Gates</p> <p>10. Sequencing of pick and place robot using PLC programming.</p> <p>11. Identification of different control system components in PLC based mini assembly cell.</p> <p>12. Development of applications using SCADA system for any automation application.</p>
<b>Assignments:</b>	
Assignments will be based on above syllabus	
Unit I	1. Numerical based on finding stability of control systems.
	2. Explain the Transfer function based modeling of Mechanical System
	3. Explain the Transfer function based modeling of Thermal System
	4. Explain the Transfer function based modeling of Fluid System
	5. Explain concept of poles and zeros and its importance in stability analysis.
	6. MATLAB based assignments on Routh-Hurwitz's stability criterion
Unit II	1. At least five questions on finding an overall transfer function of control system by using block diagram algebra method.
Unit III	1. What is the meaning of system response?
	2. What do you understand by input-output model equation?
	3. Define instantaneous response, lagging response and delayed response.
	4. Write notes on transient response specifications.
	5. What types of test signals are usually considered for testing a system response.
	6. Define state, state variable, state vector, state space and state model.
Unit IV	1. Why signal conditioning elements are necessary? Explain. What are the applications of signal conditioning elements?
	2. Define an op-amp. Explain with a neat block diagram. List the characteristics of an ideal op-amp.
	3. Write short notes on Inverting and Non-Inverting amplifier.
	4. Describe the significance of an instrumentation amplifier. Explain the operation of an instrumentation amplifier with the help of a circuit diagram.
	5. Define terms timing diagram, sequential logic and flip-flop
	6. Describe the operations of J-K FF with truth table.
	7. Explain working of SAR type ADC
	8. Explain working of R-2R ladder type DAC
Unit V	1. Define mechatronics and appreciate its relevance to contemporary engineering design
	2. Identify five mechatronic systems and its primary elements
	3. Describe the various forms and elements of open-loop and closed-loop control system
	4. Differentiate between feedback and feedforward control system
	5. Explain working of control actions- P, PI, PD and PID
	6. MATLAB based assignments on PID Controller
Unit VI	1. Draw block diagram of PLC and explain working of each block in brief.
	2. What is mean by ladder diagram? State difference between ladder and relay logic
	3. With the help suitable example explain working of latch

	4. Explain working of timer and counter with ladder diagram.
	5. State the criteria for selection of PLCs.
	6. Write five ladder logics for industrial applications.
	7. Write a short note on SCADA System & its use in automation
	8. Mini project based on PLC Programming.
<b>Text Books/Reference Books:</b>	
1.	Control System Engineering: Nagrath L.T. and Gopal. M., Wiley Eastern Lid.
2.	Alciatore and Histan, "Introduction to Measurement and Mechatronics Systems", McGraw Hill.
3.	W. Bolton, "Mechatronics", Pearson Education.
4.	M D Singh and J G Joshi, "Mechatronics", PHI
5.	Gary Dunning, "Programmable Logic Controllers", Cengage Learning.
6.	Mechatronics-Principles, Concepts and Application: Mahalik, McGraw Hill Education Pvt Ltd;
7.	Process Control Instrumentation Technology, 8 <sup>th</sup> Edition Curtis D. Johnson, University of Houston
8.	Ogata, Katsuhiko: "Modern Control Engineering (5 <sup>th</sup> Edition)", Prentice-Hall, Inc., 2009 (ISBN: 0-13-615673-8)
9.	Madan Gopal, Control Systems Principles and Design, Tata McGraw Hill, seventh edition, 1997.
10.	Nise, Control System Engineering, John Wiley & sons, 3 <sup>rd</sup> Edition.
11.	Norman Nise, "Control System Engineering", Prentice Hall India, Fourth Edition .
12.	Anand Kumar, "Control System Theory", Prentice Hall India.
13.	F. H. Raven, "Automatic Control Engineering", Third edition, McGraw Hill, 1983.
14.	Dr. N. K. Jain, "Automatic Control Systems Engineering", Dhanpat Rai Publishing Company.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

### 3. AUTOMOBILE ENGINEERING

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	<b>Total : 03 Credits</b>
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have basic knowledge of		
<b>1.</b>	The Students should have basic knowledge of Elements of Mechanical engineering	
<b>2.</b>	The Students should have basic knowledge of Machine Tools	
<b>3.</b>	The Students should have basic knowledge of Internal Combustion Engine	
<b>4.</b>	The Students should have basic knowledge of Theory of Machine	
<b>Course Objectives:</b>		
	1. Study basic principles of actual automobile systems 2. Study important systems in an automobile 3. Study recent and modern trends in automobile sector	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	various systems in an automobile	
<b>2.</b>	Importance and features of different systems like steering axle, differential.	
<b>3.</b>	Importance and features of different systems like Transmission, braking System	
<b>4.</b>	Importance and features tyres, wheel and balancing etc.	
<b>5.</b>	Importance of electrical, starting and generating system etc.	
<b>6.</b>	Principle of operation, construction and applications of various sensors used in modern automobile	
<b>UNIT - I</b>		
<b>Classification of Automobiles</b>	Broad classification of Automobiles, Major components & their functions, Types of vehicle layouts, Types of bodies, Body construction & materials, All wheel drive, Types of chassis & their construction.	<b>(06 Hours)</b>

<b>UNIT - II</b>	<p><b>Steering System</b> Function of steering, Steering system layout, Automotive steering mechanism Ackerman &amp; Davis, Types of steering gear boxes, Condition for true rolling, Steering geometry Camber, Caster, King pin inclination, included angle, Toe-in &amp; Toe-out, Wheel alignment, Under steer &amp; Over steer, Types &amp; working of power steering.</p> <p><b>Transmissions:</b> Necessity of gear box, Sliding mesh, Constant mesh, Synchromesh and epicyclic gear box, Overdrives and hydrodynamic torque converter, Trouble shooting and remedies.</p> <p><b>Live axle and differential:</b> Final drive, spiral, bevel, Hypoid and worm drives, Types of live axles, semi, three quarter and full floating axles. Necessity of differential, Conventional and non-slip differential, Trouble shooting and remedies.</p>	<b>(06 Hours)</b>
<b>UNIT - III</b>	<p><b>Clutch Braking System</b> Requirement of clutch, Types &amp; functions, Single plate, Multiplate, Centrifugal, Cone clutch, Electromagnetic &amp; Fluid clutches, Troubleshooting &amp; automobile clutch.</p> <p><b>Braking System</b> Function of automotive brake system, Types of braking mechanism Internal, Expanding &amp; Disc brake, Mechanical, Hydraulic &amp; Air brake system, Servo &amp; power brakes, Antiskid braking, Calculation of braking force required, Stopping distance &amp; dynamic weight transfer.</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Suspension</b> Object of suspension, Basic requirement, Air suspension and its features, Independent suspension, Spring &amp; unspring mass, Types of spring, Shock absorber, Torsion bars, Air suspension, Hydro pneumatic suspension, Pitching, rolling and bouncing.</p> <p><b>Wheels and Tyres</b> Requirements of wheels and tyres, Constructional features, Types of tyres, Types of rim , Inflation Pressure and its importance, Application to ride and stability, Trouble shooting and remedies.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Electrical system</b> Battery: Types of battery, Lead-Acid, Alkaline, ZEBRA, Sodium Sulphur and Swing, Ratings, charging, Maintenance and testing of Lead-Acid battery.</p> <p><b>Starting system:</b> Requirements, Various torque terms used, Starter motor drives; Bendix, Follo through, Barrel, Rubber compression, Compression Spring, Friction Clutch, Overrunning Clutch, Dyer.</p>	<b>(06 Hours)</b>

	Starter motor solenoids and switches, Glow plugs. <b>Alternator:</b> Principle of operation, Construction, Working, Rectification from AC to DC.	
<b>UNIT - VI</b>	<b>Recent trends in Automobiles</b> Electronic Control module (ECM), operating modes of ECM (closed loop and open loop) Inputs required and output signals from ECM, Electronic Spark control, Air Management system, Idle speed control. Construction, working & application of temperature sensors, inductive sensors, Position sensors (rotary, linear). Hot wire and thin film air flow sensors, vortex flow/turbine fluid sensors, Optical sensor, Oxygen sensors, Light sensors, methanol sensors ,Rain sensor, New developments in the sensor technology.	<b>(06 Hours)</b>
<b>Any Six Assignments from the following:</b>		
1. Study of types of bodies and chassis of automobile.		
2. Report on dismantling and assembly of steering mechanisms.		
3. Report on dismantling and assembly of brakes.		
4. Report on dismantling and assembly of rear axle and differential.		
5. Report on dismantling and assembly of suspension systems.		
6. Study of types of tyres and rims.		
7. Report on battery charging and starting systems.		
8. Study and understanding of different types of sensors used in automobile.		
9. Report on industrial visit to any automobile Manufacturer.		
10. Report on industrial visit to any Two wheeler/ Four Wheeler service station		
<b>Text Books/Reference Books:</b>		
1	Automotive Mechanics, William Cruose & Donald L. Anglin, Tata Mcgraw Hill	
2	Automotive Mechanics , Joseph Heitner, East-West press pvt .Ltd	
3	The Automobile Engineering, T. R. Banga & Nathu Singh, Khanna Publishers	
4	The Automobile, Harbans Singh Reyat, S. Chand & Co.	
5	Automobile Engineering, R. K. Rajput, Laxmi Publication	
6	Basic Automobile Engineering, C.P.Nakra, Dhanpat Rai Publishing CO	
7	Automobile Engineering, Kirpal Singh Vol I & II, Standard publishers Distributors ,Delhi	
8	Automobile Engineering, K. K. Jain & R.B. Asthana, Tata Mcgraw Hill	
9	Automotive Mechanics, S. Srinivasan, Tata Mcgraw Hill	



10	Automobile Engineering, Vol I & II, R.K. Mohanty, Standard Book House	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

## 4. INDUSTRIAL FLUID POWER

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -03Hours/ Week	End Semester Examination: 60 Marks	Theory: 03
	Continuous Assessment: 40 Marks	<b>Total :03</b>
	Term Work/ Oral: -- Marks	

<b>Course Prerequisites:</b> -	<p>The Students should have</p> <ol style="list-style-type: none"> <li>1. Knowledge of fluid mechanics, turbomachinery.</li> <li>2. Knowledge of mechanical measurement.</li> <li>3. Knowledge of Theory of Machine</li> </ol>
<b>Course Objective: -</b>	<ol style="list-style-type: none"> <li>1. Familiarization with fluid power principles and the fluid power industry.</li> <li>2. To analyse specific problems, design solutions and evaluate fluid power systems in industrial applications.</li> <li>3. To instil within students a positive safety attitude with regard to the design, construction, operation, and maintenance of fluid power systems.</li> <li>4. To provide students with knowledge of the applications of fluid power systems in process, construction, robotics and manufacturing industries.</li> <li>5. To develop within each student a measurable degree of competence in the design, construction, operation and maintenance of fluid power systems.</li> <li>6. To provide students with an understanding of the properties of hydraulic and pneumatic fluids, as well as components utilized in industrial fluid power systems.</li> </ol>
<b>Course Outcomes: -</b>	<p>Students should be able to</p> <ol style="list-style-type: none"> <li>1. Identify fluid power system and its basic components for practical applications.</li> <li>2. Select suitable pump, reservoir and accumulators for various industrial applications.</li> <li>3. Use specific pressure, flow and direction control valves based on applications.</li> <li>4. Select actuator and develop a simple hydraulic circuit to accomplish the task.</li> <li>5. Understand basic components of the pneumatic &amp; electro-pneumatic systems and develop pneumatic circuits for industrial automation.</li> <li>6. Design hydraulic &amp; pneumatic circuit for industrial applications.</li> </ol>

## Course Contents

<b>Unit 1</b>	<b>Introduction to Fluid Power</b>	<b>(06Hrs)</b>
<p><b>Fluid power system:</b> Components of fluid power system, advantages and limitations. Difference between electrical, pneumatic and fluid power systems. Applications in the fields of machine tools, material handling, aerospace, mobile and stationary machines, clamping devices and more applications of fluid power.</p> <p><b>Types of hydraulic fluids, Seals, Conductors:</b> Petroleum based, synthetic and water based. Properties of fluids, Pascal's Law, selection of fluids, additives, effect of temperature and pressure on hydraulic fluid. Seals, sealing materials. Types of pipes, hoses, material. Fluid conditioning through filters, strainers, sources of contamination and contamination control.</p>		
<b>Unit 2</b>	<b>Source of Power</b>	<b>(06 Hrs)</b>
<p><b>Pumps:</b> Types, classification, principle of working and constructional details of gear pumps, vane pump, piston pump, power and efficiency calculations, characteristics curves, selection of pumps for hydraulic power transmission (Numerical Treatment).</p> <p><b>Power units and accessories:</b> Types of power units, reservoir assembly, sizing of reservoirs, constructional details, pressure switches, temperature switches. Accumulators: Types, selection procedure, applications of accumulators. ISO symbols for hydraulic and pneumatic Components</p>		
<b>Unit 3</b>	<b>Fluid Power Control</b>	<b>(06 Hrs)</b>
<p><b>Control of fluid power:</b> Necessity of fluid control through pressure control, directional control and flow control valves.</p> <p><b>Control valves:</b> i) Principle of pressure control valves, direct operated and pilot operated pressure relief valves, pressure reducing valve, sequence valve. ii) Principle of flow control valves, pressure compensated and non-compensated flow control valves.iii) Principle of directional control valves, types of directional control valves, two-way, three-way, four-way valves, check valve and shuttle valve. Open centre, close centre, tandem centre valves. Actuating devices- manually operated, mechanically operated, solenoid operated, pilot operated, lever operated.</p>		
<b>Unit 4</b>	<b>Actuators and Industrial Circuits</b>	<b>(06 Hrs)</b>
<p><b>Actuators:</b> (i) Linear and Rotary actuators (ii) Types of cylinders and mountings, Design considerations for cylinders (iii) Types of hydraulic motors- gear, vane &amp; piston. (iv) Methods of control of acceleration, deceleration. (v) Calculation of piston velocity, thrust under static and dynamic applications, considering friction, inertia loads (Numerical Treatment).</p> <p><b>Industrial circuits:</b> Simple reciprocating, Regenerative, Speed control (Meter in, meter out &amp; bleed off), Sequencing, Synchronization, transverse &amp; feed, automatic reciprocating, fail safe circuit, counter balance circuit, actuator locking, circuit for hydraulic press, unloading circuit, motor breaking circuit.</p>		
<b>Unit 5</b>	<b>Pneumatics</b>	<b>(06 Hrs)</b>
<p><b>Principle of Pneumatics:</b> (i) Laws of compression, types of compressors, selection of compressors. Pneumatic actuators-rotary, reciprocating (ii) Comparison of pneumatics with hydraulic power transmissions. (iii) Types of filters, regulators, lubricators, mufflers, dryers. (iv) Pressure regulating valves, (v) Direction control valves (vi) Speed regulating methods</p>		

used in Pneumatics.(vii)Basic pneumatic circuits (viii) Introduction to electro-pneumatics. Application of pneumatics in industrial automation.

**Introduction to vacuum:** Vacuum measurement, vacuum pumps, introduction to vacuum sensors and valves. Industrial applications of vacuum.

<b>Unit 6</b>	<b>System Design</b>	<b>(06 Hrs)</b>
Design of hydraulic/ pneumatic circuit for practical application, Selection of different components such as reservoir, various valves, actuators, filters, pumps based on design. (Students are advised to refer manufacturer's catalogues.)		

### Term work

Term work shall consist record of minimum 10 experiments from following; Out of which Experiment no.7, Experiment no. 9 and Experiment no. 13 are compulsory.

1. Study of ISO/JIC Symbols for hydraulic and pneumatic systems.
2. Study of positive displacement pumps and determination of performance characteristics.
3. Study of filters and determination of filtration ratings.
4. Study of pressure control valves and circuits.
5. Study of flow control valves (Meter in, Meter out Circuits).
6. Study of direction control valves and circuits.
7. Following experiments to be done on pneumatic trainer:
  - a) Automatic reciprocating circuit.
  - b) Speed control circuit.
  - c) Pneumatic circuit involving shuttle valve/quick exhaust valve.
  - d) Sequencing circuit.
  - e) Circuits by using logic gates.
8. Following experiments to be done on hydraulic trainer:
  - a) Regenerative circuit.
  - b) Speed control circuit.
  - c) Sequencing circuit.
  - e) Transverse and feed circuit.
9. Design of circuits by using fluid simulation software's such as LVSIM®-HYD & PNEU, AUTOMATION STUDIO.
10. Study of Logic for DELAY Circuit using signal Input device unit & Indicator unit.
11. Design of compressed air distribution in pneumatic systems.
12. Design of simple hydraulic systems used in practice such as hydraulic clamp, jacks, dumper, forklift etc.
13. Industrial visits for applications of hydraulic and pneumatic system and their reports.
14. Study of accumulators/actuators/intensifiers/hydraulic and pneumatic power brakes.

## Assignments

Assignments will be based on above syllabus

1. Theory questions based on hydraulic fluids, seal, strainer, conductor and filters.
2. At least five numerical/theory questions on sources of power.
3. Theory questions based on selection of pressure control, flow control and directional control valve for specific application.
4. Develop at least five hydraulic circuits using simulation software like Automation Studio.
5. Develop at least five pneumatic circuits for low cost industrial automation using simulation software like Automation Studio, Fluid SIM®.
6. Design of at least five hydraulic/pneumatic systems which includes components such as reservoir, various valves, actuators, filters, pumps based on design.
7. Theory questions based on sources of contamination, and its control.
8. Theory questions based on fluid power control.
9. Theory questions based on pneumatics and its applications
10. Identify at least five fluid power applications and enlist the fluid power components used in each of these applications.
11. Design of hydraulic/pneumatic circuit for practical application and selection of fluid power components.

## Text Books

1. Anthony Esposito, Fluid Power with Applications, Pearson.
2. S.R. Majumdar, Oil Hydraulic systems- Principle and maintenance, Tata McGraw Hill.
3. S. R. Majumdar, Pneumatics Systems Principles and Maintenance, Tata McGraw Hill.
4. H. L. Stewart, Hydraulics and Pneumatics, Taraporewala Publication.
5. Jagadeesha T. and Tahammaiah Gowda, Fluid Power, Generation, Transmission and Control Wiley Publication.

## Reference Books

1. J. J. Pipenger "Industrial Hydraulics", McGraw Hill
2. Pinches "Industrial Fluid Power", Prentice hall.
3. D.A. Pease "Basic Fluid Power", Prentice hall.
4. B. Lall "Oil Hydraulics", International Literature Association.
5. Yeaple "Fluid Power Design Handbook".
6. ISO - 1219, Fluid Systems and components, Graphic Symbols
7. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books
8. Product Manuals and books from Vickers/ Eaton, FESTO, SMC pneumatics
9. Dr. R K Bansal, Fluid Mechanics, Laxmi Publications (P) Ltd.

## Unit Tests-

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit-IV, V, VI

## Elective II: 5.1 COMPUTATIONAL FLUID DYNAMICS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH:03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total:03 Credits
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of Mathematics & Science	
2.	Knowledge of fluid mechanics and heat transfer	
<b>Course Objectives:</b>		
1.	To introduce Governing Equations of vicious fluid flows	
2.	To introduce numerical modeling and its role in the field of fluid flow and heat transfer	
3.	To enable the students to understand the various discretization methods	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Student should able to understand types of flow	
2.	Student should able to understand CFD Analysis	
3.	Student should able to understand numerical methods used in CFD	
4.	Student should able to understand Generate mesh	
5.	Student should able to understand conjugate heat transfer	
6.	Student should able to understand turbulence modeling	
<b>Course Contents</b>		
<b>UNIT - I</b>	<b>Introduction to fluid Dynamics</b>	<b>(06 Hrs)</b>
	Concepts of Fluid Flow, Pressure distribution in fluids, Reynolds transport theorem, Integral form of conservation equations, Differential form of conservation equations, Different Types of Flows, Euler and	

	Navier Stokes equations, Properties of supersonic and subsonic flows, Flow characteristics over various bodies.	
<b>UNIT - II</b>	<b>Mesh Generation</b>	<b>(06 Hrs)</b>
	Surface mesh generation Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms, grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids, Need for adaptive and, moving grids, Tet, pyramid, prism, and hex grids, using various elements in combination	
<b>UNIT - III</b>	<b>Basic Discretization Techniques</b>	<b>(06 Hrs)</b>
	Need to discretization the domain and governing equations, Finite difference approximation using Taylor series, for first order (Forward Difference Approximation, Backward Difference Approximation, Central difference Approximation) and second order (based on 3 node, 4 node and 5 node points), explicit and Implicit approaches applied to 1D transient conduction equation, Couette flow equation using FTCS and Crank Nicholson's Method, Stability Criteria concept and physical interpretation, Thomas Tri-diagonal matrix solver.	
<b>UNIT - IV</b>	<b>Two Dimensional Steady and unsteady heat conduction</b>	<b>(06 Hrs)</b>
	Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet, Neumann, robbins and mixed boundary condition – solution by Explicit and Alternating Direction Implicit method (ADI Method), Approach for irregular boundary for 2D heat conduction problems	
<b>UNIT - V</b>	<b>Application of Numerical Methods to Convection – Diffusion System</b>	<b>(06 Hrs)</b>
	Convection: first order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept and physical interpretation Convection –Diffusion: 1D and 2D steady Convection Diffusion system – Central difference approach, Peclet Number, stability criteria, upwind difference approach, 1 D transient convection-diffusion system	
<b>UNIT - VI</b>	<b>CFD as Practical Approach</b>	<b>(06 Hrs)</b>
	Introduction to any CFD tool, steps in pre-processing, geometry creation, mesh generation, selection of physics and material properties, specifying boundary condition, Physical Boundary condition types such as no slip, free slip, rotating wall, symmetry and periodic, wall roughness, initialising and solution control for the solver, Residuals, analysing the plots of various parameters (Scalar and Vector contours such as streamlines, velocity vector plots and animation). Introduction to turbulence models. Reynolds Averaged Navier-Stokes equations (RANS), $k-\epsilon$ , $k-\omega$ . Simple problems like flow inside a 2-D square lid driven cavity flow through the nozzle	
<b>Assignments:</b>		

Assignments will be based on above syllabus	
1.	Reynolds transport theorem, Integral form of conservation equations
2.	Differential form of conservation equations, Different Types of Flows, Euler and Navier Stokes equations
3.	Surface mesh generation Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms
4.	Grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids
5.	Finite difference approximation using Taylor series, for first order
6.	Explicit and Implicit approaches applied to 1D transient conduction equation, Couette flow equation using FTCS and Crank Nicholson's Method
7.	Solution of two dimensional steady and unsteady heat conduction equation with Dirichlet, Neumann,
8.	Robbins and mixed boundary condition – solution by Explicit and Alternating Direction Implicit method (ADI Method), Approach for irregular boundary for 2D heat conduction problems
9.	Convection: first order wave equation solution with upwind, Lax–Wendroff, Mac Cormack scheme, Stability Criteria concept
10.	Selection of physics and material properties, specifying boundary condition, Physical Boundary condition types such as no slip, free slip, rotating wall, symmetry and periodic, wall roughness
<b>Text Books/Reference Books:</b>	
1.	Versteeg, H.K., and Malalasekera, W., An Introduction to Computational Fluid Dynamics: The finite volume Method, Longman, 1998.
2.	Ghoshdastidar , P.S., computer Simulation of flow and heat transfer, Tata McGraw Hill Publishing Company Ltd., 1998.
3.	Patankar, S.V. Numerical Heat Transfer and Fluid Flow, Hemisphere Publishing Corporation, 2004.
4.	Muralidhar, K., and Sundararajan, T., Computational Fluid Flow and Heat Transfer, Narosa Publishing House, NewDelhi, 1995.
5.	Prodip Niyogi, Chakrabarty .S.K., Laha .M.K. Introduction to Computational Fluid Dynamics, Pearson Education, 2005
6.	Introduction to Computational Fluid Dynamics Anil W. Date Cambridge University Press, 2005.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



<b>Elective II: 5.2 INDUSTRIAL ENGINEERING &amp; MANAGEMENT</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH:03 Credits
Tutorial: 00 Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of Management	
2.	Basic information of Industrial engineering.	
3.	Basic knowledge of human considerations in manufacturing.	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of industrial engineering tools and management practices in manufacturing.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Definition, principles and functions of management.	
2.	Types and selection of business organizations.	
3.	Functioning of Personnel, Marketing and Finance Department.	
4.	Method Study tool for standardizing the method.	
5.	Work Measurement tool for standardizing the time.	
6.	Ergonomically accepts in manufacturing.	
<b>UNIT - I</b>	<b>Management-An Introduction:</b> Management- Meaning and Definitions, Management, Administration, and Organization concepts, Management as an Art and Science and a profession, contribution of various thinkers to management thought, Types and Functions of Management. Different approaches to management – scientific, operational, human and system approach.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Organization:</b> Different forms of business Organization –Individual proprietorship, Partnership, Joint stock company, Co-Operative enterprise, Public Sector, Undertakings, organizational structures in Industries, Line,	<b>(06 Hours)</b>

	Functional ,Line and functional , Project, Matrix Organization and Committees	
<b>UNIT - III</b>	<p><b>Financial, Marketing and Personnel Management:</b></p> <p>Personnel Management-Definitions Recruitment, Selection and training of the employees, Job valuation and Merit rating, wage administration different methods of wage payments, incentives.</p> <p>Marketing Management-Definitions, Marketing and Selling concept, market segmentation, distribution channels, Market Research, Advertising and sales promotion and Sales forecasting.</p> <p>Financial Management-Capital structure, Fixed capital, working capital, sources of finance, cost analysis, Break even analysis, Depreciation and Financial statement.</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Method Study:</b></p> <p>Steps in method study, tools and techniques used, process chart symbols, flow diagrams, two handed chart, multiple activity chart, use of motion pictures and its analysis. SIMO charts, chorno &amp; cycle graph, developing, presentation, installation and maintenance of improved methods.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Work Measurement :</b></p> <p>Time Study: Aim and objectives , terminology and tools, use of stop watch procedure in making a time study, elements, selection of operations time study forms, handling of foreign elements. Performance rating. Allowances: Personal, Fatigue and other allowances. Analysis and calculation of Standard Time. Determination of number of cycles time study for indirect functions such as Maintenance , Marketing etc., MOST Technique.</p> <p>Works Sampling: Definition, Objectives, theory of Work Sampling. Other applications of work sampling, errors in work sampling study.</p> <p>Synthetic and Standard data Methods: Concepts, introduction to PMTS, MTM-1, WF, Basic motion time, MTM-2, and other second – generation methods timing of group operations.</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Ergonomics and Industrial Safety:</b></p> <p>Definitions, importance in industry, basic anatomy of human body, anthropometrics, measurement of physical work and its techniques, work and rest cycles, bio mechanical factors environment effects.</p> <p>Importance of safety, planning, training, safety precautions, safety</p>	<b>(06 Hours)</b>

	Equipments, Government regulations on safety.	
<b>Assignments:</b>		
1.	Management: Types, Functions, Principles	
2.	Study of organization Structure	
3.	Study of Business organizations	
4.	Study of Financial, Marketing and Management	
5.	Study of Personnel Management	
6.	Study of Method Study methods and procedure	
7.	Study of Method Study charts	
8.	Study of Work Measurement methods and procedure	
9.	Study of Time study procedure and problems	
10.	Study of Work sampling and problems	
11.	Study of Ergonomics	
12.	Study of Industrial Safety	
<b>Text Books/</b>		
1.	O. P. Khanna, Industrial Engineering & Management, Dhanapat Rai & Sons.	
2.	M. C. Shukla, Business Organization and Management, S. Chand & Co. Ltd, New Delhi.	
3.	Harold Koontz & Heinz Enrich, Essentials of Management, McGraw Hill International.	
4.	M. N. Mishra, Organizational Behavior, Vikas publishing New Delhi.	
5.	Dale Yoder, Personnel Management.	
6.	Work Study, ILO.	
7.	S. S. Patil, Industrial Engineering & Management, Electro tech Publication.	
8.	Mansoor Ali & Dalela, Industrial Engineering & Management System, Standard Publisher distributions.	
9.	R. M. Currie, Work Study, ELBS.	
10.	Management by James A. F. Stoner, R. Edward Freeman, PHI	
11.	Management Today: Principles and Practice by Gene Burton and Manab Thakur, TMH	
12.	Organizational Behavior by Keith Davis, TMH	
13.	Management (Tasks, responsibilities and Practices) by Peter Drucker, Harper Business	
14.	Production Management by Lockyer, ELBS	
15.	Modern Production Management by E. S. Buffa ( John Wiley )	
16.	Financial Management by Vanhorne, PHI	
17.	Financial Management (Theory and Practice) by Prasanna Chandra, TMH	
18.	Marketing Management by Philip Kotler, Pearson Edition	

19.	Marketing Management by Rajan Saxena, TMH
20.	Personnel Management by Edward Flippo, TMH
21.	Industrial Engineering and PPC” by A.K Bewwor and V.A.Kulkarni.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV,V and VI

## ELECTIVE II: 5.3 NANOTECHNOLOGY

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: 00 Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Material Science	
2.	Physical properties of Material	
3.	Chemical properties of Material	
<b>Course Objectives:</b>		
	To know the history, synthesis, characterization and application of Nanotechnology	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The basic of nano science and nanotechnology	
2.	Properties of nanomaterials	
3.	Synthesis process of the nanomaterials	
4.	Characterization tools of nanomaterial	
5.	Applications of nano science e and nanotechnology	
6.	Safety parameters while implementing nanotechnology	
<b>UNIT - I</b>	<b>Basics of Nanoscience</b>	<b>(06 Hours)</b>
	Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphenes and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials.	
<b>UNIT - II</b>	<b>Properties of Nano materials</b>	<b>(06 Hours)</b>

	Mechanical, Thermal, Electrical, Optical, Magnetic and Structural properties. Carbon nanostructures -Fabrication, structure, electrical properties and mechanical properties	
<b>UNIT - III</b>	<b>Synthesis of Nonmaterial's</b>	<b>(06 Hours)</b>
	Bottom up-Ball Milling, Melt mixing, Physical vapour deposition, Ionized cluster beam deposition, Laser pyrolysis, Sputter deposition, Electric arc deposition, Gas evaporation. Chemical methods: Hydrothermal combustion, bath deposition with capping techniques and top down, Chemical vapour deposition, Synthesis of metal & semiconductor nanoparticles by colloidal route, Microemulsions, Sol-gel method, Combustion method, Wet chemical method	
<b>UNIT - IV</b>	<b>Nanomaterials characterization</b>	<b>(06 Hours)</b>
	Nanomaterials characterization XRD, UV-VIS spectroscopy, X-ray fluorescence, X-ray photon emission spectroscopy, Scanning electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy, Atomic force microscopy, Nuclear magnetic resonance spectroscopy, Electron spin resonance spectroscopy, Raman spectroscopy	
<b>UNIT - V</b>	<b>Applications of Nanotechnology</b>	<b>(06 Hours)</b>
	Industrial applications of nanomaterials, in the areas of electronics, photonics, biology, nano biomaterials, health and environment, medicine, defence, chemicals, catalysts, textiles, etc. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming. Monitoring nanoparticles at work place and sensors used for this.	
<b>UNIT - VI</b>	<b>Nanotechnology and Safety</b>	<b>(06 Hours)</b>
	Assessment of human health risks associated with the use of nanotechnologies and nanomaterials in the food <b>and</b> agriculture sectors, safety, current risk assessment approaches used by FAO/WHO, environmental, ethical, policy and regulatory issues. Toxicity of nanoparticles, exposure to nanoparticles and CNTs and influence on respiratory systems.	
<b>Term Work/Practical's:</b>		
1. Study of nanoscience and nanotechnology structures		
2. Synthesis of nanofibers by electrospinning processes		
3. Synthesis of nonmaterial's by sol gel process		

4. Study of Atomic Force Microscope	
5. Study of nano particle analyzer	
6. Study of Electrospinning Process	
7. Study of FTIR	
<b>Assignments:</b>	
1. Study of nano science and nanotechnology structures	
2. Properties :Mechanical, Thermal, Electrical, Optical, Magnetic and Structural	
3. Properties: Carbon nanostructures	
4. Synthesis of Nonmaterial's: Bottom up	
5. Synthesis of Nonmaterial's: Chemical methods	
6. Surface electron microscopy, Transmission electron microscopy, Scanning tunneling microscopy	
7. UV-VIS spectroscopy, X-ray fluorescence, Atomic force Microscope, Raman spectroscopy	
8. Applications in electronics, photonics, biology, health and environment, medicine, defence, chemicals, catalysts, textiles	
9. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming	
10. Nanotechnology and Safety	
<b>Text Books/Reference Books:</b>	
1	Edward L. Wolf (2nd Ed.), Nanophysics & Nanotechnology: An Introduction to Modern Concepts in Nanoscience, WILEYVCH, 2006
2	H.S.Nalwa, Hand book of Nanostructure materials and nanotechnology; (Vol.1-5), Acad. Press, Boston, 2000
3	C.P.Poole Jr., F.J.Owens; Introduction to Nanotechnology, John Wiley and sons, 2003
4	C. Furetta, Hand book of thermoluminescence; World Scientific Publ.
5	5.T.J.Deming, Nanotechnology; Springer Verrlag, Berlin, 1999
6	C. Delerue, M.Lannoo; Nanostructures theory and Modelling
7	Fausto, Fiorillo, Measurement and Characterization of Magnetic materials
8	Janos H, Fendler; Nanoparticles and Nanostructured Films

9	Liu,Hand Book of Advanced Magnetic Materials (4 Vol.)
10	Banwong, Anurag Mittal; Nano CMOS Circuit and Physical Design
11	S. Sakka,Sol-gel science and technology processing, characterization and applications; Kluwer Acad. Publ.
12	Goser et al, “Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices”
13	A. A. Balandin and K. L. Wang, “Handbook of Semiconductor Nanostructures & Nanodevices”
14	Cao Guozhong, “Nanostructures & Nanomaterials -Synthesis, Properties & Application
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



<b>Elective II: 5.4 PRODUCTION PLANING AND CONTROL</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of Industrial Engineering & Management	
2.	Knowledge of statistics.	
3.	Basic knowledge of resources of production Man, Machine Material.	
<b>Course Objectives:</b>		
1.	The student should understand the scope, objective and application of Production Planning And Control manufacturing Industries.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The importance of PPC in industry.	
2.	The Forecasting by using different techniques.	
3.	Different ideas and concept to improve PPC in industry.	
4.	Different techniques for material requirement planning	
5.	Different techniques used for PPC in industry.	
6.	Computer Aided Process Planning.	

<b>Course Contents</b>		
<b>UNIT I</b>	<b>Introduction to PPC :</b> Role and stages of PPC, PPC as an integrated function, Product Life Cycle Analysis, Types of Production systems.	<b>(06 Hrs )</b>

<b>UNIT II</b>	<b>Forecasting Techniques:</b> Use and types of forecasting, Methods of forecasting and comparison, Verification and control.(Numerical Treatment)	<b>(06 Hrs)</b>
<b>UNIT - III</b>	<b>Techniques And Production Control:</b> Process sheet, Routing, Scheduling- Gantt Chart, Machine Loading Chart, Line of Balance, Line Balancing, Dispatching rules, Sequencing - Johnson's rule, Loading, Follow- up, Evaluation, PERT, CPM. .(Numerical Treatment)	
		<b>(06 Hrs)</b>
<b>UNIT - IV</b>	<b>Materials Planning And Purchasing:</b> Scope and requirement of MRP, MRP I and MRP II, Master Production Schedule, Bill of Materials, Capacity Requirement Planning, Introduction to ERP, Purchasing - Documentation, Make or Buy decisions, Vendor Development.	
		<b>(06 Hrs)</b>
<b>UNIT - V</b>	<b>a) Inventory Control:</b> Types of Inventory Cost of Inventory, EOQ, Selective Inventory Control, Replenishment Systems.  <b>b) Stores Management:</b> Types of stores, Storage layout and storage systems, Stores Documentations, Stores Control and Control of Wastage and surplus, JIT, KANBAN, KAIZEN, Value Stream Mapping	
<b>UNIT - VI</b>	<b>Computer aided production planning and control applied to :</b> a) Machine capacity planning and utilization. b) Productivity measurement. c) Material Requirement Planning.  d) Scheduling Techniques. Hands on experience of Computer aided Production Planning and Control. Case studies from Industries.	<b>(06 Hrs)</b>
<b>Assignments:</b>		
1.	Introduction of PPC	
2.	Techniques of Forecasting used in PPC	
3.	Different Techniques used in PPC to improve the production and to reduce the cost of production	
4.	Use and application applications of material planning and purchasing	
5.	Use of inventory control	

6.	Computer aided production planning and control (CAPP)
<b>Text Books/Reference Books:</b>	
1.	J.L. Riggs, "Production Systems - Planning Analysis and Control ", JhonWiley & Sons.
2.	J.B. Dilworth, "Operations Management - Design, Planning & Control for Manufacturing and Services ", McGraw Hill.
3.	S N Charry, "Production and Operation Management" Tata McGraw- Hill
4.	Samuel Elion, Elements of PPC ", Universal Book Company.
5.	Martand Telsang, "Industrial Engineering and Production Management" S. Chand and Co. Ltd.
6.	Moore, "Production Control ".
7.	Mager and Boodman," Production Planning And Inventory Control"
8.	Martin Star, "Production Management ".
9.	Erry Johnson, "Process Engineering ".
10.	E. EL. Buffa, "Production Management ".
11	A.K. Bewoor and V.A. Kulkarni "Production planning and Control"
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

## Elective II: 5.5 Experimental Methods in Mechanical Engineering

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory:-03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical:--- Hours / Week	Continuous Assessment: 40 Marks	PR: -- Credits
	Term Work/ Oral: -- Marks	<b>Total: 03 Credits</b>

<b>Course Prerequisite:-</b>	Student should have knowledge of: <ol style="list-style-type: none"> <li>1. Basic concepts in core courses in Mechanical Engineering.</li> <li>2. Basic concepts in Engineering Mathematics.</li> <li>3. Mechanical Measurements.</li> </ol>
<b>Course Objective:-</b>	The student must be able to: <ol style="list-style-type: none"> <li>1. Understand the concepts of probability and statistics.</li> <li>2. Understand application of curve fitting techniques in engineering.</li> <li>3. Understand methods of design of experiments.</li> <li>4. Understand need of uncertainty analysis</li> <li>5. Understand advanced measurement techniques.</li> <li>6. Select a data acquisition system for a given application.</li> </ol>
<b>Course Outcomes:-</b>	Learner will be able to- <ol style="list-style-type: none"> <li>1. Understand characteristics of measurement system</li> <li>2. Apply various techniques of curve fitting.</li> <li>3. Apply basic concepts of design of experiments.</li> <li>4. Use techniques of uncertainty analysis.</li> <li>5. Use advanced measurement techniques in experimentation</li> <li>6. Use data acquisition system (DAS) in experimentation.</li> </ol>

### Course Contents

<b>Unit 1</b>	<b>Introduction to Experimental methods</b>	<b>(06 Hrs.)</b>
<p><b>Probability and Statistics:</b> Statistical Measurement Theory, Mean Value and Uncertainty, Probability-Density Function, Histogram-Frequency distribution, Mean value and Variance, Infinite Statistics, Normal-Gaussian distribution, Normal-Gaussian distribution,</p> <p><b>Characteristics of measurement systems:</b> Dynamic characteristics of first order (liquid in glass thermometer) and second order instruments (U tube manometer). Response of first order and second order systems.</p>		
<b>Unit 2</b>	<b>Curve Fitting</b>	<b>(06 Hrs.)</b>
<p>Engineering application of curve fitting. Least squares approach, Polynomial curve fitting, Overfit and underfit. Multivariable regression analysis. Correlation coefficient. Power law and exponential curve fitting. Numericals based on practical engineering problems.</p>		

<b>Unit 3</b>	<b>Planning of Experiments</b>	<b>(06 Hrs.)</b>
Planning of experiments, various stages in experimental investigations; preliminary, intermediate and final, steady state and transient techniques, Need for design of experiments (DOE). Guidelines for performing DOE. Factorial design: Full factorial design and Fractional factorial design. $2^K$ factorial design. Taguchi method. Response surface methodology.		
<b>Unit 4</b>	<b>Uncertainty in Measurements</b>	<b>(06 Hrs.)</b>
Errors in instruments, Analysis of experimental data and determination of overall uncertainties in experimental investigation, uncertainties in measurement of parameters like pressure, temperature, flow etc. under various conditions. Estimation of uncertainty by Partial Differentiation Method (PDM), Combining uncertainty components. Student's t-test method.		
<b>Unit 5</b>	<b>Advanced Measurement Techniques</b>	<b>(06 Hrs.)</b>
Shadowgraph, Schlieren, Interferometer, Laser Doppler Anemometer, Telemetry in measurement, Orsat apparatus, Gas Analyzers, Smoke meters, gas chromatography, spectrometry, FFT analyzer.		
<b>Unit 6</b>	<b>Data Acquisition System (DAS)</b>	<b>(06 Hrs.)</b>
<b>Data Acquisition Systems:</b> Basic and automated versions of DAS. Characteristics of DAS: analogous input, sample speed, accuracy, linearity and resolution. A/D and D/A converters, Signal conditioning equipments. Case studies on selection of DAS for different experimentations. Introduction to data acquisition softwares.		

### Reference Books

1. Coleman H. W. and Steele W. G., Experimentation, Validation, and Uncertainty Analysis for Engineers, 3<sup>rd</sup> ed.: John Wiley & Sons Inc., New Jersey, 2009.
2. Grewal, B. S. Higher engineering mathematics. Khanna Publisher, New Delhi, 1996.
3. Montgomery, Douglas C. Design and analysis of experiments. Vol. 6. New York: Wiley, 2002.
4. Kumar D. S., Mechanical Measurement & Control, Metropolitan Book Co. Pvt. Ltd. New Delhi, 2007.
5. Beckwith T. G., Marangoni R. D., Lienhard J. H., Mechanical Engineering Measurements, Pearson Prentice Hall, 2007

### Assignments-

1. Problems on uncertainty analysis
2. Theory questions on introduction to experimental methods
3. Problems on practical engineering based on curve fitting
4. Theory questions on curve fitting
5. Theory questions on design of experiments
6. Practical engineering problems based on design of experiments
7. Questions based on transducers, sensors and actuators

8. Questions based on static and dynamic characteristics of instruments
9. Questions based on data acquisition system
10. Two practical oriented problems using any coding language.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## 6. INPLANT TRAINING

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: -- Hrs. / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: -- Hrs. / Week	Continuous Assessment: -- Marks	TW/OR: 04 Credits
	Term Work/ Oral: 50 Marks	Total: 04 Credits

<b>Course Prerequisites:-</b>	1. Students should have basic idea about engineering fundamentals
<b>Course Objective: -</b>	<ol style="list-style-type: none"> <li>1. Able to understand company organization and products manufactured.</li> <li>2. Able to understand economic considerations for a specific product</li> <li>3. Able to understand safe working environment in the company.</li> <li>4. Able to communicate with workers and supervisors.</li> <li>5. Able to understand various aspects of industrial practices and ethics.</li> <li>6. Able to understand exposure for real life work and internships, carrier options with different work environments.</li> </ol>
<b>Course Outcomes: -</b>	<ol style="list-style-type: none"> <li>1. Factory layout and workflow</li> <li>2. List of in-house manufactured and bought out parts and the economic considerations for a specific product.</li> <li>3. Component wise product manufacturing process chart.</li> <li>4. Your training learning, deficiencies and lapses and suggestions for improvements</li> </ol>

### **In plant training for 45 days:**

Before the VII semester, students are required go through in-plant training for 45 days in a manufacturing company. The students will show their interest of training to the faculty coordinator who will arrange their training. In case a student wishes to undergo training in a specific company, he will indicate the same to the training coordinator who after ensuring the suitability of the company will take suitable action. During the training period student will be required to strictly follow the company rules and regulations about timings and other matters will work on the assigned project. During training period the students are required to go the company daily. Their attendance record verified by the factory training in charge of the factory will be part of their project report.

### **Report:**

On completion of training, students are required to write a technical report about their training. In general the report should not exceed 50 pages of typed material. The report should cover following: Introduction-organization, its short history, products manufactured, competitors and organization's position in the market and its growth potential, production planning & control, material management, delivery of orders, off loading of work to third party cost saving or energy saving proposals, qualitative feedback from expert, study of tool room .

## 7. PROJECT STAGE -I

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 00 Hrs. / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: 02 Hrs. / Week	Continuous Assessment: -- Marks	TW/OR: 04 Credits
	Term Work/ Oral: 100 Marks	<b>Total: 04 Credits</b>
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of Mathematics & Science	
2.	Knowledge of basic concepts in heat transfer.	
3	Basic information of thermodynamics.	
4	Basic knowledge of design	
5	Knowledge of basic concepts in mechanical engineering.	
<b>Course Objectives:</b>		
1.	To identify problem for a specific need of an organization	
2.	To review literature on specific research topic	
3.	To make feasible, sustainable design	
4.	To work sincerely as a member of a team	
5.	.To communicate ideas to supervisors as well as subordinates	
6.	To develop new equipment or make modifications in existing one	
<b>Course Contents</b>		
1	The formation of a project team with members having similar interest.	
2	Discuss the ideas within the team members and choosing a faculty member interested in similar activity with the consent of the HOD. The projects can be on new equipment development, on industry sponsored problems or on research oriented subjects.	
3	Discuss the project with the Faculty with the idea that projects selected are suitable for design and fabrication with the available resources.	
4	First presentation must include following points: <ul style="list-style-type: none"> <li>• Project Aim</li> <li>• Feasible design and alternatives considered</li> <li>• Estimation of approximate cost of the project</li> <li>• Activities bar chart</li> <li>• Internal Lab resources required</li> </ul> External resources required and their availability.	
5	Second presentation consists of: <ul style="list-style-type: none"> <li>• Collection of reference material and</li> <li>• Design of the equipment with working drawings</li> </ul>	



	Stage of work completed through activities bar chart.
6	Third presentation includes complete work with suggested modifications.

## 8. Power Plant Engineering

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory:-04 Hrs. / Week	End Semester Examination: 60 Marks	TH: 04 Credits
Practical:- 02 Hrs. / Week	Continuous Assessment: 40 Marks	PR: 01 Credit
	Term Work/ Oral: 50 Marks	<b>Total : 05 Credits</b>

<b>Course Prerequisite:-</b>	<p>Student should have knowledge of:</p> <ol style="list-style-type: none"> <li>1. Basic concepts in Fluid Mechanics, Engineering Thermodynamics and Turbo-machinery.</li> <li>2. Basic concepts in Engineering Mathematics.</li> </ol>
<b>Course Objective:-</b>	<p>The student must be able to:</p> <ol style="list-style-type: none"> <li>1. Understand present status of power generation in India.</li> <li>2. Understand various aspects of steam power plant.</li> <li>3. Understand details of steam condensers, cooling towers and noozels.</li> <li>4. Understand details of renewable and hybrid power systems.</li> <li>5. Perform analysis of power plant for specific application</li> <li>6. Understand various energy storage techniques.</li> </ol>
<b>Course Outcomes:-</b>	<p>Learner will be able to understand-</p> <ol style="list-style-type: none"> <li>1. Brief overview of different types of power plants</li> <li>2. Details of non-renewable power systems.</li> <li>3. Performance of condensers, cooling towers and nozzles.</li> <li>4. Performance of renewable and hybrid power systems.</li> <li>5. Economics of power generation.</li> <li>6. Procedures for safe operation and maintenance of power plants.</li> </ol>

### Course Contents

Unit 1	Introduction to Power Engineering	(08 Hrs.)
<p>Different types of power plants–Thermal, Hydro, IC Engine, Gas Turbine, Nuclear and their characteristics, Combined Cycle, Pumped storage, Compressed air storage power plants and their characteristics. Comparison of Power plants with respect to various parameters.</p> <p>Issues in Power plants. Resources and development of power in India, NTPC, NHPC and their role in Power development in India.</p> <p>Power generation in Private sector, Power distribution, National Grid, Indian Electricity Grid Code. Regulation Structure of IEGC, Operating Policies and Procedures, Present Power position in India.</p>		

<b>Unit 2</b>	<b>Non-Renewable Power Systems</b>	<b>(08 Hrs.)</b>
<p>High pressure and Super Critical Boilers – Fluidised bed boilers.</p> <p><b>Steam power cycles-</b> Rankin cycle with reheat, regeneration. Numerical based on different combinations. Performance of boilers.</p> <p><b>Fuel and ash handling,</b> Combustion equipment for burning coal, Mechanical Stokers. Pulveriser, Electrostatic Precipitator, Draught- Different types</p> <p><b>Gas Turbine Power Plants:</b> Fuels, Gas turbine material, open and closed cycles, reheating, Regeneration and intercooling, combined cycle. Turbojet, Ramjet, Turboprop, Rocket engine.</p> <p><b>Diesel Power Plants:</b> Types of diesel plants, components, Selection of Engine type, applications.</p> <p><b>Nuclear Power Plants:</b> Nuclear reactors-PWR, BWR, CANDU, Sodium graphite, fast breeder, homogeneous; gas cooled. Advantages and limitations, nuclear power station, waste disposal.</p>		
<b>Unit 3</b>	<b>Condensers, Cooling Towers and Steam Nozzles</b>	<b>(08 Hrs.)</b>
<p><b>Steam Condensers:</b> Function of condenser in thermal power plant, Classification of condensers: Jet, Surface and Evaporative. Air leakage in condenser: sources and its effects. Condenser vacuum, Estimation of quantity of cooling water, Dalton’s law of partial pressure, Vacuum efficiency, Condenser efficiency.</p> <p><b>Cooling Towers:</b> Cooling water system, types of cooling towers. Performance assessment of cooling towers, Energy saving opportunities.</p> <p><b>Steam nozzles:</b> General forms of nozzles, Flow through steam nozzles, Velocity of steam leaving nozzle. Mass of steam discharged, Critical pressure ratio, Areas of throat and exit for maximum discharge, Length of nozzle. Efficiency of a nozzle. Effect of friction in a nozzle.</p>		
<b>Unit 4</b>	<b>Renewable and Hybrid Power Systems</b>	<b>(08 Hrs.)</b>
<p><b>Solar Power System:</b> Types of Solar Collectors, Collection efficiency, Testing of Solar collectors – IS code, Applications of solar energy. Solar Pond, Solar Energy storage and types. Photovoltaic and fuel cells.</p> <p><b>Wind power:</b> Power from wind, Site selection, Wind energy conversion systems and their classification, construction and working of typical wind mill, Design considerations for wind mills, present status.</p> <p><b>Biomass power:</b> Energy plantation, Combustion and fermentation, Anaerobic digester, Biomass gasification, Pyrolysis, various applications of Biomass energy, Bio-fuel – Relevance, types, and applications.</p> <p><b>Hybrid Power Systems:</b> Need for Hybrid systems, Range and type of hybrid systems, Case studies of Diesel-PV, Wind-PV, Micro-hydel-PV, Biomass-Diesel systems, hybrid electric vehicles, etc.</p>		
<b>Unit 5</b>	<b>Analysis of Power Plants</b>	<b>(08 Hrs.)</b>

Load Curves, Load duration curves, Performance and operational characteristics of power plants, Peak load, Intermediate load and Base load plants and their characteristics, Input output characteristics of power plants, Economic division of between Base load plant and peak load plants. Cost of energy generation, Tariff methods. Economics of load sharing, comparison of various power plants. Numericals based on the syllabus contents.		
<b>Unit 6</b>	<b>Energy Storage Technologies, Plant Safety and Maintenance</b>	<b>(08 Hrs.)</b>
<p><b>Energy Storage Technologies:</b> Pumped Hydroelectric Storage, Compressed Air Energy Storage, Battery Technologies - Traditional and Advanced, Flow Batteries, Flywheels, Superconducting Magnetic Energy Storage, Super-capacitors/Ultra-capacitors, Energy Storage Technology Comparisons, Functional Comparison, Cost Comparison.</p> <p><b>Plant Safety and Maintenance:</b> Operation and Maintenance procedures of power plants, Operator training, Safety during selection of power plant equipment –safety in commissioning of thermal power plant equipments, hydrostatic and air leakage test, acid and alkali cleaning, safety in auxiliary plants. Cooling water system, Safety in maintenance of power plants.</p>		

### Reference Books

1. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
2. John V Grimaldi and Rollin H Simonds, Safety Management
3. M. M. El Wakil, Power Plant Technology –Mc Graw Hill. Int. Edition.
4. Domkundwar and Arora, Power Plant Engineering, Dhanpatrai and Sons.
5. Grainger John J, and Stevenson Jr. W.D. Power System Analysis, McGraw Hill 1994
6. L. K. Kirchmeyer, Economic Operation of Power Systems, John Wiley and Sons, 1993.
7. C. A. Gross, Power System Analysis, John Wiley and Sons, Inc.1986.
8. John Weisman & L.E. Eckart, Modern Power Engineering, Prentice Hall, 1985
9. A course on Power Plant Engineering Ramlingam SCITECH Publication
10. S. P. Sukhatme, Solar Energy, Tata McGraw Hill, 3<sup>rd</sup>Edition 1996.
11. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers, 2011
12. P. K. Nag, Power plant Engineering, TMH, 3<sup>rd</sup> Edition 2002

### Assignments-

1. Theory questions on different types of power plants.
2. Problems on performance of steam power plant based on Rankin cycle
3. Theory questions on components of steam power plant.
4. Theory questions on gas turbine, diesel and solar power systems.
5. Theory questions on wind, biomass and hybrid power systems.
6. Practical engineering problems based on analysis of power plants.
7. Questions based on various terms related to economics of power generation.

8. Questions based on energy storage technologies.
9. Case study on electricity terrify calculation both for industry as well as household purpose.
10. Questions based on plant safety and maintenance.

**Term Work** (Any EIGHT experiments from the list below)

1. Study of National & International Grid, Indian Electricity Grid Code
2. Study of combined cycle gas based and coal based Power plant.
3. To perform analysis of a thermal power plant.
4. To perform analysis of gas turbine/ diesel/ solar power system.
5. To perform analysis of wind/ biomass power system.
6. Study of Power plant Instrumentation.
7. Visit to a thermal power plant.
8. Study of Heat Exchangers used in Power Plant
9. To study different energy storage technologies.
10. To study different types of hybrid power plants.

**Unit Tests-**

Unit Test-I	Unit-I, II and III
Unit Test-II	Unit-IV, V and VI

## 9. INDUSTRIAL PRODUCT DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: 2 Hours / Week	Continuous Assessment: 40 Marks	PR: 01 Credit
	Term Work/ Oral: 50 Marks	<b>Total: 04 Credits</b>

### Course Pre-requisites:

The Students should have knowledge of:

1.	Machine Drawing
2.	Machine Design
3.	CAD software viz. CATIA/ ProE/ SolidWorks/ UniGraphics

### Course Objectives:

Students should be able to understand

1.	Various aspects of product design and development
2.	Concept generation and selection
3.	Aesthetic and Ergonomic considerations in product design

### Course Outcomes:

Students should be able to

1.	Understand characteristics of successful product development.
2.	Understand different product design methods
3.	Estimate manufacturing cost, assembly and support costs.
4.	Understand the concept of prototyping
5.	Understand steps to establish the product specifications & concept generation,
6.	Understand ergonomic considerations in product design

### Course Contents

<b>UNIT - I</b>	<b>Introduction to Product Design and Development</b>	<b>(06 Hrs.)</b>
	Market survey. Identify customer needs and product planning processes. Product architecture: Implication of architecture, establishing the architecture, related system level design issue. Overview of industrial design, Successful product, development of quality aspect of product design; Challenges of product development.	
<b>UNIT - II</b>	<b>Product Design Methods</b>	<b>(06 Hrs.)</b>
	Creative and rational, clarifying objectives - the objective tree method, establishing functions- the function analysis method, setting requirements–the performance specification method, determining characteristics–the QFD method, generating alternatives – morphological chart method, evaluating alternatives – the weighted objective method, improving details – the value engineering method and	

	design strategies.	
<b>UNIT - III</b>	<b>Product Specifications and Concept Generation</b>	<b>(06 Hrs.)</b>
	Product specification, steps to establish the target specifications, Concept generation, five step concept generation method, concept selection, concept screening, concept testing, product architecture	
<b>UNIT - IV</b>	<b>Industrial Design and Prototyping</b>	<b>(06 Hrs.)</b>
	Its need, impact and quality, industrial design process and its management, legal issues in product design, design resources, economics and management of product development projects. Prototyping: Basics and principles of prototyping, Rapid prototyping technologies, planning for prototypes.	
<b>UNIT - V</b>	<b>Ergonomics and Industrial Safety</b>	<b>(06 Hrs.)</b>
	Introduction-General approach to the man-machine relationship-workstation design working position and posture. An approach to industrial design - elements of design structure for industrial design in engineering applications in manufacturing systems. Environmental Application of ergonomics in industry for safety, health and environment control. Safety and ISO 14000 Systems.	
<b>UNIT - VI</b>	<b>Design for Manufacture</b>	<b>(06 Hrs.)</b>
	Estimating manufacturing cost, reducing component, assembly and support costs, design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective prototyping-principle and planning. Product data management. Innovation and creativity in product design. Product costing, value engineering, aesthetic concepts.	
<b>Assignments:</b>		
1.	At least FIVE questions on market survey, concept generation and product architecture	
2.	At least FIVE questions on various product design methods	
3.	At least FIVE questions on various concepts related to design for manufacture	
4.	At least FIVE questions on industrial design and prototyping	
5.	At least FIVE questions on product specifications	
6.	At least FIVE questions on ergonomic considerations in product design	
7.	At least FIVE questions on safety considerations in product design	
8.	At least FIVE questions on concept generation	
<b>Term Work:</b> Use of different CAD software viz. CATIA/ ProE/ SolidWorks/ UniGraphics while doing following case studies:		

1.	A case study on market study to identify costumer needs
2.	A case study on use of morphological analysis
3.	A case study on Quality Function Development (QFD)
4.	A case study of one aesthetic considerations in product design
5.	Failure Modes and Effects Analysis (FMEA) in product design
6.	A case study on Design for Manufacturing
7.	A case study on Product Lifecycle Management (PLM)
8.	A case study of one ergonomic considerations in product design
9.	A case study of one industrial safety considerations in product design
<b>Text Books/Reference Books:</b>	
1.	Product Design and Development: Karl T. Ulrich, Steven G. Eppinger; Irwin McGraw Hill
2.	Product design and Manufacture: A.C. Chitale and R.C. Gupta; PHI Chitale & Gupta, "Product Development", Tata McGraw Hill
3.	New Product Development: Tim Jones, Butterworth, Heinemann, Oxford, 1997.
4.	Product Design for Manufacture and Assembly: Geoffrey Boothroyd, Peter Dewhurst and Winston Knight.
5.	Product Design : Otto and Wood; Pearson education.
6.	Industrial Design for Engineers: Mayall W.H, London, Hiffee books Ltd, 1988
7.	Introduction to ergonomics – R.C. Bridger, McGraw Hill Pub.
8.	Product Design – Kevin Otto, Kristin Wood Pierson Education
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



## 10. OPTIMUM DESIGN

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04 Hrs. / Week	End Semester Examination: 60 Marks	TH: 04 Credits
Practical: -02 Hrs. / Week	Continuous Assessment: 40 Marks	PR: 01Credits
	Term Work/ Oral: 50 Marks	<b>Total: 05 Credits</b>

### Course Pre-requisites:

The Students should have basic knowledge of

- |    |   |
|----|---|
| 1. | Student should have knowledge of Fundamentals of Engineering Mechanics      |
| 2. | Student should have knowledge of Machine Design and Computer Aided Drafting |
| 3. | Student should have knowledge of Machine Design –I & II                     |
| 4  | Student should have knowledge of Theory of Machine                          |

### Course Objectives:

To develop competency for system visualization and design.

To enable student to design pressure vessels and to use IS code.

To enable student, select materials and to design internal engine components.

To introduce student to optimum design and use optimization methods to design mechanical components.

To enable student to design machine tool gearbox.

Ability to apply the statistical considerations in design and analyze the defects and failure modes in components

### Course Outcomes:

Students will be able to understand

- |    |  |
|----|--|
| 1. | The student will understand the difference between component level design and system level design. |
| 2. | Ability to design various mechanical systems like pressure vessels, machine tool gearboxes, etc.   |
| 3. | Ability to learn optimum design principles and apply it to mechanical components.                  |

4.	Ability to handle system level projects from concept to product	
<b>UNIT - I</b>	<p><b>Design of Bevel Gear and Worm gears</b></p> <p>Introduction, classification of bevel gears, terms used in bevel gears, formative or equivalent number of teeth for bevel gears, forces acting on a bevel gear, strength of bevel gears</p> <p><b>worm and worm wheel:</b> Introduction, terms used in worm gearing, forces acting on worm gears, strength of worm gear teeth, wear tooth load for worm gear, efficiency of worm gearing, thermal rating of worm gearing</p>	<b>(06 Hours)</b>
<b>UNIT - II</b>	<p><b>Design of Machine Tool Gearbox</b></p> <p>Introduction to machine tool gear boxes, design and its applications, basic considerations in design of drives, determination of variable speed range, graphical representation of speed and structure diagram, ray diagram, selection of optimum ray diagram, deviation diagram, difference between numbers of teeth of successive gears in a change gear box.</p>	<b>(06 Hours)</b>
<b>UNIT - III</b>	<p><b>Statistical Considerations in Design.</b></p> <p>Frequency Distribution-Histogram and frequency polygon, normal distribution-units of central tendency and dispersion – standard deviation- population combinations – design for natural tolerances – design for assembly- statistical analysis of tolerances, mechanical reliability and factor of safety.</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Pressure Vessels</b></p> <p>Introduction, Classification of Pressure Vessels, Stresses in a Thin Cylindrical Shell due to an Internal Pressure, Circumferential or Hoop Stress, Longitudinal Stress, Thin Spherical Shells Subjected to an Internal, Thick Cylindrical Shell Subjected to an Internal Pressure, Compound Cylindrical Shells, Stresses in Compound Cylindrical Shells, Cylinder Heads and Cover Plates, Autofrettage.</p>	
<b>UNIT - V</b>	<p><b>Optimum Design</b></p> <p>Objectives of optimum design, adequate and optimum design, Johnson's Method of optimum design, primary design equations,</p>	<b>(06 Hours)</b>

	subsidiary design equations and limit equations, optimum design with normal specifications of simple machine elements- tension bar, transmission shaft and helical spring, Pressure vessel. Introduction to redundant specifications (Theoretical treatment).	
<b>UNIT - VI</b>	<p><b>Product Design Processes and Design Economics</b></p> <p>Technological innovation, product and process cycles, designing to codes and standards, design for manufacture and assembly, importance of economic decision making, value engineering, legal and ethical issues in design. Introduction to Design of Experiment.</p> <p>Mathematics of time value of money, cost comparison, depreciation, profitability of investments, benefit-cost analysis</p>	<b>(06 Hours)</b>
<b>Term Work/Practical's:</b>		
<b>Assignments:</b>		
<p><b>1. One design project</b></p> <p>The design project shall consist of two imperial size sheets (Preferably drawn with 3D/2D CAD software)-one involving assembly drawing with a part list and overall dimensions and the other sheet involving drawings of individual components, manufacturing tolerances, surface finish symbols and geometric tolerances must be specified so as to make it working drawing. A design report giving all necessary calculations of the design of components and assembly should be submitted. Projects shall be in the form of design of mechanical systems including pressure vessel, multispeed gear box, etc.</p>		
<p><b>2.</b> Collect information about gear manufacturer along with catalog and identify designation, standards.</p>		
<p><b>3.</b> Write a brief note on Statistical Considerations in Design with reference to any case study.</p>		
<p><b>4.</b> Collect detailed information about pressure vessels types, uses, advantages, disadvantages with photos.</p>		
<p><b>5.</b> Discuss different modern software tools used for design optimization.</p>		
<p><b>6.</b> Write assignment on Digital Manufacturing.</p>		
<b>Text Books /Reference Books:</b>		
1	Bhandari V.B.— Design of Machine Elements, Tata McGraw Hill Pub. Co. Ltd.	
2	Juvinal R. C, Fundamentals of Machine Components Design, Wiley, India	
3	Black P. H. and O. Eugene Adams, —Machine Design, McGraw Hill Book Co. Inc.	

4	Johnson R. C., —Mechanical Design Synthesis with Optimization Applications, Von Nostr and Reynold Pub
5	S. K. Basu and D. K. Pal,—Design of Machine Tools Oxford and IBH Pub Co.
6	Rudenko, Material Handling Equipment, M. I. R. publishers, Moscow
7	P. Kanniah, Design of Transmission systems, SCIETCH Publications Pvt. Ltd
8	Pandy, N.C.and Shah, C. S.,—Elements of Machine Design—,Charotar Publishing House.
9	Singiresu S. Rao, Engineering Optimization: Theory and Practice, ,John Wiley & Sons.
10	M. V. Joshi, Process Equipment Design, Mc-Millan.
11	Design Data—,P.S.G.College of Technology, Coimbatore
12	I.S. 2825: Code for unfired pressure vessels
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Elective III: 11.1. INDUSTRIAL AUTOMATION AND ROBOTICS</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	PR: -- Credits
	Term Work/ Oral: -- Marks	<b>Total: 03 Credits</b>
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of Mathematics & Theory of Machines	
2.	Knowledge of Automatic Control Systems	
3.	Knowledge of Sensors and Transducers	
<b>Course Objectives:</b>		
1.	To inculcate the basic concepts, parts of robots and types of robots	
2.	To make the student familiar with the various drive systems for robot, sensors and their applications in robots and programming languages of robots	
3.	To create manpower for working on robot	
<b>Course Outcomes:</b>		
After the successful completion of this course, the student will be able,		
1.	To identify potential areas for automation and justify need for automation.	
2.	To do line balancing of an automation system.	
3.	To explain the basic principles of robotic technology, configurations, control and programming of robots.	
4.	To select suitable sensor & design robotic gripper for different applications.	
5.	To analyze robots through kinematic and dynamic study.	
6.	To explain the basic principles of robot programming language and Identify typical robot applications.	
<b>Course Contents</b>		
<b>UNIT I</b>	<b>Introduction to Industrial Automation</b>	<b>(06 Hrs.)</b>

	Automation and Robotics, Historical Development, Basic concept of automation, Building Blocks of Automation Systems- Sensors, Analyzers, Actuators, Drives. Types of automation: fixed, flexible and programmable and their comparative study. Concept of Mechanization of Parts Handling.	
<b>UNIT II</b>	<b>High Volume Manufacturing System</b>	<b>(06 Hrs.)</b>
	Transfer Lines, Detroit type automation-Design and fabrication considerations. Analysis of automated flow lines- technology, analysis of transfer lines without storage, partial automation and automated flow lines with storage buffers, computer simulation of automated flow lines. Assembly system and line balancing- computerized line balancing methods.	
<b>UNIT III</b>	<b>Fundamentals of Robot Technology</b>	<b>(06 Hrs.)</b>
	<p><b>Fundamentals of Robotics:</b> Robot Definitions, Laws of Robotics, Basic Structure of Robots, links and Joints, types of Joints, types of links, types of end effectors, Wrist configuration: concept of: yaw, pitch and roll. Robot Anatomy, work volume, work envelope, robot manipulator. Specifications of robot: degrees of freedom (DOF), accuracy, repeatability, spatial resolution, compliance, loads carrying capacity, speed of response.</p> <p><b>Classification of Robots-</b> 1) Co-ordinate system: Cartesian, cylindrical, spherical, SCARA, articulated 2) Control Method: Servo controlled and non-servo controlled, their comparative study 3) Form of motion: P-T-P (point to point), C-P (continuous path), pick and place etc. and their comparative study 4) Drive Technology: Hydraulic, Pneumatic, Electric (stepper motor, D.C. servo motor) in detail with selection criteria. Motion conversion: Rotary to rotary, rotary to linear and vice versa.</p>	
<b>UNIT IV</b>	<b>Sensors and End-Effectors in Robotics</b>	<b>(06 Hrs.)</b>
	<b>Sensors and Transducers in Robotics:</b> Uses of Sensors in Robotics, type of sensors in robot systems, non-optical and optical position sensors, Touch Sensors-Tactile sensor, Pressure sensors, colour sensor, gas sensor and flexible force sensor, Torque sensors, Light sensors, Voice Communication.	

	<b>End-Effectors in Robotics:</b> Classification of End Effectors, Drive system for end effectors, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, adhesive Grippers, Hooks, Scoops, Tools as end effectors. Gripper force analysis and gripper design- Simple problems, Active and Passive Grippers.	
<b>UNIT V</b>	<b>Robot Kinematics and Dynamics</b>	<b>(06 Hrs.)</b>
	Introduction to manipulator kinematics, position representation, forward and reverse transformation of two degree of freedom robot arm, four degree of freedom manipulator in three dimensions. Robot Dynamics, D Alembert's Equations of Motion.	
<b>UNIT VI</b>	<b>Robot Programming Languages and Industrial Applications</b>	<b>(06 Hrs.)</b>
	<b>Robot Programming Languages:</b> Concept of on-line and off line programming, concept of teach pendant. Methods of robot programming- Lead through methods, Textual robot languages and their Features. <b>Applications of Robots:</b> Robot applications based on surveillance system, machining, material handling, house hold and service sector. Applications of Telechiric robots.	
<b>Assignments:</b>		
1.	At least five theory questions based on identifying the industrial applications of robotics & automation.	
2.	At least five theory questions on identifying the industrial applications of automation with building blocks.	
3.	At least five theory questions on identifying the fixed, flexible and programmable automation.	
4.	At least five theory questions on high volume manufacturing system.	
5.	At least five theory questions on study of line balancing of an automation system.	
6.	At least five PLC programs based on pick and place robot.	
7.	At least five theory questions based on fundamentals of robotics.	
8.	At least five theory questions based on selection of sensors.	
9.	At least five theory /numerical questions based on selection of end effectors of robot.	

10.	At least five theory /numerical questions based on robot kinematics and dynamics.
11.	At least five theory questions based on robot programming language and robot applications.
12.	At least five theory questions on identifying the industrial applications of robots.
<b>Text Books/Reference Books:</b>	
1.	“Industrial Robotics”, Groover, Weiss, Nagel, McGraw Hill International
2.	Automation, Production Systems and Computer Integrated Manufacturing M.P.Groover, Pearson Education.5th edition, 2009
3.	Introduction to Robotics- John J. Craig, Addison Wesley Publishing, 3rd edition, 2010
4.	Robotics Technology and Flexible Automation, Second Edition, 2010 McGraw Hill Education (India) Private Limited
5.	P.A. Janaki Raman, Robotics and Image Processing an Introduction, Tata McGraw Hill Publishing company Ltd., 1995.
6.	Stuart A Boyer: SCADA supervisory control and data acquisition, International Society of Automation, 2010.
7.	A Robot Engineering Textbook “– Mohsen Shahinpoor – Harper & Row publishers, New York
8.	“Anatomy of Automation”- Amber G.H & P. S. Amber, Prentice Hall. Principles of CIM by Vajpayee, PHI.
9.	R. K. Mittal, I. J. Nagrath, "Robotics and Control", Tata McGraw Hill Publishing Company Ltd., New Delhi.
10.	Robert J. Schilling, "Fundamentals of Robotics: Analysis and Control", Prentice Hall of India, New Delhi
11.	Arthur J. Critchlow, "Introduction to Robotics", Macmillan Publishers Limited, 1985
12.	Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, "Industrial Robotics: Technology, Programming and Applications", McGraw Hill Book Company
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



### Elective III: 11.2 CRYOGENICS

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
Practical: - Hours / Week	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	

#### Course Pre-requisites:

The Students should have

1. Knowledge of heat transfer.
2. Knowledge of refrigeration and air conditioning.

#### Course Objectives:

1. To introduce Governing Equations of viscous fluid flows
2. To introduce numerical modeling and its role in the field of fluid flow and heat transfer
3. To enable the students to understand the various discretization methods

#### Course Outcomes:

Students will be able to understand

1. Student should able to understand cryogenic systems
2. Student should able to understand Behavior of materials at low temperature
3. Student should able to understand Gas Liquification Systems
4. Student should able to understand Gas Separation And Purification Systems
5. Student should able to understand Measurement Systems For Low Temperatures , Fluid Storage And Transfer Systems
6. Student should able to understand Application Of Cryogenic Systems

#### Course Contents

UNIT - I	Introduction to Cryogenic and properties of materials	(06 Hrs.)
	History and development it's importance, cryogenic temperature scale. Low temperature properties of materials, Mechanical properties Thermal properties, electric and magnetic properties, Properties of cryogenics& fluids.	
UNIT - II	Gas Liquification Systems	(06 Hrs.)
	Introduction- production of low temperature , Liquefaction systems for N <sub>2</sub> , Neon, Hydrogen, He etc.(Numerical Treatment)	
UNIT - III	Cryocoolers	(06 Hrs.)
	Regenerative systems – Overview of regenerative coolers, Introduction to Pulse Tube Coolers, Stirling Coolers, G-M Coolers, J-T Coolers, Cryocooler applications.	

<b>UNIT - IV</b>	<b>Gas Separation And Purification Systems</b>	<b>(06 Hrs.)</b>
	Thermodynamically ideal separation systems- properties of mixtures , principles of gas separation Rectification column- Linde single and double column system of air separation.	
<b>UNIT - V</b>	<b>Fluid Storage And Transfer Systems</b>	<b>(06 Hrs.)</b>
	Dewar vessel, insulation types and importance. Components of transfer system with importance. Importance of vacuum and it's measurement.	
<b>UNIT - VI</b>	<b>Application Of Cryogenic Systems</b>	<b>(06 Hrs.)</b>
	Applications in mechanical, electrical, food preservation, biological and medical, space technology etc.	
<b>Assignments:</b>		
Assignments will be based on above syllabus		
1.	History and development it's importance, cryogenic temperature scale.	
2.	Low temperature properties of materials, Mechanical properties Thermal properties, electric and magnetic properties	
3.	Introduction- production of low temperature , Liquefaction systems for N2	
4.	Liquefaction systems for Neon, Hydrogen, He	
5.	Regenerative systems – Overview of regenerative coolers, Introduction to Pulse Tube.	
6.	Stirling Coolers, G-M Coolers, J-T Coolers, Cryocooler applications.	
7.	Thermodynamically ideal separation systems- properties of mixtures , principles of gas separation Rectification column- Linde single	
8.	Dewar vessel, insulation types and importance.	
9.	Components of transfer system with importance. Importance of vacuum and it's measurement	
10.	Applications in mechanical, electrical, food preservation, biological.	
<b>Text Books/Reference Books:</b>		
1.	Cryogenics systems – Randall Barron – Mc Graw Hill Book Co	
2.	Cryogenic Engineering – R. B. Scott – Van Nosfrand Co.	
3.	Cryogenic Engineering –J. H. Bell – Prentice Hall	
4.	Cryogenic Engineering – R. W. Vance – John Welley	
5.	Cryocoolers - Walkers – Prentice Hill Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

<b>Elective III: 11.3 PROJECT MANAGEMENT &amp; ETHICS</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	
	Term Work/ Oral: -- Marks	<b>Total: 03 Credits</b>
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of general management.	
<b>2.</b>	Basic knowledge of statistics	
<b>3.</b>	Basic knowledge of industrial management	
<b>Course Objectives:</b>		
	The objective of the course is to create awareness of the concept of project management and its components to students	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	Project management and its importance.	
<b>2.</b>	Various techniques used to analyze a project.	
<b>3.</b>	Methods for cost estimation of a project.	
<b>4.</b>	Methods for planning and scheduling of a project.	
<b>5.</b>	Methods for monitoring and control of projects.	
<b>6.</b>	Project management and business ethics.	
<b>UNIT - I</b>		
<b>Introduction to Project Management</b>		<b>(06 Hours)</b>
	Project, Project Management, Management by projects, Project Management Associations, Benefits of Project Management, Project management Process, Role of Project Manager. Project Lifecycle	

<b>UNIT - II</b>	<b>Project Management Techniques and Risk Management</b>	<b>(06 Hours)</b>
	<p>Feasibility Studies, Numerical Models (Payback Period, Return on Investment, Net Present Value, Internal rate of Return), Scoring Models, Break Even Analysis</p> <p>Project Risk Management: Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks.</p> <p>Use of excel and MS project for feasibility studies and risk management.</p>	
<b>UNIT - III</b>	<b>Project Cost Estimating</b>	<b>(06 Hours)</b>
	<p>Estimating terminology, Project Costs, Estimating Methods (Jobbing, Factoring, Inflation, Economies of Sales, Unit Rates, Day Work), Analogous Estimating, Parametric Estimating, Bottom-Up Estimating, Three-Point Estimates, Monte Carlo Simulation, Project Budgeting, Resource Allocation, Cost Forecasts</p> <p>Use of excel and MS project for project cost estimating</p>	
<b>UNIT - IV</b>	<b>Project Planning and Scheduling</b>	<b>(06 Hours)</b>
	<p>Project Planning: Introduction, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS)</p> <p>Scheduling: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System</p> <p>Use of MS project Project Planning and Scheduling</p>	
<b>UNIT - V</b>	<b>Project Monitoring and Control</b>	<b>(06 Hours)</b>
	<p>Project Execution and Control: Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control</p> <p>Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS, Design of PMIS</p> <p>Project Performance Measurement and Evaluation: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement</p>	

	and Evaluation, Controlling the Projects	
<b>UNIT - VI</b>	<b>Professional Responsibility (Ethics)</b>	<b>(06 Hours)</b>
	Ensuring Integrity and Professionalism, Project Management Knowledge Base, Enhancing Individual Competence, Balancing Stakeholder Interests, Interactions with Team Members and Stakeholders, Templates, Tools and Techniques	
<b>Assignments:</b>		
<b>1.</b>	At least five questions based on the introduction to project management	
<b>2.</b>	Case study involving various aspects of project.	
<b>3.</b>	Case study involving various techniques used for project selection.	
<b>4.</b>	At least five Numericals on various techniques used for project selection.	
<b>5.</b>	Case study of project cost estimation	
<b>6.</b>	At least five Numericals on project cost estimation	
<b>7.</b>	Case study of project scheduling	
<b>8.</b>	At least five Numericals on project scheduling	
<b>9.</b>	Case study based on project scheduling	
<b>10.</b>	At least five questions based on project monitoring	
<b>11.</b>	At least five questions based on ethics	
<b>12.</b>	Industrial case study of project ethics	
<b>Text Books/Reference Books:</b>		
1	Project Management Institute; "A Guide to the Project Management Body of Knowledge (PMBOK Guide)"; 5th Revised edition (1 January 2013)	
2	Harold Kerzner; "Project Management: A Systems Approach to Planning, Scheduling and Controlling Paperback"; Wiley; tenth edition (20 November 2012)	
3	Erik Larson, Clifford Gray; "Project Management: The Managerial Process"; McGraw Hill Education; Sixth edition (1 July 2014)	
4	Panneerselvam R; "Project Management"; Prentice Hall India Learning Private Limited; 1 Edition (2009)	

5	Samuel J. Mantel, Jack R. Meredith; "Project Management: A Managerial Approach"; Wiley; Eighth edition (6 August 2012)
6	Gupta R; "Project Management"; Prentice Hall India Learning Private Limited; Second edition (2014)
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Elective III: 11.4. TOTAL QUALITY MANAGEMENT</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	Total: 03 Credits
	Term Work/ Oral: -- Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basics of Quality Control	
<b>2.</b>	Basics of Measurements and measuring Instruments	
<b>3.</b>	Knowledge of Statistics.	
<b>Course Objectives:</b>		
To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management and to understand the statistical approach for quality control.		
<b>Course Outcomes:</b>		
<b>1.</b>	Implement the principles of total quality management.	
<b>2.</b>	Apply six sigma concepts and increase the quality of product.	
<b>3.</b>	Make use of TQM techniques	
<b>4.</b>	They will be able to implement TQM Tools.	
<b>5.</b>	Execute Quality standards in companies	
<b>6.</b>	Make use of Advanced Techniques of Total Quality Management like Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering	
<b>UNIT-I: Quality &amp; Total Quality Management</b>		<b>(06 Hrs)</b>
Quality, Definitions of Quality, New philosophy of quality, Product quality, & its prospects. Overview of TQM : Concept & definition, Fundamentals, Principles of TQM, Elements of TQM, Approaches of TQM, Models of TQM, Zero defect concept, Benefits of TQM. Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits,		
<b>UNIT-II: Quality Assurance</b>		<b>(06 Hrs)</b>
Basic concepts, Quality assurance input – process – output. Significance of feedback for Quality assurance, Process capability analysis, Concept of Six Sigma. Internal customer approach, Customer – Satisfaction, data collection & complaint, Redressal mechanism.		
<b>UNIT-III: TQM Tools</b>		<b>(06 Hrs)</b>

Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure, Just – in- Time, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA., FMEA, TPM.	
<b>UNIT-IV: TOYOTA Production System and Lean Manufacturing</b>	<b>(06 Hrs)</b>
History of TPS. History, Scope, What is lean production? – Introduction, background, and lean thinking. Lean production preparation – System assessment, process and value-stream mapping – Sources of waste. Lean production processes, approaches and techniques. —Importance of focusing upon flow. Tools include: a. Workplace organization – 5S. b. Stability. c. Just-In-Time – One piece flow – Pull. d. Cellular systems. e. Quick change and set-up reduction methods. f. Total productive maintenance. g. Poka-Yoke – mistake proofing, quality improvement. h. Standards. i. Leveling. j. Visual management. Employee involvement – Teams – Training – Supporting and encouraging involvement – Involving people in the change process -- communication -- Importance of culture	
<b>UNIT-V: Quality Systems</b>	<b>(06 Hrs)</b>
Policy & objectives, Quality standards, Concept of quality system standards, Relevance & origin of ISO 9000–2000 standard & certification, Benefits. Elements of ISO 9001, 9002, 9003 series–Clauses, contents, interpretations & implementation. TS - 16949, QS-9000, ISO 14000, OHSAS	
<b>UNIT-VI: Advanced Techniques of Total Quality Management</b>	<b>(06 Hrs)</b>
Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering –Loss function, orthogonal arrays, Signal to noise ratio, parameter design & tolerance design. Total Quality in service sector. S. S. Technique, Kanban (Little's Law for KANBAN system)	
<b>Term work:</b> Detail Study and Presentations on Above topics to be submitted.	
<b>Assignments</b>	
<ol style="list-style-type: none"> <li>1. Assignment on TQM</li> <li>2. Assignment on Six sigma concept.</li> <li>3. Assignment on TQM principles.</li> <li>4. Assignment on TQM tools.</li> <li>5. Assignment on Quality Systems</li> <li>6. Assignment on Advanced Techniques of Total Quality Management</li> </ol>	



**Text Books/ References**

1. Sundar Raju, "Total Quality Management", Tata McGraw Hills.
2. M. Zairi, "Total Quality Management for Engineers", Aditya Books.
3. ISO 9000 Quality System", Dalela& Saurabh, Standard Publishers.
4. R.C. Gupta, "Statistical Quality Control".
5. Grant E. L. & R. Leavenworth, "Statistical Quality Control", Tata McGraw Hills
6. TapanBagchi, "Taguchi Methods Management", Pearson Education.
7. Feigenban, "Total Quality Control", Tata McGraw Hills.
8. Total Quality Management Handbook, J. K. Hradeskym, Tata McGraw Hills.

**Unit Test**

Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V, VI

**Elective III: 11.5. FINITE ELEMENT ANALYSIS**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	TH: 03 Credits
	Continuous Assessment: 40 Marks	Total :03 Credits
	Term Work/ Oral: -- Marks	

**Course Pre-requisites:** Students should have knowledge of Engineering Mathematics-I, Strength of Machine Elements, Numerical Methods, Machine Design and Heat Transfer.

**Course Objectives:**

- To develop the finite element formulation for a model one-dimensional problem like axially loaded bar for the case of simplest approximation (i.e., linear approximation).
- Develop the Shape Functions for Various Elements.
- To discuss the possible refinements of the simplest approximation.
- To develop the frame work of a finite element code to solve the one-dimensional problem.
- To extend the finite element formulation to other one-dimensional problems like the beam problem.
- To develop the two-dimensional finite element formulation for a model 2-D problem like 2-D steady-state heat conduction problem.

**Course Outcomes:**

- Students will be able to understand Formulation of Finite Element Method.
- Students will be able to solve 1 D Problems.
- Students will be able to solve 2 D Structural and Thermal Problems.
- Students will be able to analyze Mechanical Engineering real life problems.
- Students will be able to solve Mechanical Engineering Problems subjected to Heat Transfer.
- Students will be able to solve Mechanical Engineering Problems subjected to Mechanical Vibration.

<b>UNIT – I</b> <b>(6 Hrs.)</b>	<b>Introduction</b> Basic Steps in FEM Formulation, Error Analysis P & h formulation; Stress Equilibrium equation; Strain displacement equation; Stress-Strain equation; Introduction to Solvers; Variational Approach, Ritz Method. Derivation of Elemental Equations, Assembly, Imposition of Boundary Conditions, Solution of the Equations. Computer implementation: Pre-processor, Processor, Post-processor.
<b>UNIT – II</b> <b>(6 Hrs.)</b>	<b>One Dimensional Problem</b> 1 -D Elements, Relationship between Global and Natural coordinate system; Formulation of Element Stiffness Matrix and Load Vector by Potential Energy approach; Shape Functions using LAGRANGE Polynomials for Two noded Bar Element, Rectangular Element, hexahedron Brick Element; Convergence Criteria, Temperature effect.
<b>UNIT – III</b> <b>(6 Hrs.)</b>	<b>Two Dimensional Problem</b> Plain Stress , Plain Strain; Types of 2 D Element, Formulation of Element Stiffness matrix and Load Vector for Constant Strain Triangles, Formulation of Element Stiffness matrix and Load Vector for 2D Trusses; Introduction to Higher Order Elements.
<b>UNIT – IV</b> <b>(6 Hrs.)</b>	<b>Axisymmetric Formulation:</b> Stress calculation and Temperature effect on Flywheel using Galerkin Approach; Isoparametric Elements; Element Quality Criterion; Full and Reduced integration; Sub Modelling and Sub Structuring.
<b>UNIT – V</b> <b>(6 Hrs.)</b>	<b>1D Steady State Heat Transfer:</b> Governing Differential Equation; Steady State Heat transfer Formulation of 1 D Element for Conduction and Convection; Boundary Conditions and Solving for Temperature Distribution; 1D Heat Transfer Steps involved in Processing Steps.
<b>UNIT – VI</b> <b>(6 Hrs.)</b>	<b>Dynamic Analysis:</b> Lumped mass and Consistent Mass Matrices; Free Vibration Problems, Formulation of Eigen Value and Eigen Vector Problem by Power Method, Step wise solution of Problems on Vibration in Bar Element; FEM Formulation. Time-dependent Problems.
<b>Term Work/Practicals:</b>	
1. Structural Analysis of Corner Bracket, Truss Structure and Spring.	
2. Static and Dynamic Analysis of Cantilever Beam.	
3. Modal analysis of Simple Pendulum.	
4. Steady State Heat Transfer through a Plate with Hole.	
5. Analysis of Connecting Rod.	

6. Analysis of Composite Leaf Spring.	
7. Analysis of Piston.	
8. Analysis of Burnished Components.	
9. Analysis of Knuckle Joint.	
10. Analysis of Screw Jack.	
<b>Assignments:</b>	
1. Introduction to Finite Element method.	
2. Derivations and Numerical on Variational Approach and Ritz Method.	
3. Derivations and Numerical on Potential Energy Approach.	
4. Determination of Shape Functions for Various Elements.	
5. Derivations and Numerical on CST Elements.	
6. Derivations and Numerical on Trusses.	
7. Stress calculation and Temperature effect on Flywheel using Galerkin Approach.	
8. Isoparametric Elements: Full and Reduced integration methods Numerical.	
9. Derivation and Numerical on Steady State Heat transfer Formulation of 1 D Element for Conduction and Convection by Differential Equation.	
10. Analysis of any one Mechanical Component subjected to Heat transfer.	
11. Determination of Eigen value and Eigen vector for any Mechanical component.	
12. Analysis of Time Dependent problem.	
<b>Text Books/Reference Books:</b>	
1	S. S. Rao, The Finite Element Methods in Engineering, Pergomon Press Oxford, 2nd edition, 1989
2	Sagarlind L. J, Applied Finite Element Analysis, John Wiley, 1984
3	Chandrupatla & Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall, 1999
4	Reddy. J.N, An Introduction to Finite Element Methods, Tata McGraw Hill, 1997
5	Cook, Robert, Davis Etal, Concept & Applications of Finite Element Analysis, John Wiley & Sons, 1999

<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



## 12. PROJECT STAGE -II

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 00 Hours / Week	End Semester Examination: -- Marks	TH: -- Credits
Practical: - 04 Hours / Week	Continuous Assessment: -- Marks	TW/OR: 08 Credits
	Term Work/ Oral: 200 Marks	<b>Total: 08 Credits</b>

### **Course Pre-requisites:**

The Students should have

1	Knowledge of basic concepts in heat transfer.
2	Basic information of thermodynamics
3	Basic knowledge of fluid mechanics.
4	Knowledge of basic concepts in mechanical engineering
5	Basic knowledge of design

### **Course Objectives:**

1.	To fabricate the designed equipments
2.	To conduct laboratory and field testing of the new equipment
3.	To analyze performance of the equipment with different performance parameters
4.	To make changes in design if necessary based on the performance analysis
5.	To prepare project report and deliver presentation
6.	To work sincerely as a member of team

### **Course Contents**

The project taken in the First semester will be continued as far as possible. In case after the training, the students wish to change their project, the same may be allowed after discussion with the faculty. The new project should be based on the training taken and should utilize the training experience.

In Semester II concentration will be on

1. Hard ware fabrication
2. Testing of equipment
3. Preparing a project report

The work will be evaluated through three presentations with aim of watching the progress and suggesting modifications for completing the project.

**BHARATI VIDYAPEETH  
DEEMED UNIVERSITY, PUNE**

**B. Tech. (Production) - 2014 Course**

**SEM-I**

S. N	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks								Total Credit							
					End Sem Exam	Continuous Assessment			TW	TW / OR	TW / Pr	Total					T H	T	P r	Total
						UT	Att .	As s												
1.	Engineering Mathematics – I	3	1	-	60	20	10	10	-	-	-	100	3	1		4				
2.	Fundamentals of Civil Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4				
3.	Engineering Graphics	4	-	2	60	20	10	10	25	-	-	125	4		1	5				
4.	Engineering Physics	4	-	2	60	20	10	10	25	-	-	125	4		1	5				
5.	Fundamentals of Electrical Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4				
6.	Professional skill Development	2	-	-	30			20	-	-	-	50	2		-	2				
7.	Workshop Technology	-	-	2	-	-	-		50	-	-	50	-		1	1				
	<b>Total</b>	19	1	10	330	100	50	70	150	-	-	700	19	1	5	25				



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**B. Tech. (Production) - 2014 Course**

**SEM-II**

S. N	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks								Total Credit			
		L	T	P	End Sem Exam	Continuous Assessment			TW	TW / OR	TW / Pr	Total	T H	T	P r	Total
						UT	At t	As s								
1.	Engineering Mathematics – II	3	1	-	60	20	10	10	-	-	-	100	3	1		4
2.	Fundamentals of Mechanical Engineering	3	-	2	60	20	10	10	25	-	-	125	3		1	4
3.	Engineering Mechanics	4	-	2	60	20	10	10	25	-	-	125	4		1	5
4.	Engineering Chemistry	4	-	2	60	20	10	10	25	-	-	125	4		1	5
5.	Mechanical Engineering Drawing	2	-	4	60	20	10	10	25	-	-	125	2		2	4
6.	Professional skill Development	2	-	-	30			20	-	-	-	50	2		-	2
7.	Production Practice- I	-	-	2	-	-	-	-	50	-	-	50	-		1	1
	<b>Total</b>	18	1	12	330	100	50	70	150			700	18	1	6	25

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**ENGINEERING MATHEMATICS-I**

**Teaching Scheme:**

**Lectures: 3Hrs/Week**

**Tutorials: 1Hr/Week**

**Examination scheme:**

**Semester Examination: 60 marks**

**Continuous Assessment: 40 marks**

**Credits Allotted:**

**Theory : 03**

**Tutorial : 01**

**Unit I**

**MATRICES**

Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors, Cayley – Hamilton Theorem. Application to problems in Engineering .

**(08 Hours)**

**Unit II**

**COMPLEX NUMBERS AND APPLICATIONS**

Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.

**(08 Hours)**

**Unit III**

**DIFFERENTIAL CALCULUS**

Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem.

**EXPANSION OF FUNCTIONS**

Taylor's Series and Maclaurin's Series.

**(08 Hours)**

**Unit IV**

**DIFFERENTIAL CALCULUS**

Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits.

**INFINITE SERIES**

Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.

**(08 Hours)**

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**Unit V**

**PARTIAL DIFFERENTIATION AND APPLICATIONS**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.

**(08 Hours)**

**Unit VI**

**JACOBIAN**

Jacobians and their applications, Chain Rule, Functional Dependence.

**MAXIMA AND MINIMA**

Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.

**(08 Hours)**

**Assignments**

1. Rank ,System of Linear Equations.
2. Complex Numbers.
3. Differential Calculus and Expansion of Functions.
4. Indeterminate Forms and Infinite Series.
5. Partial Derivatives, Euler's Theorem on Homogeneous Functions.
6. Jacobians, Maxima and Minima of Functions of two variables.

**References / Text Books :**

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
3. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008) .
4. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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<b>02: Fundamentals of Civil Engineering</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Concepts of units and conversions of units.	
2.	Basic knowledge of Chemistry	
3.	Basic knowledge of geography, concept of latitude and longitude.	
<b>Course Objectives:</b>		
	To make student understand the scope and application of Civil Engineering	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Different building components and material	
2.	Classification of surveying	
3.	Levelling of the ground	
4.	Planning of building	
5.	Methods of irrigation and water supply	
6.	Different methods of transportation	
<b>UNIT - I</b>	<b>Civil Engineering Scope And Applications.</b>	<b>(06 Hours)</b>
	Civil Engineering scope, importance and applications to other disciplines of Engineering; Civil Engineering construction process and role of Civil engineer; Government authorities related to Civil Engineering; Types of structures based on loading , material and configuration; Building components and their functions; Civil Engineering materials: concrete, construction steel, bricks, flooring material and tiles, paints, plywood , glass and aluminum.	
<b>UNIT - II</b>	<b>Surveying</b>	<b>(06 Hours)</b>
	Objectives, Principles and Classification of Surveying; Linear, angular, Vertical and area Measurements and related instruments.	
<b>UNIT - III</b>	<b>Building Planning And Bye Laws</b>	<b>(06 Hours)</b>
	Site selection for residential building; Principles of building planning; Building bye laws- necessity, Floor Space Index, Heights , open space requirements, set back distance , ventilation and lighting, concept of carpet and built up area, minimum areas and sizes for residential buildings ; Concept of Eco friendly structures	

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	and Intelligent buildings.	
<b>UNIT - IV</b>	<b>Foundations and Earthquakes</b>	<b>(06 Hours)</b>
	Function of foundation, concept of bearing capacity and its estimation, types of foundation and its suitability, causes of failure of foundation. Earthquakes causes, effects and guidelines for earthquake resistant design, earthquake zones.	
<b>UNIT - V</b>	<b>Irrigation And Water Supply</b>	<b>(06 Hours)</b>
	Rainfall measurement and its use in design of dams; Types of dams, canals, methods of irrigation and their merits and demerits; hydropower structures ;Water supply, drinking water requirements and its quality, water and sewage treatment flow chart.	
<b>UNIT - VI</b>	<b>Infrastructure</b>	<b>(06 Hours)</b>
	Roads- types of roads and their suitability, cross section of roads, meaning of terms ; width of roads, super elevation, camber, gradient ,sight distance, materials used for construction of roads. Railways- Types of gauges, section of railway track, components of railway track, advantages. Bridges: Components - Foundation, Piers, Bearings, Deck. Airways- Components -Runway, Taxiway and Hangers.	
<b><u>Term Work:</u></b>		
( Term work shall consist of any eight exercises from the list given below.)		
1.	Study and use of prismatic compass and measurement of bearings.	
2.	Study and use of Dumpy level and reduction of levels by collimation plane method.	
3.	Area measurement by Digital Planimeter.	
4.	Drawing plan and elevation of a residential bungalow.	
5.	Study of features of topographical maps.	
6.	Assignment on collection of information on Civil Engineering materials.	
7.	Assignment on types of foundations.	
8.	Assignment problem on irrigation and hydropower structures.	
9.	Assignment on study of flow chart of water and sewage treatment.	
10.	Assignments on types of transportation systems.	
<b>Text Books:</b>		

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1.	“ Surveying- Vol I “ - S.K. Duggal , Tata McGraw Hill Publication.
2.	“Built Environment” – Shah , Kale, Patki, , Tata McGraw Hill Publication
3.	“Building Construction” – Dr. B.C. Punmia , Laxmi Publication
4.	“Irrigation and water Power Engineering “- Dr. P.N. Modi,Standard Publishers ,New Delhi
5.	“Text book of Transportation Engineering “- Arora, Charotar Publishers.
6.	Water supply and sanitary engineering-Rangawala, Charotar Publishers.
7.	“Basic Civil engineering”- M.S. Palanichamy- Tata McGraw Hill Publication
<b>Reference Books:</b>	
1.	“Surveying –Theory and Practice”-James Anderson- Tata McGraw Hill Publication
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

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**ENGINEERING GRAPHICS**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted</b>
Theory: -04 Hours / Week	End Semester Examination: - 60Marks	<u>05</u>
Practical: 02 Hours / Week	Continuous Assessment: - 40Marks	
	Term Work: 25 Marks	

Unit I	<p><b>Lines and Dimensioning in Engineering Drawing</b> Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.</p> <p><b>Curves used in Engineering Practice</b> Ellipse by Directrix-Focus method, Arcs of Circle method, Concentric circle method and Oblong method. Involute of a circle, Cycloid, Archimedean Spiral, Helix on cone, Loci of points- Slider Crank mechanisms.</p>	(6)
Unit II	<p><b>Orthographic Projection</b> Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.</p>	(6)
Unit III	<p><b>Isometric Projections</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, and Sphere.</p>	(6)
Unit IV	<p><b>Projections of Points and Lines and planes</b> Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP</p>	(6)
Unit V	<p><b>Projection of Solids</b> Projection of prism, pyramid, cone and cylinder by rotation method.</p>	(6)
Unit VI	<p><b>Section of Solids</b> Types of section planes, projections of solids cut by different sections of prism, pyramid, cone and cylinder.</p>	(6)

**Term work**

Term work shall consist of five half-imperial size or A2 size (594 mm x 420 mm) sheets.  
Assignment 05 Problems on each unit in A3 size Drawing Book

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**SHEETS**

1. Types of lines, Dimensioning practice, Free hand lettering, 1st and 3rd angle methods symbol.
2. Curves and loci of points
3. Projections of Points and Lines and planes
4. Orthographic Projections
5. Isometric views
6. Projection of Solids

**Text Books**

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International Publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988



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**ENGINEERING PHYSICS**

<b>Teaching Scheme:</b>	<b>Examination scheme:</b>	<b>Credits Allotted:</b>
<b>Lectures: 4Hrs/Week</b>	<b>End Semester Examination: 60 marks</b>	<b>Theory: 04</b>
<b>Practical: 2Hr/Week</b>	<b>Continuous Assessment: 40 marks</b>	<b>Practical: 01</b>
	<b>Term Work: 25marks</b>	

**UNIT – I**

**MODERN PHYSICS**

Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focussing, Wavelength and resolution, Specimen limitation, Depth of field and focus, Electron microscope, Positive rays, Separation of isotopes by Bainbridge mass spectrograph.

**NUCLEAR PHYSICS**

Nuclear fission, Liquid drop model of nucleus, Nuclear fission in natural uranium, Fission energy, Critical mass and size, Reproduction factor, Chain reaction and four factor formula, Nuclear fuel and power reactor, Nuclear fusion and thermonuclear reactions, Merits and demerits of nuclear energy, Particle accelerators, Cyclotron, Betatron,

**(08hours)**

**UNIT – II**

**SOLID STATE PHYSICS**

Band theory of solids, Free electron theory, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

**SUPERCONDUCTIVITY**

Introduction, Properties of a super conductor, Meissner's effect, Critical field, Types of superconductors, BCS theory, High temperature superconductors, Application of superconductors.

**(08hours)**

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**UNIT – III**

**THERMODYNAMICS**

Zeroth law of thermodynamics, first law of thermodynamics, determination of  $J$  by Joule's method, Applications of first law, heat engines, Carnot's cycle and Carnot's engine, second law of thermodynamics, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics.

**NANOSCIENCE**

Introductions of nanoparticles, properties of nanoparticles (Optical, electrical, Magnetic, structural, mechanical), synthesis of nanoparticles (Physical and chemical), synthesis of colloids, growth of nanoparticles, synthesis of nanoparticles by colloidal route, applications.

**(08 hours)**

**UNIT-IV**

**OPTICS - I**

**INTERFERENCE**

Interference of waves, Visibility of fringes, interference due to thin film of uniform and non-uniform thickness, Newton's rings, Engineering applications of interference (optical flatness, interference filter, non-reflecting coatings, multi-layer ARC).

**DIFFRACTION**

Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Diffraction at a circular aperture (Result only), Plane diffraction grating, Conditions for principal maxima and minima, Rayleigh's criterion for resolution, Resolving power of grating and telescope.

**(08 hours)**

**UNIT-V**

**OPTICS - II**

**POLARISATION**

Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism, Polaroids, Elliptical and circular polarisation, Quarter and half wave plates, Production of polarised light, Analysis of polarised light, half shade polarimeter, LCD.

**LASERS**

Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography.

**(08 Hours)**

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**UNIT-VI**

**ARCHITECTURAL ACOUSTICS**

Elementary acoustics, Limits of audibility, Reverberation and reverberation time, Sabine's formula, Intensity level, Sound intensity level, Sound absorption, Sound absorption coefficient, different types of noise and their remedies, Sound absorption materials, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies.

**QUANTUM MECHANICS**

Electron diffraction, Davisson and Germer's experiment, Wave nature of matter, De-Broglie waves, Wavelength of matter waves, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box and non rigid box.

**(08hours)**

**TERM WORK**

**Experiments**

Any ten experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Newton's rings.
11. Ultrasonic interferometer.
12. Sound intensity level measurement.
13. Wavelength of laser by diffraction.
14. Determination of refractive index for O-ray and E-ray.
15. Brewester's law.

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**Assignments**

1. Recent advances in Nanotechnology
2. Nuclear radiation detectors.
3. Atomic force microscope (AFM).
4. Advanced opto-electronic devices.
5. Laser in Industry.
6. Different spectroscopic methods – a comparison (Raman, IR, UVR, etc.).

**Unit Tests:**

Unit Test I : Unit I, II, III

Unit Test II: Unit IV, V, VI

***Reference Books:***

1. Physics for Engineers – Srinivasan M.R.
2. A text Book of Engineering Physics- M.N. Avadhanulu, P.G. Kshirsagar
3. Engineering Physics- K. Rajagopal
4. Electronics Principles – A.P.Molvino
5. Fundamentals of Optics – Jenkins and White
6. A Textbook of Sound – Wood
7. Engineering Physics – Sen, Gaur and Gupta

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<b>02: Fundamentals of Electrical Engineering</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Mathematics	
<b>2.</b>	Physics	
<b>Course Objectives:</b>		
	The course introduces fundamental concepts of DC and AC circuits, electromagnetism, transformer and measuring instruments and electronic components to all first year engineering students.	
<b>Course Outcomes:</b>		
<b>1.</b>	Understand and apply knowledge of basic concepts of work ,power ,energy for electrical, mechanical and thermal systems	
<b>2.</b>	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks	
<b>3.</b>	Describe construction, principle of operation, specifications and applications of capacitors and batteries	
<b>4.</b>	Describe and apply fundamental concepts of magnetic and electromagnetic circuits for operation of single phase transformer	
<b>5.</b>	Define basic terms of single phase and three phase ac circuits and supply systems	
<b>6.</b>	Know and use electrical safety rules	
<b>UNIT - I</b>	<b>Basic concepts</b>	<b>(06 Hours)</b>
	Concept of EMF, Potential Difference, current, resistance, Ohms law, resistance temperature coefficient, SI units of Work, power, energy. Conversion of energy from one form to another in electrical, mechanical and thermal systems	
<b>UNIT - II</b>	<b>Network Theorems</b>	<b>(06 Hours)</b>
	Voltage source and current sources, ideal and practical, Kirchoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem, Thevenin's theorem, Max Power Transfer theorem.	
<b>UNIT - III</b>	<b>Electrostatics</b>	<b>(06 Hours)</b>
	Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Batteries-Types, Construction& working.	

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<b>UNIT - IV</b>	<b>Magnetic Circuit &amp; Transformer</b>	<b>(06 Hours)</b>
	<p>Magnetic effect of electric current, cross and dot convention, right hand thumb rule, concept of flux, flux linkages, Flux Density, Magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability, B-H curve, hysteresis loop, series-parallel magnetic circuit, composite magnetic circuit, Comparison of electrical and magnetic circuit</p> <p>Farady's law of electromagnetic induction, statically and dynamically induced emf, self inductance, mutual inductance, coefficient of coupling, Single phase transformer construction, principle of operation, EMF equation, voltage ratio, current ratio, kVA rating, losses in transformer, Determination of Efficiency &amp; Regulation by direct load test.</p>	
<b>UNIT - V</b>	<b>AC Fundamentals &amp; AC Circuits</b>	<b>(06 Hours)</b>
	<p>AC waveform definitions , form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar &amp; rectangular form, concept of impedance, admittance, active, reactive, apparent and complex power, power factor, 3-ph AC Circuits.</p>	
<b>UNIT - VI</b>	<b>Electrical Wiring and Illumination system</b>	<b>(06 Hours)</b>
	<p>Basic layout of distribution system, Types of Wiring System &amp; Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED), Study of Electricity bill.</p>	

**Term Work:**

The term work shall consist of record of minimum eight exercises / experiments.

1. Determination of resistance temperature coefficient
2. Verification of Superposition Theorem
3. Verification of Thevenin's Theorem
4. Verification of Kirchoff's Laws
5. Verification of Maximum power transfer Theorem
6. Time response of RC circuit
7. Study of R-L-C series circuits for  $X_L > X_C$  ,  $X_L < X_C$  &  $X_L = X_C$
8. Verification of current relations in three phase balanced star and delta connected loads.
9. Direct loading test on Single phase transformer
  - a) Voltage and current ratios.
  - b) Efficiency and regulations .
10. Study of a Residential (L.T.) Bill

**Text Books:**

- 1) B.L.Theraja- "A Textbook of Electrical Technology" Volume- I, S.Chand and Company Ltd.,New Delhi
- 2) V. K. Mehta, - "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi
- 3) I. J. Nagrath and Kothari – "Theory and problems of Basic Electrical Engineering", Prentice Hall of

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India Pvt. Ltd	
<b>Reference Books:</b>	
1. Edward Hughes – “Electrical Technology”- Seventh Edition, Pearson Education Publication	
2. H. Cotton – “Elements of Electrical Technology”, C.B.S. Publications	
3. John Omalley Shawn – “Basic circuits analysis” Mc Graw Hill Publications	
4. Vincent Del Toro – “Principles of Electrical Engineering”, PHI Publications	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

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**Workshop Technology**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of hand tools used in day to day life.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. basic Manufacturing Processes used in the industry,
2. importance of safety

**Term work shall consist of any three jobs, demonstrations on rest of the trades and journal consisting of six assignments one on each of the following topics.**

**Carpentry- Introduction** to wood working, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft & machining allowances  
Term work includes one job involving joint and woodturning.

**Fitting-** Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping.  
Term work to include one job involving fitting to size, male-female fitting with drilling and tapping.

**Sheet Metal Practice** Introduction to primary technology processes involving bending, punching and drawing various sheet metal joints, development of joints.

**Joining-** Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies.  
Term work includes one job involving various joining processes like riveting, joining of plastics, welding, brazing, etc.

**Forging** -Hot working, cold working processes, forging materials, hand tools & appliances, Hand forging, Power Forging.

**Moulding** -Principles of moulding, methods, core & core boxes, preparation of foundry sand, casting, Plastic moulding.

**Plumbing (Demonstration Common for Electrical & Non electrical Group)**

Types of pipe joints, threading dies, Pipe fittings.



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**ENGINEERING MATHEMATICS-II**

**Teaching Scheme:**

**Lectures: 3Hrs/Week**

**Tutorials: 1Hr/Week**

**Examination scheme:**

**End Semester Examination: 60 marks**

**Continuous Assessment: 40 marks**

**Credits Allotted:**

**Theory : 03**

**Tutorial : 01**

**Unit I**

**DIFFERENTIAL EQUATIONS (DE)**

Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types.

**(08 Hours)**

**Unit II**

**APPLICATIONS OF DIFFERENTIAL EQUATIONS**

Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, Simple Harmonic Motion, One-Dimensional Conduction of Heat, Chemical engineering problems.

**(08 Hours)**

**Unit III**

**FOURIER SERIES**

Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis.

**INTEGRAL CALCULUS**

Reduction formulae, Beta and Gamma functions.

**(08 Hours)**

**Unit IV**

**INTEGRAL CALCULUS**

Differentiation Under the Integral Sign, Error functions.

**CURVE TRACING**

Tracing of Curves, Cartesian, Polar and Parametric Curves. Rectification of Curves.

**(08 Hours)**

**Unit V**

**SOLID GEOMETRY**

Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder.

**(08 Hours)**

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**Unit VI**

**MULTIPLE INTEGRALS AND THEIR APPLICATIONS**

Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.

**(08 Hours)**

**Assignments**

1. Differential Equations.
2. Application of DE.
3. Fourier Series and Integral Calculus.
4. DUIS and Curve Tracing.
5. Solid Geometry.
6. Double and Triple integrations, area and volume.

**References / Text Books :**

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd, 8<sup>th</sup> edition (1999).
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill (2008)
3. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune, 7<sup>th</sup> edition (1988).
4. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, Delhi, 42<sup>th</sup> edition (2012).
5. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil, Thomson Learning, 6<sup>th</sup> edition (2007).
6. Advanced Engineering Mathematics, 2e, by M. D. Greenberg, Pearson Education, 2<sup>nd</sup> edition (2002).

**Syllabus for Unit Test:**

**Unit Test I :- Unit I, II, III**

**Unit Test II :- Unit IV, V, VI**

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**FUNDAMENTALS OF MECHANICAL ENGINEERING**

<b>Teaching Scheme:</b>	<b>Examination Scheme:</b>	<b>Credits Allotted</b>
Theory: -03Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 02 Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Thermodynamics-</b> Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind (Elementary treatment only)</p>	(08)
UNIT-II	<p><b>Introduction to I.C. Engines and turbines-</b> Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Hydraulic turbines, steam turbines, gas turbines.(Theoretical study using schematic diagrams)</p> <p><b>Introduction to refrigeration, compressors &amp; pumps-</b> Vapor compression and vapor absorption system, house hold refrigerator, window air conditioner. Reciprocating and rotary compressor, Reciprocating and centrifugal pump. (Theoretical study using schematic diagrams)</p>	(08)
UNIT-III	<p><b>Energy Sources -</b> Renewable and nonrenewable, solar flat plate collector, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Nuclear power.</p> <p><b>Heat transfer-</b> Statement and explanation of Fourier’s law of heat conduction, Newton’s law of cooling, Stefan Boltzmann’s law. Conducting and insulating materials and their properties, types of heat exchangers and their applications.</p>	(08)

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UNIT-IV	<p><b>Properties of fluids-</b> Introduction, Units of measurements, mass density, specific weight, specific volume and relative density, viscosity, pressure, compressibility and elasticity, gas laws, vapor pressure, surface tension and capillarity, regimes in fluid mechanics, fluid properties and analysis of fluid flow.</p> <p><b>Properties of Materials and their Applications-</b> Metals – Ferrous and Non-Ferrous, Nonmetallic materials, smart materials, Material selection criteria.</p>	(08)
UNIT-V	<p><b>Mechanical devices -</b> Types of Belts and belt drives, Chain drive, Types of gears, Types of Couplings, friction clutch (cone and plate), brakes, Power transmission shafts, axles, keys, bush and ball bearings.</p> <p><b>Mechanisms-</b> Slider crank mechanism, Four bar chain mechanism, List of various inversions of Four bar chain mechanism, Geneva mechanism, Ratchet and Paul mechanism</p>	(08)
UNIT-VI	<p><b>Machine Tools-</b> Lathe Machine – Centre Lathe, Drilling Machine – Study of Pillar drilling machine, Introduction to NC and CNC machines, Grinding machine, Power saw, Milling Machine.</p> <p><b>Introduction to manufacturing processes and Their Applications-</b> Casting, Sheet metal forming, Sheet metal cutting, Forging, Fabrication, Metal joining processes.</p>	(08)

**List of experiments-**

The Term Work shall consist of **any Eight** experiments of following list

1	Measurement of viscosity using Redwood viscometer.
2	Assembly and working of 4-bar, 6-bar, 8-bar planer mechanisms
3	Finding relation between input angle and output angle for various link lengths.
4	Study of domestic refrigerator & window air-conditioner
5	Demonstration of operations of centre lathe
6	Demonstration of operations on drilling machines

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7	Demonstration of Two stroke and four stroke engine
8	Study of power transmitting elements: Coupling, Gears and bearings
9	Demonstration of pumps and compressor
10	Study and demonstration of different types of clutches.

**References-**

- 1 "Thermodynamics An Engineering Approach" Yunus A. Cengel and Michael A. Boles, McGraw-Hill, Inc,2005,6th edition.
2. "Applied Thermodynamics for Engineering Technologists" T. D. Eastop and A. McConkey, 5<sup>th</sup> Edition, Prentice Hall.
3. "I.C. Engines Fundamentals" J. B. Heywood, McGraw Hill, 3rd Edition, MacMillian
4. "Internal Combustion Engine ": V. Ganeshan, Tata McGraw-Hill, 3rd edition.
- 5 "Strength of Materials" H. Ryder, Macmillians, London, 1969, 3rd edition.
6. "Mechanics of Materials" Johston and Beer TMH, 5th edition
- 7 "Mechanisms and Machine Theory" Ambekar A.G., Prentice-Hall of India, 2007.
8. "Theory of Machines" S.S. Rattan, Tata McGraw- Hill, 2nd edition.
- 9 "A Textbook of production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition.
- 10 "Fluid Mechanics & Fluid Power" D.S. Kumar, Katson Publishing Engineering House, Ludhiana. 8th edition

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<b>10: Engineering Mechanics</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Scalar and Vector	
2.	Newton's law of motion	
3.	Law of friction	
4.	Concept of physical quantities, their units and conversion of units	
5.	Concept of differentiation and integration	
<b>Course Objectives:</b>		
	To develop and apply the concept of resultant and equilibrium for various static and dynamic engineering problems.	
<b>Course Outcomes:</b>		
<b>The student should be able to</b>		
1.	calculate resultant and apply conditions of equilibrium.	
2.	analyze the truss and calculate friction force.	
3.	calculate centroid and moment of inertia.	
4.	solve problem on rectilinear motion.	
5.	solve problems on curvilinear motion.	
6.	use D'Alembert's principle, Work Energy principle and Impulse Momentum principle for particle.	
<b>UNIT - I</b>	<b>Resultant and Equilibrium</b>	<b>(06 Hours)</b>
	Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	
<b>UNIT - II</b>	<b>Truss and Friction</b>	<b>(06 Hours)</b>
	Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts. Analysis of Perfect Trusses - Method of Joint, Method of Section and Graphical Method.	
<b>UNIT - III</b>	<b>Centroid and Moment of Inertia</b>	<b>(06 Hours)</b>
	Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	

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<b>UNIT - IV</b>	<b>Kinematics of Rectilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Equations of motion, Constant and variable acceleration, Motion Curves, Relative motion, Dependent motion.	
<b>UNIT - V</b>	<b>Kinematics of Curvilinear motion of a Particle</b>	<b>(06 Hours)</b>
	Motion of a Projectile, Cartesian components, Normal and Tangential components of a curvilinear motion.	
<b>UNIT - VI</b>	<b>Kinetics of a Particle</b>	<b>(06 Hours)</b>
	D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	
<b>Term Work:</b>		
A) The term-work shall consist of minimum <b>Five</b> experiments from list below.		
1. Determination of reactions of Simple and Compound beam.		
2. Study of equilibrium of concurrent force system in a plane.		
3. Determination of coefficient of friction for Flat Belt.		
4. Determination of coefficient of friction for Rope.		
5. Study of Curvilinear motion.		
6. Determination of Coefficient of Restitution.		
B) The term-work shall also consist of minimum <b>Five</b> graphical solutions of the problems on different topics.		
<b>Text Books:</b>		
1) "Engineering Mechanics (Statics and Dynamics)", Hibbeler R.C., McMillan Publication.		
2) "Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.		
3) "Engineering Mechanics", Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.		
<b>Reference Books:</b>		
1. "Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.		
2. "Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication.		
3. "Engineering Mechanics (Statics and Dynamics)", Meriam J.L. and Kraige L.G., John Wiley and Sons Publication.		
4. "Engineering Mechanics (Statics and Dynamics)", Timoshenko S.P. and Young D.H., McGraw Hill Publication.		
5. "Engineering Mechanics (Statics and Dynamics)", Tayal A.K., Umesh Publication.		
6. "Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication.		
<b>Syllabus for Unit Test:</b>		

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Unit Test -1	UNIT – I to III
Unit Test -2	UNIT – IV to VI



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**ENGINEERING CHEMISTRY**

**Teaching Scheme:**

**Lectures: 4Hrs/Week**

**Practical: 2Hr/Week**

**Examination scheme:**

**End Semester Examination: 60 marks**

**Continuous Assessment: 40 marks**

**Term Work: 25marks**

**Credits Allotted:**

**Theory: 04**

**Practical: 01**

**Unit I**

**WATER**

Introduction, Hardness of water, Effect of hard water on boilers and heat exchangers: a) boiler corrosion b) caustic embrittlement c) scales and sludges d) priming and foaming  
Water softening methods for industrial purposes :a) Zeolite process b) Phosphate conditioning Numerical based on the zeolite process

**(08 Hours)**

**Unit II**

**MATERIAL CHEMISTRY**

**Crystallography :** Unit cell, Laws of crystallography, Weiss indices and Miller indices, Crystal defects (point and line defects), X-ray diffraction – Bragg's Law and numerical.

**Cement :** Introduction of cement, Hydraulic/ Non-hydraulic cementing materials, classification of cement, chemistry of portland cement, chemical composition and compound constituents of portland cement, properties of cement and its applications.

**(08 Hours)**

**Unit III**

**FUELS**

Introduction, classification of fuels, calorific value of fuels, NCV and GCV, Determination of calorific values using Bomb calorimeter and Boys' gas calorimeter.

Theoretical calculation of calorific value of a fuel, Analysis of coal a) Proximate b) Ultimate analysis of coal, Numericals based on NCV, GCV.

**(08 Hours)**

**Unit IV**

**CORROSION AND ITS PREVENTION**

Corrosion: - Definition, atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic series, Factors affecting corrosion-nature of metal, nature of environment.

Methods of prevention of corrosion- Cathodic and Anodic protection, Metallic coatings, Electroplating, Hot dipping.

**(08 Hours)**

**Unit V**

**ELECTROCHEMISTRY**

Introduction, Arrhenius Ionic theory, Kohlrausch's law of independent migration of ions  
Laws of electrolysis: Faradays Laws, Ostwald's dilution law, Acids and Bases, concept of pH and pOH, Buffer solutions, Solubility Product, Redox Reactions.

Electrode Potential, electrochemical cell, concentration cell, reference Electrodes, Overvoltage, Conductometric Titrations, Fuel cells, Lead Acid Storage Cell and numericals based on the above articles.

**(08 Hours)**

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**Unit VI**

**STEREOCHEMISTRY**

Introduction, chirality, optical activity, Enantiomers, Diastereomers, projection formula of tetrahedral carbon- Newman projection, Wedge projection, Fischer projection, Geometrical isomerism :- cis and trans isomerism, E and Z isomers

Optical isomerism :- Mesoform, the number of optical isomers for chiral molecules,

Conformations :- conformations of ethane, conformations of n-butane

**(08 Hours)**

**TERM WORK**

**Experiments**

**Any Ten experiments from the following:**

1. Estimation of hardness of water by EDTA method.
2. Estimation of chlorine by Mohr's method.
3. Determination of percentage of Ca in given cement sample
4. Determination of coefficient of viscosity by Ostwald's viscometer
5. Study of Bomb calorimeter for determination of calorific value.
6. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
7. Determination of dissolved oxygen in a water sample.
8. To determine the Molecular Weight of polymer
9. Estimation of Copper from brass sample solution by Iodometrically
10. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
11. To standardize NaOH solution and hence find out the strength of given hydrochloric Acid solution
12. To determine Surface Tension of given liquid by Stalagmometer
13. Study of corrosion of metals in medium of different pH.
14. To set up Daniel cell
15. To determine pH of soil
16. To determine Acidity of soil

**Assignments**

7. Effect of hard water on boilers and heat exchangers
8. Hydraulic/ Non-hydraulic cementing materials
9. Analysis of coal a) Proximate b) ultimate analysis of coal
10. Wet corrosion-mechanism, Electroplating, Hot dipping
11. Geometrical isomerism :- cis and trans isomerism, E and Z isomers
12. Fuel cells

**References / Text Books :**

7. Engineering Chemistry by Jain and Jain, Dhanpat Rai Company (P) Ltd, New Delhi
8. Chemistry of Engineering Materials, Agarwal C.V, Rata Publication Varanasi, 6<sup>th</sup> edition (1979)
9. Chemistry in Engineering and Technology, Volume W, Tata McGraw Hill Publishing Company Ltd, New Delhi (1988)
10. Applied Chemistry, O. P. Vidyankar, J. Publications, Madurai, (1955)
11. Engineering Chemistry, S. N. Chand and Co., Jalandhar, 31st Edition (1990)
12. Engineering Chemistry by Dara S. S. S Chand Publications
13. Fundamentals of Electrochemistry, V. S. Bagotsky (Ed) Wiley NY (2006)

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**Syllabus for Unit Test:**

**Unit Test I :- Unit I,II,III**

**Unit Test II :- Unit IV,V,VI**

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**MECHANICAL ENGINEERING DRAWING**

Teaching Scheme:	Examination Scheme:	Credits Allotted
Theory: -02Hours / Week	End Semester Examination: - 60Marks	<u>04</u>
Practical: 04Hours / Week	Continuous Assessment: -40Marks	
	Term Work: 25 Marks	

UNIT-I	<p><b>Introduction to Computer Aided Drafting:</b> Working Interface of AutoCAD, Drawing Limits, Creating 2-D Drawing in AutoCAD, AutoCAD commands, Editing commands in AutoCAD, Dimensioning in AutoCAD, Creating text in Auto CAD, Changing object properties Scale, Object Snap Mode, Display control in AutoCAD, Layer</p>	(06)
UNIT-II	<p><b>Dimensioning Practices:</b> Terms and Notations, Leader, Extension Lines, Terminations and Origin indication, Functional dimension, Non-functional dimension, Datum dimension, Redundant and auxiliary dimension, Chain dimensioning, Running dimensioning, Co-ordinate dimensioning, Symmetrical or equidistant dimensioning, Methods of dimensioning Common features: Diameters, Radii, Hole sizes, chamfers, Screw threads, Chords, Arcs, Angles, Spheres, Cylinders, Squares. Conventional Representation of Machine Components As per SP-46 (1988)</p>	(06)
UNIT-III	<p><b>Orthographic Projections [ By Using AutoCAD]</b> Reference planes, types of orthographic projections – First angle projections, Third angle projections, methods of obtaining orthographic views by First angle method, Sectional orthographic projections – full section, half section, offset section.</p>	(06)
UNIT-IV	<p><b>Isometric Projections [ By Using AutoCAD]</b> Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, construction of Isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.</p>	(06)
UNIT-V	<p><b>Development of Lateral Surfaces (DLS) of Solids. [ By Using AutoCAD]</b> Applications of DLS, method of development, development of lateral surface of above solids, development of lateral surface of cut solids.</p>	(06)

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UNIT-VI	<b>Freehand Sketching</b> Free hand sketching -- FV and TV of standard machine parts – Hexagonal headed nut and bolt, foundation bolts, shafts, keys, couplings, springs, screw thread forms, welded joints, riveted joints.	(06)
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**Term Work**

First sheet based on dimensioning practice, convention and symbols in machine drawing

Second sheet based on free hand sketches.

Four AutoCAD drawing assignments

**Text Book/ Reference Books :**

N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing house, Anand, India.

D. N. Johle, Engineering Drawing, Tata Mcgraw-hill Publishing Co. Ltd..

P.S. Gill, Engineering Graphics.

N.D. Bhatt, Machine Drawing, Chartor Publishing house, Anand, India.

Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.

Fredderock E. Giesecke, Alva Mitchell & others, Principles of Engineering Graphics, Maxwell McMillan Publishing

SP 46:1988, Engineering Drawing Practice for School and Colleges

J. D. Bethune, Engineering Graphics with Auto CAD 2002, Pearson Education, 2003

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**PRODUCTION PRACTICE I**

**TEACHING SCHEME:**

Theory: -  
Practical: 02 Hours / Week

**EXAMINATION SCHEME:**

End Semester Examination: -  
Continuous Assessment: -  
Term Work: 50 Marks

**CREDITS ALLOTTED:**

01 Credit

**Course Pre-requisites:** Basic knowledge of various machine tools.

**Course Objectives:** Make the students familiar with basic manufacturing processes

**Course Outcomes:** students should be able to understand

1. Understand machine tools, mechanism and accessories used in various production processes
2. Make the job of turning & taper turning operation using lathe
3. Perform Forging and grinding of lathe tool with one knife and other end vee
4. Prepare simple solid pattern involving wood turning
5. Perform Welding using gas/arc welding process
6. Understand Sand Casting process

Each candidate shall be required to complete and submit the following term work:

**A. Jobs:**

Plain and Taper turning – one job

Forging and grinding of lathe tool with one knife and other end vee – one job

Making a simple solid pattern involving wood turning – one job

Welding (gas or arc) – one job

Sand Molding – one job

**B. Journal & Demonstration:**

Assignments on machine tools will be in the form of a journal based on demonstrations on machine tools. This should include sketches and relevant descriptions as given below:

**1) Block Diagrams (Any Two)**

- a) Lathe
- b) Universal milling machine
- c) Radial drilling machine
- d) Cylindrical grinder.

**2) Mechanisms (Any Two) a) All geared headstock of a center lathe.**

- b) Spindle arbor (assembly) drive of milling machine
- c) Crank and slotted lever quick return drive of shaping machine.
- d) Spindle assembly in a drilling machine.

**3) Accessories (Any Two)**

- a) Taper turning attachment for a center lathe.
- b) Universal dividing head.
- c) Milling cutters.

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**Faculty of Engineering & Technology**

**Programme : B.Tech (Production) Sem – III (2014 Course)**

S.N	Course Title	Scheme of Teaching				Scheme of Examination										Total Credit			
		L	T	P	Total	IE	Ass	UT	ESE	Total	TW	TW/ OR	TW/ Pr	Total	TH	T	Pr	Total	
1	Welding and Foundry Technology	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
2	Basic Electronics and Communication Engineering	3		2	5	10	10	20	60	100	-	50	-	150	3	-	1	4	
3	Industrial Engineering and Management	3	1	-	4	10	10	20	60	100	-	-	-	100	3	1		4	
4	Strength of Machine Elements	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
5	Applied Thermodynamics	3	-	-	3	10	10	20	60	100	-	-	-	100	3		-	3	
6	Professional skill Development	4	-	-	4		20	-	30	50	-	-	-	50	4		-	4	
7	Production Practice-II	-	-	4	4	-		-	-	0		-	50	50	-		2	2	
	<b>Total</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>50</b>	<b>70</b>	<b>100</b>	<b>330</b>	<b>550</b>	<b>0</b>	<b>150</b>	<b>50</b>	<b>750</b>	<b>19</b>	<b>1</b>	<b>5</b>	<b>25</b>	

**Bharati Vidyapeeth University, Pune**

**Faculty of Engineering & Technology**

**Programme : B.Tech (Production) Sem – IV (2014 Course)**

S.N	Course Title	Scheme of Teaching				Scheme of Examination										Total Credit			
		L	T	P	Total	IE	Ass	UT	ESE	Total	TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total	
1	Machining Technology	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
2	Material Science	3	-	2	5	10	10	20	60	100	-	50	-	150	3	-	1	4	
3	Design of Machine Elements	3	-	2	5	10	10	20	60	100	-	50	-	150	3		1	4	
4	Engineering Mathematics III	3	1	-	4	10	10	20	60	100	-	-	-	100	3	1	-	4	
5	Production Planning and Control	3	-	-	3	10	10	20	60	100	-	-	-	100	3		-	3	
6	Professional skill Development	4	-	-	4		20	-	30	50	-	-	-	50	4		-	4	
7	Production Practice-III	-	-	4	4	-		-	-	0		-	50	50	-		2	2	
	<b>Total</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>50</b>	<b>70</b>	<b>100</b>	<b>330</b>	<b>550</b>	<b>0</b>	<b>150</b>	<b>50</b>	<b>750</b>	<b>19</b>	<b>1</b>	<b>5</b>	<b>25</b>	



<b>WELDING AND FOUNDRY TECHNOLOGY</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Manufacturing Processes	
2.	Basic knowledge of Joining.	
3.	Basic knowledge of Casting.	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of welding and foundry technology		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Describe the advantages and disadvantages of the different classes of manufacturing processes.	
2.	Understand the different casting process	
3.	Know the pattern making and mold making	
4.	Choose the best casting process for a specific product.	
5.	Understand the different Welding process	
6.	Choose the proper process for different joining cases	
<b>UNIT-I</b>	<b>Introduction Of Welding Processes</b> Classification of welding processes. Advantages and disadvantages of welding processes Arc welding processes-Carbon arc, Submerged arc, Tungsten inert gas (TIG), Metal inert gas (MIT), Plasma arc, Stud welding and related arc welding processes –Theory, Comparison on merits, limitation and applications, Fluxes used in arc welding. Gas welding – Processes and equipment used, Types of flames, Gas cutting– Merits, demerits and applications	<b>(06)</b>
<b>UNIT-II</b>	<b>Resistance Welding</b> Resistance welding –, Spot, Seam, Projection, Butt, Percussion welding, Tube	<b>(06)</b>

	welding, Electric resistance welding process, its merits, demerits and application. <b>Solid-State Welding</b> Solid-State Welding- Pressure, Diffusion, Ultrasonic, Explosive, Friction, Forge, Principle, Equipment used, Flux used, Merits demerits and application of the above process.	
<b>UNIT-III</b>	<b>Other Welding Processes</b> ThermitWelding,Laser beam welding, Electron beam welding, Braze welding, Welding of dissimilar metals, Welding of polymers, Welding of Cast Iron, Welding of Tool Steel, Welding of Aluminium and its Alloys, Welding inspection, Welding defects and their Classification. Welding Symbols.Importance of ASME codes, ISO standards on joiningprocesses.	<b>(06)</b>
<b>UNIT-IV</b>	<b>Pattern And Mould Making</b> Foundry Layout, Foundry departments and sections, Pattern and pattern making, Design and allowances for patterns, Colour codes for patterns, Storage of patterns, Moulding sand and core sands, Sand control Test, Core and core making – Introduction, Core making Procedure, Types of cores, Core print, Core boxes. Mould and mould making-Moulding Methods, Moulding processes, Gating System, Software available	<b>(06)</b>
<b>UNIT-V</b>	<b>Melting And Pouring Practice:</b> Melting furnaces and their selection, Cupola and its operation, Advantages and limitations, applications, Induction melting furnaces, Advantages, Limitations, applications, Pouring practice and equipments, Ladle technology, Solidification of castings, Strike out, Fettling, Cleaning and Surface preparation of castings, Inspection and testing of castings, Defects in castings.	<b>(06)</b>
<b>UNIT-VI</b>	<b>Die Casting Process:</b> Pressure and gravity die casting, Shell mould casting, Investment casting, Continuous casting, centrifugal casting, Applications, Merits and limitations of all, Use of robots in foundry, Production of iron Casting, Copper alloy foundry practice, Aluminium alloy foundry practice, Export potentials for cast products in Indian context.	<b>(06)</b>

<p><b>Term work:</b>  <b>List of Experiments:</b></p> <ul style="list-style-type: none"> <li>• Mechanical test on weldment (weld) - Tension bend, drop weight, tear test.</li> <li>• Moulding and core sand testing (Clay content test, moisture content test etc).</li> <li>• Fluidity test using fluidity spiral pattern</li> <li>• Permeability test.</li> <li>• Green strength mould and Green strength core.</li> <li>• Mould and core hardness test.</li> </ul>					
<p><b>Assignments:</b></p> <ul style="list-style-type: none"> <li>• Six Assignments based on above syllabus &amp; Industrial visit</li> </ul> <p><b>Oral/Practical</b>  Term work and oral will be based on above syllabus</p> <p><b>Text Books / References</b></p> <ul style="list-style-type: none"> <li>• O. P. Khanna, A text book of Welding Technology, Dhanpat Rai and Sons</li> <li>• O. P. Khanna, A text book of Foundry Technology, Dhanpat Rai and Sons</li> <li>• P. N. Rao, Manufacturing Technology- Vol 1, McGraw Hill Education (India) Private Limited</li> <li>• Md. Ibrahim Khan, Welding science and technology, New Age International (P) Ltd.</li> <li>• G.R.Nagpal, Tool Engineering and Design, Khanna Publishers</li> <li>• B.S.Raghuwanshi, Workshop Technology, Vol-I, Dhanpat Rai &amp; Co.</li> <li>• P L Jain, Principles of Foundry Technology, Tata Mc Graw-Hill, New Delhi</li> <li>• Steel Casting ASM Hand book, Vol. No. I.</li> </ul>					
<p><b>Syllabus for Unit Test</b></p> <table border="1"> <tr> <td>Unit Test 1</td> <td><b>Units I , II and III</b></td> </tr> <tr> <td>Unit Test 2</td> <td><b>Units IV, V and VI</b></td> </tr> </table>		Unit Test 1	<b>Units I , II and III</b>	Unit Test 2	<b>Units IV, V and VI</b>
Unit Test 1	<b>Units I , II and III</b>				
Unit Test 2	<b>Units IV, V and VI</b>				

## BASIC ELECTRONICS AND COMMUNICATION ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students have completed a course in Physics and have the knowledge of laws of Dynamics		
<b>Course Objectives:</b>		
Students will get basic knowledge of electronic components, devices, microcontroller, digital electronics and communication.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The basic components of electronics	
2.	Working of rectifiers.	
3.	Basic of Microprocessor.	
4.	Basics of Digital electronics	
5.	Basics of analog communication.	
6.	Basics of digital communication.	
<b>UNIT - I</b>	<b>Electronic components:</b> Resistors, Inductors and Capacitors and their types, Construction and characteristics of PN junction diode Zener Diode Tunnel diode Bipolar junction transistors CB,CC,CE circuits Field Effect transistors	<b>(06)</b>
<b>UNIT - II</b>	<b>Electronic Devices and Linear ICs:</b> Rectifiers: Half wave, Full wave and Bridge rectifiers capacitor filter wave forms, ripple factor regulation characteristics. Special semiconductor devices: FET SCR LED VI characteristics, applications. Introduction to Op -Amp and Timers.	<b>(06)</b>
<b>UNIT - III</b>	<b>Digital electronics:</b> Number system: Binary system, Decimal to Binary, Octal system, Hexadecimal system, binary addition, subtraction, multiplication and division. Logic gates: OR, AND, NOT, Exclusive OR, NOR, NAND gates, Logic	<b>(06)</b>

	networks, Gate Standardization, Introduction to Logic Circuit Combinational and Sequential Circuits	
<b>UNIT - IV</b>	<b>Analog Communication:</b> Communication System diagram, need of modulation, amplitude modulation, frequency modulation, phase modulation.	<b>(06)</b>
<b>UNIT - V</b>	<b>Digital Communication:</b> Sampling process, pulse code modulation, delta modulation adaptive delta modulation.	<b>(06)</b>
<b>UNIT - VI</b>	<b>Microprocessor:</b> Architecture, Block Diagram, Instruction set, Interrupts, Timing Diagrams, Stacks, Subroutines, Serial I/O. Memory Design Concepts: Decoding, Memory Types, Design of Microprocessor based system, Interfacing Techniques; (I/O Mapping & Memory Mapping) with eg. of 8255 IC.	<b>(06)</b>
<b>Assignment:</b> Assignment based on above syllabus.		
Any 8 practical's should be conducted from the following list: <ol style="list-style-type: none"> <li>1. To study various electronics components: Resistors, Inductors, Capacitors, diodes and transistors.</li> <li>2. Binary - BCD &amp; BCD – Binary conversion</li> <li>3. Study of CRO and Different modes of operation.</li> <li>4. To plot VI characteristics of PN junction diode.</li> <li>5. To plot regulation characteristics of half wave rectifier with and without capacitor filter.</li> <li>6. To plot regulation characteristics of Full wave rectifier with and without capacitor filter.</li> <li>7. To plot input-output characteristics of CE configuration of BJT.</li> <li>8. To study basic logic gates: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.</li> <li>9. To realize the Boolean expression using basic gates.</li> <li>10. Study of amplitude &amp; frequency modulation.</li> <li>11. Pulse code modulation.</li> </ol>		
<b>Text Books/Reference Books:</b>		
1	Mottershed Allen, Electronic Devices & Circuits, PHI	
2	R. P. Jain, Modern Digital Electronics, Mc Graw Hill	
3	Thomas L. Floyd, Electronic Devices, Pearson Education (Sixth edition)	
4	Millman&Halkis, Electronic Devices & Circuits, PHI	
5	Malvino Leach, Digital Principles & Applications, Mc Graw Hill	
6	Millman&Halkis, Integrated Electronics, MGH	
7.	John Keneddy"Electronics communication System" Mc Graw Hill	
8.	TaubSchilling"Digital Communication System" Mc Graw Hill	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

<b>INDUSTRIAL ENGINEERING &amp; MANAGEMENT</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Tutorial: 01 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of Management	
2.	Basic information of Industrial engineering.	
3.	Basic knowledge of human considerations in manufacturing.	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of industrial engineering tools and management practices in manufacturing.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Definition, principles and functions of management.	
2.	Types and selection of business organizations.	
3.	Functioning of Personnel, Marketing and Finance Department.	
4.	Method Study tool for standardizing the method.	
5.	Work Measurement tool for standardizing the time.	
6.	Ergonomically accepts in manufacturing.	
<b>UNIT - I</b>	<b>Management-An Introduction:</b> Management- Meaning and Definitions, Management, Administration, and Organization concepts, Management as an Art and Science and a profession, contribution of various thinkers to management thought, Types and Functions of Management. Different approaches to management – scientific, operational, human and system approach.	<b>(06)</b>
<b>UNIT - II</b>	<b>Organization:</b> Different forms of business Organization –Individual proprietorship, Partnership, Joint stock company, Co-Operative enterprise, Public Sector, Undertakings, organizational structures in Industries, Line, Functional ,Line and functional , Project, Matrix Organization and Committees	<b>(06)</b>

<b>UNIT - III</b>	<p><b>Financial, Marketing and Personnel Management:</b>  Personnel Management-Definitions Recruitment, Selection and training of the employees, Job valuation and Merit rating, wage administration different methods of wage payments, incentives.</p> <p>Marketing Management-Definitions, Marketing and Selling concept, market segmentation, distribution channels, Market Research, Advertising and sales promotion and Sales forecasting.</p> <p>Financial Management-Capital structure, Fixed capital, working capital, sources of finance, cost analysis, Break even analysis, Depreciation and Financial statement.</p>	<b>(06)</b>
<b>UNIT - IV</b>	<p><b>Method Study:</b>  Steps in method study, tools and techniques used, process chart symbols, flow diagrams, two handed chart, multiple activity chart, use of motion pictures and its analysis. SIMO charts, chorno &amp; cycle graph, developing, presentation, installation and maintenance of improved methods.</p>	<b>(06)</b>
<b>UNIT - V</b>	<p><b>Work Measurement :</b>  Time Study: Aim and objectives , terminology and tools, use of stop watch procedure in making a time study, elements, selection of operations time study forms, handling of foreign elements. Performance rating. Allowances: Personal, Fatigue and other allowances. Analysis and calculation of Standard Time. Determination of number of cycles time study for indirect functions such as Maintenance , Marketing etc., Most Technique.</p> <p>Works Sampling: Definition, Objectives, theory of Work Sampling. Other applications of work sampling, errors in work sampling study.</p> <p>Synthetic and Standard data Methods: Concepts, introduction to PMTS, MTM-1, WF, Basic motion time, MTM-2, and other second – generation methods timing of group operations.</p>	<b>(06)</b>
<b>UNIT - VI</b>	<p><b>Ergonomics and Industrial Safety:</b>  Definitions, importance in industry, basic anatomy of human body, anthropometrics, measurement of physical work and its techniques, work and rest cycles, bio mechanical factors environment effects.</p> <p>Importance of safety, planning, training, safety precautions, safety Equipments, Government regulations on safety.</p>	<b>(06)</b>
<b>Assignments:</b>		
Six Assignments based on above syllabus.		
<b>Text Books/</b>		

1.	O. P. Khanna, Industrial Engineering & Management, Dhanapat Rai & Sons.
2.	M. C. Shukla, Business Organization and Management, S. Chand & Co. Ltd, New Delhi.
3.	Harold Koontz & Heinz Enrich, Essentials of Management, McGraw Hill International.
4.	M. N. Mishra, Organizational Behavior, Vikas publishing New Delhi.
5.	Dale Yoder, Personnel Management.
6.	Work Study, ILO.
7.	S. S. Patil, Industrial Engineering & Management, Electro tech Publication.
8.	Mansoor Ali & Dalela, Industrial Engineering & Management System, Standard Publisher distributions.
9.	R. M. Currie, Work Study, ELBS.
10.	Management by James A. F. Stoner, R. Edward Freeman, PHI
11.	Management Today: Principles and Practice by Gene Burton and Manab Thakur, TMH
12.	Organizational Behavior by Keith Davis, TMH
13.	Management (Tasks, responsibilities and Practices) by Peter Drucker, Harper Business
14.	Production Management by Lockyer, ELBS
15.	Modern Production Management by E. S. Buffa ( John Wiley )
16.	Financial Management by Vanhorne, PHI
17.	Financial Management (Theory and Practice) by Prasanna Chandra, TMH
18.	Marketing Management by Philip Kotler, Pearson Edition
19.	Marketing Management by Rajan Saxena, TMH
20.	Personnel Management by Edward Flippo, TMH
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI



## STRENGTH OF MACHINE ELEMENTS

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: -03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50Marks	

### Course Pre-requisites:

The Students should have

- |           |                                       |
|-----------|---------------------------------------|
| <b>1.</b> | Fundamentals of engineering mechanics |
| <b>2.</b> | Analysis of forces and moments        |
| <b>3.</b> | Laws of motion, kinetics, kinematics  |
| <b>4.</b> | Algebra and trigonometry              |

### Course Objectives:

To provide basic concepts of stresses and strains in machine elements.

### Course Outcomes:

Students will be able to understand

- |           |  |
|-----------|--|
| <b>1.</b> | Stresses and strains in different materials.                 |
| <b>2.</b> | Shear force and bending movement of loading elements.        |
| <b>3.</b> | Principal stresses and strain.                               |
| <b>4.</b> | Torsional, bending and axial force on the shaft.             |
| <b>5.</b> | Bending stresses and shear stresses in the machine elements. |
| <b>6.</b> | Design of simple machine components.                         |

### UNIT - I

#### Simple stresses & strains

Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials.. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self weight.

Strain energy due to axial load (gradual, sudden & impact), strain energy due to self weight Introduction to thermal stresses (Theory)

**(06)**

<b>UNIT - II</b>	<p><b>Principal stresses &amp; strains</b> Normal &amp; shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses &amp; maximum shear stress, position of principal planes &amp; planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment &amp; torsional moment on circular shafts (solid as well as hollow)</p> <p><b>Theories of elastic failure:</b> Maximum principal stress theory, maximum shear stress theory, Maximum distortion energy theory, maximum strain theory – their applications &amp; limitations.</p>	<b>(06)</b>
<b>UNIT - III</b>	<p><b>Shear Force &amp; Bending Moment Diagrams</b> Shear forces &amp; bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads &amp; couples, relation between SF &amp; BM diagrams for cantilevers, Simply supported beam. Maximum bending movement &amp; positions of points of contra flexure, construction of loading diagrams &amp; BMD from SFD &amp; construction of loading Diagram &amp; SFD from BMD.</p>	<b>(06)</b>
<b>UNIT - IV</b>	<p><b>Torsion</b> Stresses, strain &amp; deformations in determinate shafts of solid &amp; hollow</p> <p><b>Slope &amp; deflection of beams</b> - relation between BM &amp; slope, slope &amp; deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope &amp; deflection for standard cases.</p>	<b>(06)</b>
<b>UNIT - V</b>	<p><b>Stresses in Machine Elements.</b></p> <p><b>Bending stresses :</b> Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections( rectangular, I,T,C ) with respective centroidal&amp; parallel axes, bending stress distribution diagrams, moment of resistance &amp; section modulus calculations.</p> <p><b>Shear stresses :</b> Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange &amp; web.</p>	<b>(06)</b>
<b>UNIT - VI</b>	<p><b>Design of Simple Machine parts:</b> Machine Design, Traditional design methods, Basic procedure of Machine Design, Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams.</p>	<b>(06)</b>

	<p><b>Term work:</b>  The Journal containing the record of following:</p> <ul style="list-style-type: none"> <li>i) Experiment on Tension test on M.S. bar.</li> <li>ii) Experiment on Compression test on M.S. bar.</li> <li>iii) Experiment on Shear test on M.S. bar.</li> <li>iv) Experiment on Torsion test on M. S. bar.</li> <li>v) Experiment on Impact test.</li> </ul> <p>Drawing file containing two half imperial sheets:</p> <ul style="list-style-type: none"> <li>i) Drawing sheet of SFD – BMD of shafts using computer.</li> <li>ii) Drawing sheet of Mohr's circle.</li> </ul>	
	<p><b>Oral :</b>  Based on above term work.</p>	
<p><b>Assignments :</b>  Assignments based on each unit. (Each assignment consist of 5 problems)</p>		
<p><b>Text Books/</b></p>		
1.	Timoshenko & Young, Engineering Mechanics, Tata McGraw Hill Book Publishing Co. Ltd. 1981.	
2.	James Gere, Mechanics of Materials, Thomson Learning	
3.	S Ramamrutham, Strength of Materials	
4.	V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publication	
5.	J. E. Shigley, Mechanical Engineering Design, McGraw Hill	
<p><b>Syllabus for Unit Test:</b></p>		
Unit Test -1	Unit I ,II and III	
Unit Test -2	Unit IV,V and VI	

<b>APPLIED THERMODYNAMICS</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of thermodynamics	
2.	Knowledge of pumps and compressors	
3.	Basic knowledge of I.C.Engine	
<b>Course Objectives:</b>		
	The student should understand the scope and application of Applied Thermodynamics	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	to apply the concepts of Carnot theorem to applications such as heat pump and refrigerator	
2.	basic concepts of thermodynamics and their application to energy conversion device like Compressors	
3.	basic concept of refrigeration and air conditioning system	
4.	Concept of air standard cycle	
5.	Concept of Internal Combustion system	
6.	Heat Transfer performance	
<b>UNIT - I</b>	<b>Second Law of Thermodynamics:</b> Limitations of first law, Heat engine, refrigerator & heat pump, Kelvin-Planks and Clausius statement, Equivalence of Kelvin -Planks and Clausius statement, Perpetual motion machine of second kind, Carnot cycle & Carnot heat engine, Entropy. <b>Steam Generators:</b> Classification, Constructional details of Process & Power boilers, boilers mountings & accessories, equivalent evaporation, boiler efficiency, energy balance, boiler draught.	<b>(06)</b>
<b>UNIT - II</b>	<b>Refrigeration</b> Unit of refrigeration, reversed Carnot cycle, Bell Coleman cycle, Vapour compression cycle, C. O. P , TR Capacity, Use of p-h charts, Desirable properties of refrigerants, & alternative refrigerants <b>Air conditing</b> Factors affecting human comfort, Dalton's law, psychrometry, DBT,WBT, Specific humidity, relative humidity, degree of saturation, study of	<b>(06)</b>

	psychrometric chart, psychrometric processes such as sensible heating, cooling, humidification & dehumidification, Different Air conditioning systems, Applications of air conditioning.	
<b>UNIT - III</b>	<p><b>Reciprocating Air Compressors:</b> Introduction, Use of compressed air, construction &amp; working of reciprocating air compressors, P-V diagrams of single stage air compressor, Effect of clearance, Volumetric efficiency, Power required to drive the compressor, Isothermal efficiency, Mechanical efficiency, Multi-staging of air compressor, perfect inter cooling, Advantages of Multi-staging</p> <p><b>Rotary Compressor:</b> Introduction, classification and working principles of different types of compressors, comparison between reciprocating and rotary compressors, positive displacement and rotary dynamic compressors,</p>	<b>(06)</b>
<b>UNIT - IV</b>	<p><b>Air Standard Cycles</b> Introduction to Air Standard cycle, assumptions, Air Standard cycle, Diesel cycle, Dual combustion cycle, comparison of above cycles, Actual cycle</p>	<b>(06)</b>
<b>UNIT - V</b>	<p><b>Internal Combustion Engine Systems:</b> <b>Fuel Feeding Systems:</b> Introduction of carburetor S.I. engines, Mixture requirements, Solex carburetor, Fuel injection systems in C.I. engines, Bosch fuel injection pump, fuel injectors, Type of nozzles. <b>Ignition Systems:</b> Battery ignition, magneto ignition, Electronic ignition systems. <b>Cooling and Lubrication Systems:</b> Necessity of cooling, Cooling systems, Types of cooling and lubrication system <b>Engine Testing &amp; Performance:</b> Measurement of I.P, B.P, Rope brake dynamometer, Hydraulic dynamometer, Eddy current dynamometer, Measurement of F.P, Willian's line method, Morse Test, Measurement of fuel &amp; air, Measurement of speed, Heat balances heat.</p>	<b>(06)</b>
<b>UNIT - VI</b>	<p><b>Heat transfer and applications</b> <b>Extended surfaces:</b> Heat Transfer through extended surfaces, derivation of differential equation for fins, Solution of differential equation for different boundary conditions having constant cross-section area, Effectiveness and efficiency of a fin.</p>	<b>(06)</b>

	<b>Heat Exchangers:</b> Classification, heat exchanger analysis, use of Log Mean Temperature Difference (LMTD) and effectiveness NTU method for parallel and counter flow heat exchangers.	
<b>Assignment:</b> Assignment based on above syllabus.		
<b>Text Books/ Reference Books:</b>		
	P.L.Ballany, “Thermal Engineering”, Khanna Publications	
	C.P.Arora, “Engineering Thermodynamics”, Tata Mc Graw Hill Publications	
	Ganesan V., “Internal Combustion Engine”, Tata McGraw Hill Publications	
	Arora C. P., “Refrigeration& Air-Conditioning”, Tata McGrawHill Publications, New Delhi	
	V. M. Domkundwar, “Thermal Engineering”, Dhanpat Rai & Co.(P)Ltd	
	R. K. Rajput, Engineering Thermodynamics ,EVSS Thermo Laxmi Publications	
	Y.Cengel&Boles, Thermodynamics-Anengineeringapproach, TataMcGrawHill Publications	
	Hawkins G. A., “Engineering Thermodynamics”, John Wiley and Sons.	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

<b>PRODUCTION PRACTICE - II</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: - Hours / Week		
Practical: 04 Hours / Week	Term Work and Practical Examination: 50 Marks	04 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic Knowledge of Welding.	
<b>2.</b>	Basic Knowledge of engineering components.	
<b>3.</b>	Basic Knowledge of materials.	
<b>Course Objectives:</b>		
	The student should understand the processes in casting and welding..	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	Welding processes	
<b>2.</b>	Pattern making process.	
<b>3.</b>	Sand Testing methods	
<b>4.</b>	Sand Moulding techniques.	
<b>5.</b>	Casting process	
	<p><b>Term Work</b></p> <p>Each candidate shall be required to complete and submit the following jobs:</p> <ol style="list-style-type: none"> <li>1. Welding-TIG / MIG / Arc Welding (One Job)</li> <li>2. Pattern making: A solid pattern consisting of wood turning or a core box. (One Job)</li> <li>3. Sand Testing.(Five test )</li> <li>4. Sand Moulding. (One Job)</li> <li>5. Casting.</li> </ol>	

## SEMESTER IV

<b>MACHINING TECHNOLOGY</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of cutting tools	
<b>2.</b>	Basic knowledge of machining processes	
<b>3.</b>	Basic knowledge materials.	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of Machining Technology		
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	To Suggest different cutting tool materials for different work piece materials according to their properties	
<b>2.</b>	Use dynamometer for measuring the cutting forces during various cutting operations.	
<b>3.</b>	Perform different operations on lathe machine	
<b>4.</b>	Perform different operations on Milling machine	
<b>5.</b>	Explain, analyzed, predict and prevent material failures in primary manufacturing processes	
<b>6.</b>	Indicate which types of manufacturing process are suited to producing different shapes of product.	
<b>UNIT-I</b>	<b>Process of Metal Cutting</b> Metal cutting - Introduction, principle, classification of cutting tools, Types of metal cutting process, Mechanism of chip formation, Types of chips, Concept of speed, feed & depth of cut, Cutting tool materials	<b>(06)</b>
<b>UNIT-II</b>	<b>Theory of Metal Cutting</b> Single point cutting tool, Tool geometry, Tool signature, selection of tools from catalogue. Systems of defining cutting angles of a single point cutting tool, Cutting forces in Orthogonal cutting, Merchant's circle of forces, Measurement of cutting forces, Tool failure - its classification, Tool wear & its types .Types of cutting Fluids.	<b>(06)</b>



<b>UNIT-III</b>	<p><b>Lathe</b> Introduction, function, types, specification of lathe machines, construction accessories, attachments, operations. Difference between capstan and turret and engine lathe, <b>Automatic Machines</b> Automatic Lathes-Introduction, function, Classification of automatic machines.</p>	<b>(06)</b>
<b>UNIT-IV</b>	<p><b>Drilling machines</b> Drilling-Introduction, Classifications of Drills. Twist drills. Types of drilling machines, operations, cutting speed, feed and depth of cut. <b>Milling machines</b> Milling- Introduction, Types of milling machines, operations, Milling cutters, Dividing head, methods of indexing.</p>	<b>(06)</b>
<b>UNIT-V</b>	<p><b>Abrasive Machining Processes</b> Abrasive machining, abrasive-types, size and geometry. Specifications of Grinding, grinding wheels, wheel marking, wheel selection. Wheel mounting. Types of grinding machines, Grinding faults. <b>Surface Finishing Processes</b> Honing, lapping, super finishing, buffing, burnishing process. Electroplating, phosphating, metal spraying, anodizing, shot Peening. Effects of surface treatment processes.</p>	<b>(06)</b>
<b>UNIT-VI</b>	<p><b>Broaching</b> Broaching-Introduction, broach geometry, Types of broaching machines, Broach design. Broaching applications. <b>Numerical control and CNC</b> Introduction to NC, basic principles of NC machine, classifications of NC system. Introduction to CNC, CNC controllers, Introduction to DNC machines, machining centers.</p>	<b>(06)</b>
<b>Term Work:</b>		
<b>List of Experiments: ( Any Five)</b>		
<ul style="list-style-type: none"> <li>• Effect of tool geometry on cutting speed, feed, depth of cut on cutting processes</li> <li>• Measurement of cutting forces in turning, drilling &amp; milling with the help of tool dynamometers</li> <li>• Study and demonstration of Automate Lathe</li> <li>• Study of dividing indexing mechanism on milling machine.</li> <li>• Study and demonstration of Grinding Machines.</li> <li>• Study and demonstration of NC and CNC machine program.</li> </ul>		
<b>Assignments</b>		
<ul style="list-style-type: none"> <li>• Six Assignments based on above syllabus &amp; Industrial visit</li> </ul>		

<b>Text Books / References</b>		
<ul style="list-style-type: none"> <li>• G.R.Nagpal, Tool Engineering and Design, Khanna Publishers</li> <li>• B.S.Raghuwanshi, Workshop Technology, Vol-II, Dhanpat Rai &amp; Co.</li> <li>• P. N. Rao, Manufacturing Technology , Vol- II, McGraw Hill Education (India) Private Limited</li> <li>• HajraChaudhari, Workshop Technology, Vol.-II</li> <li>• Roy A. Lindberg, Process &amp; Materials of Manufacture, PHI</li> <li>• P. C. Sharma, Production Engineering, S. Chand Publications</li> <li>• R. K. Jain, Production Technology, Khanna Publishers</li> <li>• E. P. DeGrmo, J. T. Black and A. Kosher, Material and processes in manufacturing, PHI</li> <li>• HMT Handbook, Production Technology, TMH</li> </ul>		
<b>Syllabus for Unit Test</b>		
Unit Test 1	Units I , II and III	
Unit Test 2	Units IV, V ,VI	

## MATERIAL SCIENCE

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hours / Week	End Semester Examination 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW and Oral: 50 Marks	

### **Course Pre-requisites:**

The Students should have

1. Knowledge of basic concept of Physics and chemistry
2. Basic information of engineering materials.
3. Basic knowledge of manufacturing processes.

### **Course Objectives:**

The student should understand the scope, objective and application of material, engineering properties, practices in material testing and selections of materials as per industrial requirements.

### **Course Outcomes:**

Students will be able to understand

1. basics of crystal structure, Mechanism of plastic deformation and Annealing and re-crystallization
2. how to measure different types of mechanical properties
3. Use of equilibrium diagrams in selections of alloys for different applications..
4. Concept of powder metallurgy and manufacturing of components by powder metallurgy
5. How to manufacture composite components
6. Basics of corrosion and Prevention of corrosion by different methods

<b>UNIT - I</b>	<b>Study of Engineering materials and Plastic Deformation:</b> Study of Engineering materials Study of crystal structure, Indexing of planes and directions, Imperfections in crystals, Mechanism of plastic deformation, Critical resolve shear stress, Deformation of single crystal and polycrystalline metals, Work Hardening , Cold and hot working, Annealing and re-crystallization	<b>(06)</b>
<b>UNIT - II</b>	<b>Mechanical Testing of Metals;</b> Study of destructive testing Tensile test, Engineering stress and true stress strain, evolution of properties, Numerical based Tensile test, Hardness testing such as Brinell, Rockwell, Vickers and Micro hardness test, Impact test, Fatigue test, Creep test, Cupping test, Non	<b>(06)</b>

	Destructive testing such as Liquid dye penetrate test, Magnaflux test, Eddy current test , Ultrasonic testing and Radiography testing.	
<b>UNIT - III</b>	<b>Study of Equilibrium Diagrams:</b> Related terms and their definitions, Hume Ruther’s rule of solid solubility, Allotropy and polymorphism, Solidification, Dendritic growth, Cooling curves, Plotting of Equilibrium diagrams, Lever rule, Coring, Isomorphs system, Eutectic system, Partial eutectic and eutectoid system, Non Equilibrium cooling and it’s effects	<b>(06)</b>
<b>UNIT - IV</b>	<b>Processing of metal powder and ceramics:</b> Introduction, Advantages and limitations of powder metallurgy, Production of metals powder, Characteristics of powder, Powder conditioning, Powder Compacting, Sintering and sintering furnaces, Ceramic, Properties and applications of ceramics. Manufacturing of ceramics Production of powder metallurgical parts such as self lubricating bearings, ferrites, electric contact materials, Carbide cutting tools etc.	<b>(06)</b>
<b>UNIT - V</b>	<b>Study of Composite Materials:</b> Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field.	<b>(06)</b>
<b>UNIT - VI</b>	<b>Corrosion and Prevention:</b> Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.	<b>(06)</b>
<b>List of Experiments:</b>		
	<ol style="list-style-type: none"> <li>1.Tensile test to determine strength and other mechanical properties</li> <li>2.Hardness test Brinell and Vickers</li> <li>3.Rocwell and Poldi hardness test</li> <li>4.Micro-Hardness test</li> <li>5.Erichsen Cupping test</li> <li>6.Magnetic Particle test</li> <li>7.Liquid penetrate test</li> <li>8.Utrasonic Test</li> <li>9. Visual inspection of casting and welded components.</li> </ol>	
	<b>Assignments</b> <ol style="list-style-type: none"> <li>1. Density calculations on crystal structure and miller indices for crystal structure .</li> <li>2. Draw different types of curves such as , Tensile stress strain , S N curves , Creep curves , brittle transient temperature curves</li> <li>3. Draw the equilibrium diagram from given data. Find out the different types of phases.</li> <li>4. Collect list of components which are made from powder metallurgical technique</li> </ol>	

	and write flow chart for production processes.. 5. Find out ten different composite parts and its composite classifications. 6. Collect different type of old components and study the corrosion on it also study the prevision processes also
	<b>Text Books/Reference Books:</b>
	<ol style="list-style-type: none"> <li>1. "Material Science and Physical Metallurgy", Dr.V.DKodgere , Everest Publication, Pune.</li> <li>2. "Physical Metallurgy", S H Avner, Tata Micro hill Publication , Delhi</li> <li>3. "Material science and Metallurgy", O P Khanna, Khanna Publication ,Delhi.</li> <li>4. "Material Science and Engineering", R K Rajput ,S K Kataria and Sons Publication, Delhi</li> </ol>
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

## DESIGN OF MACHINE ELEMENT

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of Design	
2.	Basic information of Mechanical Elements	
3.	Basic knowledge of design consideration into different Mechanical/Machine Elements	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of Design of Machine Element.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Definition, principles and functions of Design	
2.	Design and selection of shafts, keys, splines and couplings	
3.	Working principal of brakes and clutches	
4.	Design and selection of bearings.	
5.	Design and selection of joints	
6.	Design and selection of power screws and springs	

<b>UNIT - I</b>	<b>Introduction:</b> Concept of machine design, general design considerations, design procedure; factor of safety for different types of loading its significance and selection; theories of failures, Selection of engineering materials for a component considering functionality, raw material generating process, strength, cost, quantity and aesthetics, use of IS codes	<b>(06)</b>
<b>UNIT - II</b>	<b>Design of shafts, keys, splines and couplings:</b> Design of solid and hollow shafts for strength and rigidity against pure torsion, pure bending, combined bending, torsion and axial loads; design of keys and splines; design of rigid and flexible couplings.	<b>(06)</b>
<b>UNIT - III</b>	<b>Clutch &amp; Brake:</b> Types, classification, selection of different type of clutch Design of multiplate clutch. Introduction: different types of clutch(cone, centrifugal clutch).Energy absorbed by brake, Design consideration of block brake ,Introduction: internal expanding shoe brake, disk brake.	<b>(06)</b>
<b>UNIT - IV</b>	<b>Rolling Contact Bearing:</b> Types, static and dynamic load carrying capacities, stibeck's equation used, Equivalent bearing load, load life relationship, selection of bearing life, selection of rolling contact bearing from manufacture's catalogue. Bearing with probability of survival other than 90%, lubrication and mounting of bearings	<b>(06)</b>
<b>UNIT - V</b>	<b>Design of joints:</b> Design of bolted joint subjected under transverse and eccentric loading, materials for bolts, initial tightening loads on bolts, effect of washer and gasket, uniform strength bolts. Adhesive joints	<b>(06)</b>
<b>UNIT - VI</b>	<b>Power screw :</b> Power Screws: Forms of threads, Torque analysis of power screw self locking screw, stresses in power screw, collar friction, Design of Screw Jack.	<b>(06)</b>
<b>TERM WORK</b>		
1) Study of Engineering Materials, their applications and selection as per different standards used in practice. 2) Design of Coupling and Detailed Working drawings with assembly. 3) Design of bolted, riveted and welded joints for transverse and eccentric loading. 4) Working drawing of shafts, keys, splines and couplings. 5) Design of spring and power screw. 6) Types of bearing. 7) Types of brakes and clutches.		
<b>Text Books/Reference Books:</b>		
1.Design of Machine Elements, V. B. Bhandari, (Tata McGraw-Hill Publishing		

Company Ltd.)

2. Elements of Machine Design, N. C. Pandya and C. S. Shaha, (Charotar Publishing House)
3. Mechanical Engineering design, J. E. Shigley, Mitchell, (McGraw-Hill Publishing Co. Ltd)
4. Machine Tool Design, N. K. Mehta, (Tata McGraw-Hill Publishing Company Ltd.)
5. Design of Machine Elements, Drobvalsky ( MIR Publisher )
6. A Text Book of Machine Design, R. S. Khurmi, (S. Chand)
7. Design of Machine Elements by M. F. Spoots, T.E.Shoup (PHI)
8. Machine Design, R. K. Jain, (Khanna Publishers.)
9. Engg. Design, a Materials & Processing Approach, G. Dieter, (Tata McGraw-Hill Publishing Company Ltd.)
10. Computer Aided Analysis and Design of Machine Elements by Dukki Patti, Rao, Bhat , (New Age, Delhi)
11. CMTI Machine Tool Design Handbook (TMH)
12. Design of Machine Elements, An Integrated Approach by Robert and Norton, (Pearson)
13. Machine Design by Black and Adams (McGraw-Hill Publishing Company Ltd)

<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I, II and III
Unit Test -2	Unit IV, V and VI



**ENGINEERING MATHEMATICS - III**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Tutorial: 01 Hour / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of arithmetic calculations and engineering applications.	
<b>2.</b>	Knowledge of basic concept of statistics	
<b>3.</b>	Basic information of probability	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of statistical tools	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	The use of statistical methodology and tools in the engineering problem solving process.	
<b>2.</b>	The use of different measures of central value	
<b>3.</b>	The use of correlation analysis	
<b>4.</b>	The use of regression analysis	
<b>5.</b>	The concept of probability, random variable and probability distribution.	
<b>6.</b>	The concept of testing of hypothesis and experimental design.	
<b>UNIT - I</b>	<b>Introduction to Statistics-</b> Origin and growth of statistics, statistical methods Vs experimental methods. Collection of data, primary and secondary data, sampling and sample designs, methods of sampling, merits and limitations of sampling, sampling and non-sampling errors. Diagrammatic and graphic presentation of data.	<b>(06)</b>
<b>UNIT - II</b>	<b>Measures of central value-</b> Arithmetic mean, median and mode, geometric mean and harmonic mean. Measures of dispersion, mean deviation, standard deviation, skewness moments and kurtosis.	<b>(06)</b>

<b>UNIT - III</b>	<b>Correlation analysis</b> Significance of the study of correlation, types of correlation, coefficient of correlation, coefficient of determination, rank correlation	<b>(06)</b>
<b>UNIT - IV</b>	<b>Regression analysis-</b> Uses of regression analysis, difference between correlation and regression analysis. Regression equations, standard error of estimate, limitations of regression analysis.	<b>(06)</b>
<b>UNIT - V</b>	<b>Probability</b> Basics of probability, conditional probability, bayes' theorem, mathematical expectations, random variable and probability distribution, binomial, Poisson, normal distribution.	<b>(06)</b>
<b>UNIT - VI</b>	<b>Testing of hypothesis-</b> Z test, chi square test and goodness of fit, F test and analysis of variance. <b>Applications of Statistics-</b> Experimental designs, SQC, business forecasting.	<b>(06)</b>
<b>Assignments-</b> <b>5 Assignments based on above syllabus</b>  These assignments may preferably completed and verified using software's.		
<b>Text Books/Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. S. P. Gupta: Statistical methods – S Chand and sons</li> <li>2. Bhat B. R.(1981) : Modern Probability Theory –IIIrd edition :New age international (P)limited,</li> <li>3. Alan Karr,(1993) : Probability Theory – Springer Verlag.</li> <li>4. Billingsley P.(1986) : Probability &amp; Measure –John Wiley and sons</li> <li>5. S. J. Morrison, Statistics for Engineers an Introduction, John Wiley and Sons, 2009</li> <li>6. R. E. Walpole, Essentials of Probability and Statistics for Engineers and Scientists , Pearson, 2011</li> <li>7. R. L. Scheaffer, Probability and statistics for Engineers, Cengage Learning, 2011</li> <li>8. Sukhatme P. V., Sukhatme S. &amp; Ashok C : Sampling Theory of surveys and applications – Piyush publications</li> <li>9. Irwin Miller and John E. Freund, Probability and Statistics for Engineers, Prentice-Hallof India</li> <li>10. W. J. DeCoursey, Statistics and Probability for Engineering Applications, Newnes,2003</li> </ol>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I, II and III	
Unit Test -2	Unit IV, V and VI	

<b>PRODUCTION PLANNING AND CONTROL</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of basic concept of Industrial Engineering & Management	
2.	Knowledge of statistics.	
3.	Basic knowledge of resources of production Man, Machine Material..	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of Production Planning And Control manufacturing Industries.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The importance of PPC in industry.	
2.	The Forecasting by using different techniques.	
3.	Different ideas and concept to improve PPC in industry.	
4.	Different techniques for material requirement planning	
5.	Different techniques used for PPC in industry.	
6.	Computer Aided Process Planning.	
<b>UNIT - I</b>	<b>Introduction to PPC:</b> Role and stages of PPC, PPC as an integrated function, Product Life Cycle Analysis, Types of Production systems.	<b>(05)</b>
<b>UNIT - II</b>	<b>Forecasting Techniques:</b> Use and types of forecasting, Methods of forecasting and comparison, Verification and control.	<b>(05)</b>
<b>UNIT - III</b>	<b>Techniques and Production Control:</b> Process sheet, Routing, Scheduling- Gantt Chart, Machine Loading Chart, Line Balancing, Dispatching rules, Sequencing - Johnson's rule, Loading, Follow-up, Evaluation, PERT, CPM.	<b>(06)</b>

<b>UNIT - IV</b>	<b>Materials Planning and Purchasing:</b> Scope and requirement of MRP, MRP I and MRP II, Master Production Schedule, Bill of Materials, Capacity Requirement Planning. Introduction to ERP, Purchasing - Documentation, Make or Buy decisions, Vendor Development.	<b>(08)</b>
<b>UNIT - V</b>	<b>Inventory Control:</b> Types of Inventory, Cost of Inventory, EOQ, Selective Inventory Control, Replenishment Systems. <b>Stores Management:</b> Types of stores, Storage layout and storage systems, Stores Documentations, Stores Control and Control of Wastage and surplus, JIT, KANBAN, KAIZEN, Value Stream Mapping.	<b>(08)</b>
<b>UNIT - VI</b>	<b>Computer Aided Production Planning and Control:</b> a) Machine capacity planning and utilization. b) Productivity measurement. c) Material Requirement Planning. d) Scheduling Techniques. Hands on experience of Computer aided Production Planning and Control	<b>(04)</b>
<b>Assignments:</b> Six Assignments based on above syllabus.		
<b>Text Books/Reference Books:</b>		
1	"Production Systems - Planning Analysis and Control, J. L. Riggs, " , JhonWiley& Sons.	
2	"Operations Management - Design, Planning & Control for Manufacturing and Services, J.B. Dilworth " , McGraw Hill	
3	"Production and Operation Management S N Charry " Tata McGraw Hill	
4	Elements of PPC, Samuel Elion " , Universal Book Company	
5	"Industrial Engineering and Production Management MartandTelsang " S. Chand and Co. Ltd.	
6	" Production Planning And Inventory Control" Mager and Boodman	
7	S. S. Patil, Industrial Engineering & Management, Electrotech Publication.	
8	. "Production Management " Martin Star,	
9	Process Engineering " Erry Johnson	
10	"Production Planning and Control, A. K. Bewoor, " Satya Publication	
11	"Production Planning and Cost Control Jain and Arrawal", Khanna Publisher	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I,III & II	
Unit Test -2	Unit IV,V & IV	

<b>PRODUCTION PRACTICE - III</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: NIL		
Practical: 04 Hours / Week	Term Work and Practical Examination: 50 Marks	04Credits
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic Knowledge of manufacturing processes.	
<b>2.</b>	Basic Knowledge of engineering graphics.	
<b>3.</b>	Basic Knowledge of materials.	
<b>Course Objectives:</b>		
	The student should understand the machining processes by lathe milling and grinding.	
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	Turning process.	
<b>2.</b>	Taper turning process.	
<b>3.</b>	Threading process.	
<b>4.</b>	Gear cutting process..	
<b>5.</b>	Milling process.	
<b>6.</b>	Grinding process.	
	<p><b>Term Work</b>  Each Candidate shall be required to complete and submit the following jobs: ( Any Two)  One assembled job consisting of 2 to 3 pieces as below</p> <ol style="list-style-type: none"> <li>1. Operations on lathe machine (3 assembled parts)</li> <li>2. Operations on milling machine</li> <li>3. Operations on grinding. machine</li> </ol>	

**Syllabus**  
**for**  
**B.Tech.ProductionSem V**  
**&VI**

**Programme: B. Tech. (Production) Sem. V – 2014 Course**

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Metal Forming	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Kinematics and Design of Manufacturing Machine	3		-	60	20	10	10		-	100	3		3
3.	Metrology & Quality Control	3	2	-	60	20	10	10	-	50	150	3	1	4
4.	Engineering Metallurgy	3	2	-	60	20	10	10	50	-	150	3	1	4
5.	Numerical Methods	3	2	1	60	20	10	10	-	-	100	3	2	5
6.	Professional skill Development – V	4	-	-	100	-	-	-	-	-	100	4	-	4
7.	Production Practice- IV	-	2	-	-	-	-	-	-	50	50	-	1	1
	<b>Total</b>	19	10	1	400	100	50	50	100	100	800	19	5	25

**Programme: B. Tech. (Production) Sem. VI – 2014 Course**

S.N	Course	Teaching Scheme (Contact Hrs/week)			Examination Scheme (Marks)							Total Credits		
		L	P/D	T	End Sem Exam	Continuous Assessment					Total	TH	TW	Total
						Unit Test	Attendance	Assignments	TW/OR	TW/PR				
1.	Jig Fixture and Die Design *	3	2	-	60	20	10	10	50	-	150	3	1	4
2.	Production Management	3	2	-	60	20	10	10	-	-	100	3	1	4
3.	Computer Aided Design and Manufacturing	3	2	-	60	20	10	10	50	-	150	3	1	4
4.	Fluid Mechanics and Machine Tool Control	3	2	1	60	20	10	10	50	-	150	3	2	5
5.	Elective- I	3	2	-	60	20	10	10	50	-	150	3	1	4
6.	Professional skill Development – VI	4	-	-	100	-	-	-	-	-	100	4	-	4
	<b>Total</b>	<b>19</b>	<b>10</b>	<b>1</b>	<b>400</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>200</b>	<b>0</b>	<b>800</b>	<b>19</b>	<b>5</b>	<b>25</b>

\* End Semester examination of duration 4 Hours.

Total Credits Sem. I – 25

Total Credits Sem. II – 25

Grand Total - 50



<b>Subject :METAL FORMING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of conventional and non conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge engineering drawing.	
<b>Course Objectives:</b>		
	To study the metal forming processes i.e wire drawing, rolling, forging, extrusion, sheet metal working etc.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	To select wire drawing machine and understand its defects and remedies.	
2.	To select proper forging process and understand its defects and remedies.	
3.	To select type of rolling mills and understand its defects and remedies.	
4.	To select various sheet metal working processes and advance sheet metal processes.	
5.	To design simple and progressive and deep drawing die.	
6.	To select extrusion die and extrusion proper process and understand its defects and remedies.	
<b>UNIT - I</b>	<b>Fundamentals of Material Forming:</b> Introduction of forming processes. Concept of Formability, formability limits and formability diagram. <b>Wire and Tube Drawing:</b> Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Heat treatment, variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, defects in drawing and remedies, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculations, stock penetration. Lubrication in tube drawing.	<b>(06 Hours)</b>
<b>UNIT – II</b>	<b>Forging:</b> Introduction, classification of forging processes. Forging equipment-	<b>(06 Hours)</b>

	Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. Forgability tests, design of forging as a product, friction in forging. Forging defects and the remedies. New technologies: Liquid metal forging, Isothermal forging, No draft forging, P/M forging, Rotary swaging, Roll forging, lubrication in forging.	
<b>UNIT - III</b>	<b>Rolling of Metals:</b> Scope and importance of rolling. Effect of grain direction in rolling Types of Rolling Mills- construction and working. Deformation in rolling and determination forces required. Process variables, redundant Deformation, Roll bite and friction. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling.	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<b>Sheet Metal Working:</b> Sheet Metal properties, gauges and surface conditions. various cutting and forming operations, types of dies used, force requirement, theory of shear, methods of force reduction, defects, lubricants used. Miscellaneous sheet metal working operations: Metal spinning, fine blanking, coining, embossing, rubber forming, stretch forming. Coining Embossing, Curling, Spinning and fine blanking. <b>Advanced Metal Forming Processes:</b> Introduction to High velocity forming- principles, comparison of high velocity and conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming. Stretch forming, , Flow forming advantages, limitations and application of the process.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Design of Press Tools:</b> General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations such as punching, blanking, deep drawing, bending, forming etc. Design and calculations for above press working dies.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Extrusion:</b> Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.	<b>(06 Hours)</b>
<b>Term Work/Practical's:</b>		
1. Design & working drawing of simple blanking die.		
2. Design & working drawing of progressive/compound/combination die.		

3. Design & working drawing of a deep drawing die.	
4. A report on factory visit, comprising of product range, processes, plant layout, Auxillary equipment, process parameters etc.	
<b>Assignments:</b>	
1. Assignment based on each unit of syllabus.	
<b>Text Books/Reference Books:</b>	
1	Dieter, "Mechanical Metallurgy"
2	P. N. Rao, "Manufacturing Technology", Tata McGraw Hill
3	G.W. Rowe, "Principles of Industrial Metal Working Process", Edward Arnold
4	Dr. R. Narayanswamy, "Metal Forming Technology", Ahuja Book Co.
5	Surender Kumar, "Principles of Metal Working"
6	"ASM Metal hand book Vol: 4 forming"
7	P.C.Sharma, "Production Engineering", S. Chand
8	Masleror and Berkvasky, "Theory of Plastic Deformation and Metal Working", MIRPublications
9	J. N. Harris, "Mechanical Working of Metals", Pergmon Press
10	Aviter, "Fundamental of Metal Working", McGraw Hill Publisher
11	Schilles, "Press Working"
12	R.G.W. Pye; "Injection Moulding", EWP.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Subject : KINEMATICS &amp; DESIGN OF MANUFACTURING MACHINES</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 00 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	00 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Students should have Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.	
2.	Students should have Basic knowledge of various Machine Structures and drives.	
3.	Students should have Basic knowledge of Design Tolerance, Allowance and other related terms	
<b>Course Objectives:</b>		
1	To study the kinematics design for various products, its aesthetics, ergonomics, statistical techniques and reliability.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The analytical ability of students in synthesis of mechanism.	
2.	The knowledge of gear design.	
3.	Element of product design.	
4.	To set familiarization of Aesthetic and Ergonomic consideration in design	
5.	Importance of statistical consideration in design.	
6.	Basic vibration modules, tribology of material.	
<b>UNIT - I</b>	<b>Computer Aided Analysis and Synthesis of Mechanisms and Kinematics Structure of Machine Tools:</b> Computer Aided Analysis and coupler curves for four bar mechanism and. Slider crank mechanism, dimensional synthesis of mechanisms, three position synthesis of slider crank mechanism, Over lay method, Bloch Synthesis, Least square technique, Machine tool motion and their Transmissions, Kinematic balancing equation for motion transmitting elements, Kinematic structure of machine tool.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Spur Gears:</b> Design considerations based on Beam Strength, tangential loading, gear standards, types of gear tooth failures, Calculations of modules, teeth number . <b>Helical Gears:</b> Normal Module, Virtual no. of teeth, force analysis, Beam and wear	<b>(07 Hours)</b>

	strength, Introduction to Design of Helical Gears.	
<b>UNIT - III</b>	<p><b>Design for Manufacture:</b> General Principles for Design for Manufacture, Principles of design for casting, Forging, Machining, Welded Joints, etc., Design for Manufacturing &amp; Assembly.</p> <p><b>Product Design:</b> <b>Aesthetics:</b> Aim, basic forms of elements, contribution of factors like structure, elegance, rhythm, proportions, harmony, use of curves, joints, materials, surface finish &amp; color. <b>Ergonomics:</b> Aim, man-machine relationship, use of anthropometrical data related with machine tool &amp; control elements, design of controls &amp; display.</p>	<b>(05 Hours)</b>
<b>UNIT - IV</b>	<p><b>Friction and Lubrication:</b> Dry friction, friction between screw and nut, friction in turning pairs, friction circle and friction axis, friction in mechanism, principles of thick and thin film lubrication methods, principles of hydrodynamic and hydrostatic lubrication.</p>	<b>(05 Hours)</b>
<b>UNIT - V</b>	<p><b>Fundamentals of Vibration:</b> a) Un-damped Free Vibration, Equilibrium method, Energy method, Rayleigh's method. b) Damped Free Vibrations of single degree freedom system, types of damping, free vibration with viscous damping, over damped system, critically damped system, under-damped system, logarithmic decrement, viscous dampers, dry friction or coulomb damping, frequency of damped Oscillations. c) Vibration measuring instrument, measurement of displacement, velocity, acceleration, frequency and damping of vibrating systems</p>	<b>(07 Hours)</b>
<b>UNIT - VI</b>	<p><b>Statistical considerations in Design and Optimum Design:</b> <b>Statistical Considerations in Design:</b> Analysis of Tolerances, Design and Natural Tolerances, Factor of safety and reliability. <b>Optimum Design:</b> Objectives of Johnson's Method of optimum design, design for normal specification and redundant and incompatible specification.</p>	<b>(06 Hours)</b>
<b>Assignments:</b>		
1. Assignment based on above six units.		
<b>Text Books/Reference Books:</b>		
1	Bhandari V.B:” Design of Machine Elements”, Tata McGraw Hill Publication	
2	Shigly “Mechanical Engineering Design”, Tata McGraw Hill Publication	

3	M.F.Spott” Design of Machine Elements”, Prentice Hall
4	Thomas Bevan” Theory of Machines”, CBS Publisher & Distributors
5	J.E. Shigly” Theory of Machines & Mechanisms”, McGraw Hill
6	Bhargave. S.R.” Theory of Machines-II”, Technova Publishing House .
7	P.L.Ballany “Theory of machines”, Khanna Publishing, New Delhi
8	R.S.Khurmi, J. K. Gupta, “Theory of Machines”, E P H
9	G.K.Grover, Mechanical Vibrations
10	Sen and Bhattacharya, ”Machine Tool Design
11	Phakatkar, ”Theory of Machine-II”
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Subject :METROLOGY AND QUALITY CONTROL</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/PR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Measuring Units, Mathematics, and Various terms like as displacement, Velocity, Acceleration.	
2.	Basic knowledge of Design Tolerance, Allowance and other related terms.	
3.	Familiarity with elements of mechanical components like gear, screw thread, bearings etc.	
<b>Course Objectives:</b>		
	To make students have the basic principles of measuring methods and, have hands on experience on Measuring equipments and quality theories.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Make use of equipment like sine bar, angle gauge, Autocollimator, and angle dekkor to carry out angular measurement	
2.	Use of concepts like limits, fits and tolerances for designing the limit gauges	
3.	Read the symbols on drawing for surface finish and measure surface finish by instruments like Tomlinson surface meter, surftester etc	
4.	Measure the various screw thread parameters by using equipments like floating carriage micrometer, tool makers microscope and profile projector	
5.	Measure the gear tooth parameters with equipment like gear tooth vernier calliper, constant cord method, span micrometer, base tangent comparator etc	
6.	Familiarity with various TQM models	
<b>UNIT - I</b>	<b>Introduction:</b> Meaning of metrology, precision, accuracy, errors in measurement, calibration. Linear Measurement: Standards- line standard, end standard, wave length standard, classification of standards, precision and non precision measuring instrument, slip gauges. Angular Measurement: Sine bar, Sine center, Uses of sin bar, angle gauges, Auto Collimator & Angle Dekkor, Constant Deviation Prism Interferometry: Introduction, flatness testing by interferometry, NPL flatness interferometer. Laser interferometry.	<b>(04 Hours)</b>
<b>UNIT - II</b>	<b>Limits, Fits and Tolerances and Gauge design:</b> Meaning of limit, Fits and Tolerance, Cost-Tolerance relationship, concept of Interchangeability, Indian Standard System (ISS). Design of limits gauges: Types, Uses, Taylors principle, Design of	<b>(07Hours)</b>

	<p>limit gauges.</p> <p><b>Inspection of geometric parameters:</b> Flatness, Straightness, Parallelism, Concentricity, Squareness, circularity and Cylindricity.</p> <p>Comparators: Uses, types, advantages and disadvantages of various types of comparators.</p> <p><b>Recent trends in Metrology:</b> Introduction to CMM, Measuring geometrical parameters with CMM. techniques for automated inspection – contact and non-contact inspection methods – in processes automated measuring methods-machine vision, optical inspection methods.</p>	
<b>UNIT - III</b>	<p><b>Surface finish measurement:</b> Surface texture, Meaning of RMS and CLA values, Tomlinson's Surface meter, Taylor- hobson surface meter, grades of roughness, specifications.</p> <p><b>Screw Thread Metrology:</b> External screw threads terminologies, floating carriage instruments, pitch and flank measurement of external screw thread, application of Tool Makers Microscope, use of profile projector.</p> <p><b>Gear Metrology:</b> Spur gear parameters, gear tooth thickness measurement, gear tooth verniercaliper, constant chord method, span micrometer, base tangent comparator, lead and profile measurement.</p>	<b>(07 Hours)</b>
<b>UNIT - IV</b>	<p><b>Introduction to Quality:</b> Meaning of quality, Approaches-Deming's Approach, Juran's Approach, quality of product, quality of service, cost of quality, value of quality, difference between inspection, quality control, quality circle, quality policy.</p> <p><b>Introduction to quality control:</b> Meaning of Quality Control, 100% inspection and Sampling inspection, Statistics in selective inspection Introduction to statistical quality control: Control chart:- Attribute (P, np, C, U) and variable (X &amp; R chart), sampling inspection, Operating Characteristic curves and sampling plans.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>Quality Assurance Systems:</b> Total quality management (TQM): 7 tools of problem solving, cause and effect diagram, Pareto analysis etc, Quality Function Deployment (Q.F.D), Kaizen, Introduction to Six sigma, process capability index (Cp, Cpk) concept, methods of determining Cp and Cpk .</p> <p><b>Reliability, availability and maintainability;</b> Distribution of failure and repair times; determination of MTBF and MTTR, reliability models; determination of system reliability; preventive maintenance and replacement. Design of Experiments</p>	<b>(07 Hours)</b>



	(DOE).	
<b>UNIT - VI</b>	<b>Quality Management Systems:</b> History and evaluation of ISO9000 series, importance and over view of ISO9000-1998 series standards, structure of ISO9000-2000 series standards, clauses of ISO9000 series standards and their interpretation and implementation, quality system documentation, BIS standards ,ISO/TS 16949 and audit ISO14000: Environmental management concept, and requirement of ISO14001, benefits of environmental management systems. OH and AS standards.	<b>(05 Hours)</b>
<b>Term Work/Practical's:</b>		
1. Measurement bearing Parameters by using Vernier Calliper and Micrometer Screwgauge		
2. Measurement of Ovality Using Johanson Mikrokator.		
3. Measurement of angle by sine bar/sine center.		
4. Measurement of optical surface using Interferometer.		
5. Study and experiment on profile projector / Tool makers microscope		
6. Measurement of screw thread parameters using Floating Carriage Micrometer		
7. Measurement of the surface roughness		
8. Measurement of gear tooth thickness using gear tooth vernier caliper and span micrometer		
9. Machine tool Alignment test on lathe/drilling/milling machine.		
10. Experiment to measure Process Capability using Statistical Process Control Or Minitab Software		
<b>Assignments:</b>		
1. Quality and Quality Control		
2. Quality Assurance syaytem and reliability		
3. ISO 9000		
<b>Text Books/Reference Books:</b>		
1	R. K. Jain, "Engineering Metrology", Khanna Publication	
2	I.C.Gupta, "A Text book of Engineering Metrology", Dhanpat Rai and Sons.	
3	K. J. Hume, "Engineering Metrology"	
4	K. W. B. Sharp, "Practical Engineering Metrology", Pitman Publication	
5	Grant, "Statistical Quality Control", McGraw Hill	
6	"Hand Book of Industrial Metrology", A.S.T.M.E. Prentice Hall	
7	J. M. Juran, "Hand Book of Quality Control", McGraw Hill Publication	
8	Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organisation, Series,	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

<b>Subject : ENGINEERING METALLURGY</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Student should have knowledge of material science and mechanical properties of materials	
2.	Student should know about study of equilibrium diagrams ,phase ,crystal structures and microstructures .	
3.	Student should know about forging ,rolling and some manufacturing processes such as casting , machining etc.	
<b>Course Objectives:</b>		
	Student will understand different heat treatment for steel and select the materials as per requirement of industries .	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The manufacturing of steel and will be able to identify different steels as per classifications	
2.	Different heat treatment that is to be carried out for steel as per requirement	
3.	Surface and core heat treatment for different applications	
4.	Types of tool steels and alloy steels and able to suggest as per requirement	
5.	Types of cast irons and able to choose different cast irons as per applications	
6.	Non ferrous material and their applications .	
<b>UNIT - I</b>	<b>Study of Metallography and steels.</b> Study of metallography & microscopes, Etching methods, macroscopic examination methods. Brief idea about iron & steel making, blast furnace, sponge iron, cast irons, Wrought irons, pig iron, Study of Iron-Iron carbide equilibrium diagram, different types of reactions & phases, critical temperatures, cooling of different steels, Classification & specifications of steels, Structure – property relationship, microstructures of plain carbon steels, Measurement of grain size.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Cast Irons :</b> Classification of Cast irons, effect of cooling rate and alloying elements on cast irons , Types of cast irons, Manufacturing methods, Properties, applications of each cast irons, alloy cast irons , Comparison of steels & cast irons, Heat treatments of cast irons.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Alloy Steels &amp; Tool Steels :</b> Classification of alloying elements, Effect of alloying elements on properties, Various alloy steels,	<b>(06 Hours)</b>

	Stainless steels – Classification, Applications & properties, Tool Steels – Classification, Applications & properties, heat treatment of tool steels, mold tool steel.	
<b>UNIT - IV</b>	<b>Heat Treatment of steels :</b> Transformation products of austenite, Martensite transformation & characteristics of martensite, Time – Temperature Transformation curve, Critical Cooling rate, Heat treatment of steels - Annealing, Normalizing, Hardening , Hardenability, Martempering, Austempering, Retained austenite, Tempering, Ausforming, Secondary hardening, Quench cracks,	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Surface treatments and furnaces :</b> Necessity of surface hardening, Carburizing & its types, nitriding& its types, Carbonitriding, Tuffriding, Flame & Induction hardening, Heat treatment furnaces, Atmospheres used in heat treatment, Defects in heat treatments.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Study of Non-ferrous metals and its alloys:</b> Study of copper and it's alloys, equilibrium diagram of Cu-Zn system, Brasses , Bronzes, Study of Aluminum and its alloys, Al-Si equilibrium diagram, applications and properties of non ferrous alloys, Nickel and magnesium alloys, Materials for Bearings. Recent developments in materials like smart materials, magnetostrictive materials etc.	<b>(06 Hours)</b>
<b>Term Work/Practical's:</b>		
<ol style="list-style-type: none"> <li>1. Study of metallurgical microscope and etching technique</li> <li>2. Specimen preparation for metallography</li> <li>3. Macroscopic examination tests.</li> <li>4. Study of plain carbon steels and its microstructures.</li> <li>5. Study of cast irons and its microstructures</li> <li>6. Study of Non ferrous metals and its microstructures</li> <li>7. Heat treatment for plain carbon steels.</li> <li>8. Jominy End Quench test for hard ability measurements</li> <li>9. Any one surface Hardening Heat treatment.</li> </ol>		
<b>Assignments:</b>		
1. Describe in briefly the manufacturing of steels from ore ,list out the steel manufacturing industries		
2. Collect the different component made from steels find out there heat treatment done on it describe in details and submit the component.		
3. Visit the industries that do heat treatment on component and submit the report		
4. Do collection of some tools write the chemical compositions ,manufacturing and supporting treatment etc. and submit the report		
5. take any one cast iron component and write the details about it that is chemical composition ,manufacturing methods and properties		
6. List out the nonferrous materials and its applications , properties and chemical composition.		
<b>Text Books/Reference Books:</b>		

1	“Material Science and Physical Metallurgy”, Dr.V.DKodgire , Everest Publication, Pune.
2	“Physical Metallurgy”, Vijendra Singh, Standard Publishers Distributors, Delhi.
3	“Physical Metallurgy”, S H Avner, Tata Micro hill Publication , Delhi
4	“Heat Treatments of Metals ” R K Rajput ,S K Kataria and Sons Publication, Delhi.
5	“Mechanical Metallurgy”, Ditter
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>NUMERICAL METHODS</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Internal evaluation: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01 Hour/ Week		01 Credit
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of Mathematics	
2.	Basic knowledge of Differentiation and Integration	
3.	Basic knowledge of Interpolation	
<b>Course Objectives:</b>		
The student should recognize the difference between analytical and Numerical Methods and effectively use Numerical Techniques for solving complex Mechanical engineering Problems		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Use appropriate Numerical Methods to solve complex mechanical engineering problems	
2.	Find the roots of equations by various methods.	
3.	Find the solutions to simultaneous equations by various methods	
4.	Use the appropriate method of curve fitting for the given data.	
5.	Use Numerical differentiation and Integration to solve the real time problems	
6.	Write the program on ordinary differential equations	
UNIT-I	<b>Introduction</b> MATLAB fundamentals, MATLAB graphics, simple matlab demonstration programs. Error Analysis Significant figures, Accuracy and Precision, Error definition, Round-Off errors, Truncation error, Total numerical error, Blunders, Formulation error and Data Uncertainty.	(06 Hours)
UNIT-II	<b>Roots of Equation</b> Bracketing methods-Bisection and False position method. Open methods-Simple fixed-point iteration, Newton Raphson method and Secant method. Engineering Applications.	(06 Hours)
UNIT-III	<b>Solutions of Simultaneous Equations</b> Navier Gauss elimination, pitfalls of Gauss Elimination, techniques of improving solutions, complex numbers. Gauss Jordan, Gauss seidal and LU Decomposition. Engineering application-spring mass system.	(06 Hours)
UNIT-IV	<b>Curve Fitting</b> Least-Square Regression-Linear regression, polynomial regression and multiple linear regressions. Interpolation -Newton's divided	(06 Hours)

	difference interpolating polynomial. Lagrange's interpolating polynomial, coefficients of interpolating polynomials. Inverse interpolation spline interpolation. Engineering Applications.	
UNIT-V	<b>Numerical Differentiation and Integration</b> Trapezoidal rule, Simson's rules, integration with unequal segment, multiple integral, romberg integration, Gauss Quadrature. Richardson Extrapolation, derivatives of unequally spaced data. Engineering Applications. Numerical Differentiation using Forward, backward and central difference.	(06 Hours)
UNIT-VI	<b>Ordinary Differential Equations</b> Euler's method, improvement of Euler's method, Runge-Kutta method, system of equations, Adaptive Runge Kutta method. Stiffness and multistep method. Engineering Applications.	(06 Hours)
<p>Term work: List of Experiments:</p> <ol style="list-style-type: none"> <li>1. Program on Roots of Equation (Validation by suitable solver) Bisection Method, False position Method, Newton Raphson method and Successive approximation method</li> <li>2. Program on Simultaneous Equations (Validation by suitable solver) Gauss Elimination Method, Partial pivoting, Gauss-Seidal method, Gauss Jordan method</li> <li>3. Program on Numerical Integration(Validation by suitable solver) <ol style="list-style-type: none"> <li>a) Trapezoidal rule,</li> <li>b) Simpson`s Rules (1/3rd, 3/8th)</li> </ol> </li> <li>4. Program on Curve Fitting using Least square technique (Validation by suitable solver)</li> <li>5. Program on Interpolation (Validation by suitable solver)</li> <li>6. Program on Ordinary Differential Equations</li> </ol>		
<p><b>Assignments:</b></p> <p>Six Assignments based on above syllabus</p> <p><b>Text Books / References</b></p> <ul style="list-style-type: none"> <li>• S. S. Sastry, Introductory Methods of Numerical Analysis, PHI.</li> <li>• Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, (2007).</li> <li>• Grewal, B.S. and Grewal, J.S., " Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, (2004).</li> <li>• Sankara Rao, K. "Numerical methods for Scientists and Engineers", 3rd Edition Prentice Hall of India Private Ltd., New Delhi, (2007).</li> <li>• M. K. Jain, S.R.K. Iyengar and R.K.Jain, (2003), Numerical Methods for Scientific and Engineering,</li> <li>• Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, (2007).</li> <li>• Gerald and Wheatley, Applied Numerical Analysis, Pearson Education Asia</li> <li>• E. Balagurusamy, Numerical Methods, Tata McGraw Hill</li> </ul>		

<ul style="list-style-type: none"> <li>• P. Thangaraj, Computer Oriented Numerical Methods, PHI</li> <li>• Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientist, Tata Mc-GrawHill Publishing Co-Ltd.</li> <li>• Rao V. Dukkupati, Applied Numerical Methods using Matlab, New Age International Publishers.</li> </ul>		
Syllabus for Unit Test		
Unit Test 1	Units I, II and III	
Unit Test 2	Units IV, V and VI	

<b>PRODUCTION PRACTICE – IV</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Practical: 04 Hours / Week		01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1	Basic knowledge of handling the Lathe machine.	
2	Basic knowledge of handling the Milling machine.	
3	Basic knowledge of handling the Grinding machine.	
<b>Course Objectives:</b>		
The students should able to manufacture the job on lathe, Milling and Grinding Machine		
<b>Course Outcomes:</b>		
Students will be able to performed		
1	Different operations on lathe machine.	
2	Gear Cutting on Milling machine.	
3	Finishing operation on Cylindrical grinding machine and Surface grinding machine.	
<b>Term Work</b>		
Each Candidate shall be required to complete and submit the following jobs:		
1. One Composite job consisting of 3 to 4 pieces as below: Machining of components covering all operations on Lathe (Including Internal and external threading, Taper Matching, Knurling )		
Grinding operation on Above (Turning ) Job		- One Job
2. Gear Cutting on milling machine.		-One Job
<b>Note:</b> Practical examination of 6 Hours duration shall be conducted at the end of Sem.-II based on the process and practical conducted in production practice-III		



# **B.Tech.Production**

## **Sem-VI**

<b>Subject :JIG FIXTURE AND DIE DESIGN</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of conventional and non conventional manufacturing processes.	
2.	Knowledge of casting processes.	
3.	Knowledge plastic processes methods.	
<b>Course Objectives:</b> To design jig, fixtures and dies for manufacturing system.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	To understand the concept of jigs and fixture and its principles.	
2.	To design jigs with use of standard components.	
3.	To design fixture with use of standard components.	
4.	To select plastic processes methods.	
5.	To understand the concept of injection moulding and able to design the injection molding die.	
6.	To design dies for the pressure die casting.	
<b>UNIT - I</b>	<b>Fundamentals of Jigs And Fixtures:</b> Significance and purpose of jigs and fixtures and their functions in manufacturing processes. Classifications of Jigs and Fixtures. Design features of main elements of Jigs and Fixtures such as locating, clamping and guiding elements and their integrations. Indexing, locking and auxiliary elements. Bodies and bases or frames of Jigs and fixtures. Economics of Jigs and fixtures, Pneumatics & Hydraulics for Jig & Fixtures.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Design of Jigs:</b> General guidelines & procedures for design of Jigs. Design & selection of standard elements, Analysis of clamping force required & their magnitude, Design of drilling jigs.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Design of Fixtures:</b> General guidelines & procedures for design of fixtures. Design & selection of standard elements, Analysis of clamping force required & their magnitude, concept of modular fixtures & tool presetting fixtures. Design of milling, turning fixture and fixture for assembly. Economic analysis .	<b>(06 Hours)</b>

<b>UNIT - IV</b>	<b>Plastics Processing:</b> Materials used for plastic processing, Compression, transfer, injection & blow moulding processes - its working, construction, types & advantages and limitations.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Design of Injection Molds:</b> Specifications and elements of injection molding machine, Injection molding feed system: runner and gates, ejection methods, ejection force calculation, parting surface selection, cooling systems, Defects & remedies.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Design of Die Castings Dies:</b> Die casting machines-Hot & cold chamber, metals for die casting, die locking methods, interlocks & safety devices, specific details of die constructions, casting, ejection, cores, slides, loose die pieces, types of cores, directional solidification, types of feeders, die venting, water cooling, classification of dies- single, combination, multi impression. General details of die design, Gating system, inserted impressions, die casting defects and remedies, die lubrication & rules for die lubrication.	<b>(06 Hours)</b>
<b>Term Work/Practical's:</b>		
1. Design & working drawing of one drilling jig.		
2. Design & working drawing of one fixture.		
3. Design & working drawing of a die casting die.		
4. Design & drawing of a injection molding die.		
<b>Assignments:</b>		
1. Six Assignment based on the syllabus.		
<b>Text Books/Reference Books:</b>		
1	Donaldson, Lecain&Goold, "Tool Design", Tata McGrw Hill	PRODUCTION
2	Doebler H. H., "Die Casting", McGraw Hill	
3	P. N. Rao, "Manufacturing Technology", Tata McGraw Hill	
4	Wilson, "Fundamentals of Tool Design", A. S. T. M. E.	
5	M. H. A. Kempster, "Introduction to Jigs and Fixtures Design"	
6	P. H. Joshi, "Press Tools", A.H. Wheeler	
7	P. C. Sharma, "Production Engineering", S. Chand	
8	Dr. Surender Kumar, "Production Engg. Design (Tool Design)", Satya Prakashan	
9	R. G. W. Pye, "Injection Mould Design", EWP	
10	A. S. Athalye, "Plastic Processing Handbook", Multitech	
11	Richard Kibbe, John E. Neely, Meyer, White, "Machine Tool Practices"	
12	Hoffman, "Introduction to Jigs and Fixtures"	
13	"Tool Engineering Handbook", A. S. T. M. E.	
14	R. K. Jain, "Production Technology", Khanna Publishers	
15	Dr. Surender Kumar, "Production Engineering Design"	
16	"Metals Handbook", Vol II ASME	

17	"Toll and Die Design Handbook", McGraw Hill
18	Hiram and Grant, "Non Conventional Clamping Devices"
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Subject :PRODUCTION MANAGEMENT</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of Industrial Engineering.	
2.	Knowledge of Industrial Management.	
3.	Knowledge of Production Planning and Control.	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of Production Management tools and practices in manufacturing.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	To understand the evolution of Production Management, its scope, operations, organization.	
2.	To understand the factors deciding location of plant, Layout of facility and objectives of material handling.	
3.	To understand manpower planning and capacity planning techniques based on technology and objective of material, handling.	
4.	To understand the organization and administration of maintenance function- it's types, principles, operations policies etc.	
5.	To understand the concept of World-Class-Manufacturing, it's elements, problems and various contributors to develop World-Class-Manufacturing.	
6.	To understand topics in Production Management such as Green/Agile and Lean manufacturing and energy conservation and energy efficiency manufacturing with knowledge based system (IT) application	
<b>UNIT - I</b>	<b>Scope of Production Management</b> The evolution of Production management / Operations Management. Different production eras - Mass, Batch, Job production customization. Relationship of Production/Operations Management with materials, maintenance, quality control, design production engineering and sales. Scope, Definition and its relationship with other management functions such as marketing, finance and personal management. Production organizations for single product, multi product, single location, multilocation. <b>Product Design</b> Product life cycle, Relationship between product design and product cost. Stage of Product Design & Development, Functional, Economic, manufacturing and marketing aspects in product design, Concept of Concurrent engineering, 3S, House of Quality.	<b>(06 Hours)</b>

<b>UNIT - II</b>	<p><b>Location</b> Facility-location: Objectives, factors affecting site selection, , center of gravity method, profit volume rating and hub and scope model.</p> <p><b>Layout</b> Layout types, material flow pattern.</p> <p><b>Material handling</b> Material handling: Its relation with layout, Objectives, principles and types of material handling. AGV'. Unit load concept.</p>	<b>(06 Hours)</b>
<b>UNIT - III</b>	<p><b>Manpower Planning and Capacity Planning</b> Manpower forecasting, manpower inventory, capacity and level strategies, aggregate capacity planning.</p> <p><b>Productivity</b> Productivity : Factor productivity, Total productivity, Labor productivity, measurement of productivity, techniques of productivity Toyato Production System (TPS) ,Total Productivity Management(TPM) and Mangement Information System (MIS).</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Industrial Maintenance</b> Organization, Administration of maintenance function, types of maintenance, principles, operating policies, scope of maintenance management, budget and Total productive maintenance.</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>World Class Management:</b> Concept of World Class manufacturing, Emergence of information age, Manufacturing challenges of Information age, elements of business turbulent environment, Problems in manufacturing sector, Evolution of WCM, Contribution of Hall, Schoenberger, Gunn, Maskel, WCM practices in industries and WCM scenario in India.</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Recent Techniques of Production Management</b> Concept, implementation, applications, advantages and disadvantages of following tools and techniques: Energy conservation and Energy audit, Green Production, Waste heat treatment, Energy efficient manufacturing system, Lean and agile manufacturing, Knowledge Based System, Manufacturing Information System.</p>	<b>(06 Hours)</b>
<b>Assignments:</b>		
1.Six Assignment based on above syllabus.		
<b>Text Books/Reference Books:</b>		
1	H. B. Maynard and others, "Modem manufacturing", IV edition - McGraw Hill Publications, ISBN 0-07-041084-4.	
2	H. B. Maynard and others, "Industrial Engineering Handbook", IV edition- McGraw Hill Publications, ISBN 0-07-041084-4.	
3	L. R. Hignis, R. K. Mobley, Smith Ricky, "Maintenance Engineering Handbook", McGraw Hill Publications, ISBN 0-07-028819-4.	

4	Kanter Jerome, "Management Information System", Prentice Hall, ISBN 0-87692-358- 9.
5	H. Noori and R. Radford, "Production and Operation Management", Total Quality and Responsiveness international Edition - 1995 - McGraw Hill Inc.
6	B.S. Sahay, K B C. Saxena, Ashish Kumar, "World Class Manufacturing-A Strategic perspective",McMillan India Ltd.
7	F. L. Francis, J. A. White, L. F. McGinnis, "Facilities Layout and Location", Prentice Hall of India Pvt. Ltd., ISBN 81-203-1460-3.
8	T. E. Vollmann, W. L. Bery, "Manufacturing Planning and control Systems", Galgotia Publication New Delhi, ISBN 81-7515-084-X.
9	Richard Muther, "Systematic Layout Planning"
10	J. L. Riggs, "Production Systems", John Wiley and Sons.
11	Mayer, "Production Management", Tata McGraw Hill Publications.
12	M. Telsang, "Industrial Engineering and Production Management", S.Chand Publication
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>COMPUTER AIDED DESIGN AND MANUFACTURING</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR: 50 Marks	
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of drawing.	
2.	Basic knowledge of standards	
3.	Basic knowledge of manufacturing processes.	
<b>Course Objectives:</b>		
To understand the basics of CAD/CAM and to learn about the geometric issues concerned to the manufacturing and its related areas.		
<b>Course Outcomes:</b>		
<b>Students will be able to</b>		
1.	Understand the concepts of CAD and computer graphics system.	
2.	Understand the curves and the concept of geometric modeling.	
3.	Understand the concept of part families and cellular manufacturing	
4.	Understand the concept of CIM and its models.	
5.	Write the manual and APT part program for various machining operations	
6.	Understand the process of computer aided process planning and various approaches.	
UNIT-I	<b>Introduction:</b>  Product Life Cycle, Design Process, Application of Computers for Design, Benefits of CAD, Computer configuration for CAD Applications, Grover's	(06)



	<p>Model of Product life Cycle for Selection of CAD/CAM.</p> <p>Configuration of graphics workstations, Fundamentals of 2D graphics, Menu design and Graphical, User Interface (GUI), Homogeneous coordinate systems, Geometric transformations, graphics standards.</p>	
UNIT-II	<p>Space Curve design -Analytical and Synthetic approaches, parametric equations, modeling of cubic spline, Bezier curve, B-spline curve and NURBS and their manipulation techniques.</p> <p>Geometric modeling techniques- Wireframes, B-Rep, CSG and Hybrid modelers, Feature based, Parametric and Variation modeling.</p>	(06)
UNIT-III	<p><b>Group Technology and FMS</b></p> <p>Group Technology: Part families, Part Classification and coding, Cellular manufacturing and composite part concept.</p> <p>Concept of manufacturing systems and automation, automation strategies, concept of machine cell and CMS, Building blocks of FMS Planning and implementations of FMS.</p>	(06)
UNIT-IV	<p><b>CIM:</b></p> <p>Introduction, ESPRIT - CIM OSA model, The NIST - AMRF Hierarchical Model, The siemens model of CIM, The CIM model of Digital Equipment Corporation, IBM concept of CIM, Present Scenario, Rapid product development and manufacture, Extended Enterprises.</p>	(06)
UNIT-V	<p><b>Advanced Manufacturing Techniques:</b></p> <p>Principles of Numerical control, Types of CNC Machine Tools, Features of CNC Systems, Direct numerical control (DNC), Elements of CNC viz. Ball screws, rolling guide ways, structure, drives and controls, standard controllers, Virtual machining. Machining Centers and Interpolators.</p> <p>CNC Programming: Types, Manual Part Programming, Canned Cycle, Offset, APT.</p> <p>Introduction to Rapid prototyping, introduction to additive manufacturing</p>	(06)

	techniques.	
UNIT-VI	<p><b>Computer Aided Process Planning:</b></p> <p>Process Planning and Production Planning, manual experience based planning, Decision table and decision trees, Process capability analysis, Variant and Generative process planning approach, Process planning systems like CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO,CPMP</p> <p>Introduction to total integrated process planning systems</p>	(06)
<p>Term work:</p> <p>List of Experiments:</p> <ol style="list-style-type: none"> <li>1. Manual part programming using G and M codes for Turning, Step turning, Taper turning, multiple turning, Facing, Multiple facing, thread cutting and radius turning on cylindrical components.</li> <li>2. CNC Milling program involving linear motion and circular interpolation.</li> <li>3. CNC Milling program involving contour motion and canned cycles.</li> <li>4. CNC Milling program involving Pocket milling</li> <li>5. CNC code generation using any CAM software.</li> <li>6. Simulation of machining operations using any CAM software.</li> <li>7. Route sheet generation using CAM software.</li> <li>8. Study on Rapid Prototyping Technologies.</li> </ol>		
<p><b>Assignments:</b></p> <p>Six Assignments based on above syllabus.</p> <p><b>Oral/Practical</b></p> <p>Term work and oral will be based on above syllabus</p> <p><b>Text Books / References</b></p> <ul style="list-style-type: none"> <li>• RadhaKrishnan P and Subramanyam, “CAD/CAM/CIM”, Wiley Eastern Ltd</li> <li>• M. Groover, E. Zimmers, “CAD/CAM: Computer-Aided Design and Manufacturing”, Prentice Hall of India Pvt Ltd, 1995</li> </ul>		

<ul style="list-style-type: none"> <li>• Mikell P. Grover, “Automation, Production System and Computer Integrated Manufacturing”, Prentice Hall of India Pvt Ltd, 1995.</li> <li>• Zeid Ibrahim, CAD/CAM theory and practices, McGraw Hill international edition. 2009.</li> <li>• Rogers D. F. and Adams A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989.</li> <li>• Faux I. D. and Pratt M. J., Computational Geometry for Design and Manufacture, John Wiley &amp; sons, NY, 1979</li> <li>• Mortenson M. E., Geometric Modeling, John Wiley &amp; sons, NY, 1985</li> <li>• Choi B.K., Surface Modeling for CAD/CAM, John Wiley &amp; Sons, NY, 1991.</li> </ul>			
Syllabus for Unit Test			
<table border="1"> <tr> <td><b>Unit Test 1</b></td> <td>Units I, II and III</td> </tr> </table>	<b>Unit Test 1</b>	Units I, II and III	
<b>Unit Test 1</b>	Units I, II and III		
<table border="1"> <tr> <td><b>Unit Test 2</b></td> <td>Units IV, V and VI</td> </tr> </table>	<b>Unit Test 2</b>	Units IV, V and VI	
<b>Unit Test 2</b>	Units IV, V and VI		

<b>Subject : FLUID MECHANICS AND MACHINE TOOL CONTROL SYSTEM</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial : 01Hours / Week		01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have knowledge of		
1.	Fluids and its properties	
2.	Fundamentals of engineering mechanics	
3.	Basics of electrical and electronics component	
<b>Course Objectives:</b>		
	The student should understand the scope, objective and application of industrial circuits in hydraulic and pneumatic.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Used for fluid mechanics fundamentals, including concepts of mass and momentum conservation.	
2.	An ability to apply the Bernoulli's equation to solve problems in fluid mechanics.	
3.	An ability to apply control volume analysis to problems in fluid mechanics.	
4.	Knowledge of laminar and turbulent boundary layer fundamentals.	
5.	An exposure to recent developments in fluid mechanics, with application to industries.	
6.	An ability to apply the concepts developed for fluid flow analysis to issues in industrial design.	
<b>UNIT - I</b>	<b>Fluid Properties and Fluid Statics:</b> Definition of fluid, Newtonian and non Newtonian fluids. properties of fluids, Types of fluids, Viscosity, specific gravity, Compressibility, Surface tension, Capillarity etc. effect of temperature and pressure on hydraulic fluid. Pressure at a point, Pascal's law, measurement of pressure, methods, manometers, liquid pressure – horizontal, vertical plane surface.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Fluid Dynamics:</b> Types of flow, steady and unsteady, uniform and non uniform, streamline flow, laminar and turbulent flow, Use of Reynolds's number in flow through pipes. Continuity equation, energy equation, momentum equation. Euler's equation of motion along a stream line, Bernoulli's equation, Application of Bernoulli's equation to pitot tube, Venturimeter, Orifices, Orifice Meter, Triangular & Rectangular notch. Calculations of flow, friction and work done by fluid under pressure	<b>(06 Hours)</b>

<b>UNIT - III</b>	<p><b>Fluid power:</b> Introduction to fluid power: Classification, general feature and application in various fields, hydraulic and pneumatic ISO symbols in fluid power applications</p> <p>Fluids for hydraulic power: functions, properties and conditioning of hydraulic fluids.</p> <p>Sources of fluid power: classification, types and selection of pumps: positive displacement pumps and negative displacement pumps, types of compressors.</p> <p>Distribution of fluid power: selection of conductors for system considering various factors, sealing and packing devices</p>	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<p><b>Control of fluid power:</b> Pressure control valves- direct acting type, pilot operated, sequence, counter balancing, unloading, pressure reducing, construction and working:</p> <p>Direction control valves- types, construction and working, spool actuation methods, spool centre positions.</p> <p>Flow control valves- compensated and non compensated type, construction and working. Actuators: types, applications and selection</p>	<b>(06 Hours)</b>
<b>UNIT - V</b>	<p><b>System components and circuits:</b> Study of various accumulators, intensifiers, hydraulic jack, power jack, etc. Linear and regenerative circuits with accumulators and intensifiers. Study of various hydraulic and pneumatic circuits for machine tools: components, working and applications. Performance of system (descriptive treatment only).</p> <p>Fluid power maintenance and safety.</p> <p>Introduction to fluidics, maintenance and study of simple logic gates, Use of hydraulics V/s Pneumatics in industry.</p>	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<p><b>Pneumatic system Elements:</b> Piping materials and pressure ratings, piping layout, calculation of pressure drop in pneumatic line; Air compressors, types, working, selection criteria; FRL unit, construction and working; pneumatic cylinders and air motors, construction and working; types, calculation of force and air consumption of air, hydraulic and electric motor</p> <p>Hydro pneumatic system: concept, working and applications (Descriptive treatment only).</p>	<b>(06 Hours)</b>
<b>Term Work/Practical's:</b>		
A journal containing record of any eight experiments of the following:		
1. Verification of modified Bernoulli's equation.		
2. flow through orifice/ Venturimeter		
3. At least two experiments on Hydraulic Trainer.		
4. Practical performance using Automation Studio Software		

<b>Assignments:</b>	
1. study of symbols used in fluid power	
2.) study of different types of valves used in fluid circuits	
3. Study of actuators / Intensifier/ Accumulators	
4. Design of control circuit for a machine tool.	
5. study of power pack unit	
6. Design of hydraulic and pneumatic circuits.	
<b>Text Books/Reference Books:</b>	
1	Modi, Seth: 'hydraulics and fluid mechanics': standard book house, Delhi
2	Dr. j. lal: 'Fluid mechanics & hydraulics with computer application'. Metropolitan Book co. pvt. Ltd. Delhi
3	Garde, mirajgaonkar : 'Engineering fluid mechanics': Nemchand& bros. Roorkee
4	D. A. Pease : 'Basic fluid power': Prentice hall
5	H. L. Stewart : 'pneumatic & hydraulics': Industrial Press
6	A. Esposito : 'Fluid power with application': Prentice hall
7	A. B. Goodwin: 'Power hydraulics'.
8	A. B. Goodwin: ' Fluid Power system'
9	Eatons Vickers: 'Industrial Hydraulic manual'.
10	Festo's 'manual on pneumatic principle, Applications'
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Subject :ELECTIVE I MARKETING MANAGEMENT</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic Management Concept.	
2.	Functions of Management.	
3.	Principles of Management.	
<b>Course Objectives:</b> The objective of this course is to facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Structure, functions and strategies of Marketing department.	
2.	Design the product marketing and cost for the product marketing.	
3.	The distribution channels and their selection.	
4.	Importance of Market Segmentation.	
5.	Implementation of Marketing Information System & Marketing Research.	
6.	Advance tools in marketing and their implementation.	
<b>UNIT - I</b>	<b>Marketing</b> – Definition, Concepts Significance & functions of Marketing, Approaches to the study of Marketing, Relevance of Marketing in a developing economy. Role & functions of Marketing Manager Marketing mix; Strategic marketing planning – an overview. Introduction to 8P for marketing.	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Product Decisions:</b> Concept of a product; Classification of products; Major product decisions; Product line and product mix; Branding; Packaging and labeling; Product life cycle – strategic implications; New product development and consumer adoption process. <b>Pricing Decisions:</b> Factors affecting price determination; Pricing policies and strategies; Discounts and rebates.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Distribution Channels and Physical Distribution Decisions:</b> Nature, functions, and types of distribution channels; Distribution channel intermediaries; Channel management decisions; Retailing and wholesaling.	<b>(06 Hours)</b>

	Factors influencing channels, Elements of Promotion Mix – Sales Promotion System. Recent Trends in Promotion Sale. Advertising – Role of Advertising, Advertising Media, B to B and online marketing.	
<b>UNIT - IV</b>	<b>Market Segmentation</b> Meaning, Definition, Different ways to Segmentation, Essential of effective Market Segmentation, Distinction between Differential Marketing & Concentrated Marketing.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Marketing Information System &amp; Marketing Research.</b> Concept & components of a Marketing Information System – Marketing Research – Meaning & scope – marketing research procedure – types & techniques of Marketing Research – Managements use of Marketing Research.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Issues and Developments in Marketing:</b> Social, ethical and legal aspects of marketing; Marketing of services; International marketing; Green marketing; Cyber marketing; Relationship marketing and other developments of marketing.	<b>(06 Hours)</b>
<b>Assignments:</b>		
1. Six Assignment based upon above syllabus		
<b>Text Books/Reference Books:</b>		
1	Kotlar, Philip, Marketing Management, Prentice Hall, New Delhi.	
2	Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi.	
3	Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi.	
4	McCarthy, E.J., Basic Marketing: A managerial approach, Irwin, New York.	
5	John Fraire., Principles and practice of Marketing	
6	Kanuk , Consumer Behavior By Schiffman	
7	Davis – Olsan , Marketing Information System	
8	Gandhi , Marketing – A Managerial Introduction	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	



<b>Subject :ELECTIVE I DESIGN FOR MANUFACTURING AND ASSEMBLY</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic Knowledge of Manufacturing processes.	
2.	Knowledge of Materials and its properties.	
3.	Knowledge of Casting and metal extrusion.	
<b>Course Objectives:</b>		
	To make the student well conversant with the relations between design for manufacturing and design for assembly.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The steps in DFMA.	
2.	Carry out sand castings and manufacture powder metallurgy products.	
3.	The process of design for machining.	
4.	The process for metal extrusion and forging	
5.	The process for assembly	
6.	The use of CAD in DFMA	
<b>UNIT - I</b>	<b>Introduction to DFMA:</b> History of DFMA, Steps for applying DFMA during product design, Advantages of applying DFMA during product design, Reasons for not implementing DFMA, Introduction to Manufacturing Process: Classification of manufacturing process, Basic manufacturing processes, Mechanical properties of material: Tensile properties, Engineering stress-strain, True stress strain, Compression properties, Shear properties, Introduction to materials and material selection: Classification of engineering materials, Material selection for product design	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Sand casting:</b> Introduction to sand casting, Typical characteristics of a sand cast part, Design recommendation for sand casting, Investment casting: Introduction, Steps in investment casting, Design consideration of Investment casting, Typical characteristics and applications, Die casting: Introduction to die casting, Advantages of the die casting process, Disadvantages of the die casting process, Applications, Suitable material consideration, General design consideration, Specific design recommendation, Injection moulding: Introduction	<b>(06 Hours)</b>

	to injection moulding, Typical characteristics of injection moulded parts, Effect of shrinkage, Suitable materials, Design recommendations, Design for powder metal processing: Introduction to powder metal processing, Typical characteristics and applications, Limitations, Design recommendations.	
<b>UNIT - III</b>	<b>Design for machining:</b> Introduction to machining, Recommended materials for machinability, Design recommendations, Design for tuning operation: Process description, Typical characteristics and applications, Suitable materials, Design recommendations, Design for machining round holes: Introduction, Suitable materials, Design recommendations, Recommended tolerances, Parts produced by milling: Process description, Characteristics and applications of parts produced on milling machines, Design recommendations for milling, Dimensional factors and tolerances, Parts produced by planning, shaping and slotting: Process description, Design recommendation planning, Design for broached parts: Process description, Typical characteristics of broached parts, Suitable materials for broaching, Design recommendations.	<b>(06 Hours)</b>
<b>UNIT - IV</b>	<b>Metal Extrusion:</b> Process, Suitable material for extrusion, Design recommendation for metal extrusion, Metal stamping: Process, Characteristics and application of metal stamping, Suitable materials for stamping, Design Recommendations for metal stamping, Fine blanked parts: Fine blanking process, Material suitable for fine blanked parts, Design recommendations for piece parts, Rolled formed section: Process, Design recommendations rolled section, Impact or cold extrusion: Process, Design recommendations for backward extrusion, Forward extrusion: Process, Design recommendations for forward extrusion, Design for Forging: Forging processes, Forging nomenclature, Suitable materials for forging, Design recommendations, Metal injection moulded parts: Process, Materials suitable, Design recommendations for metal injectionmolded parts.	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Introduction to Assembly:</b> The assembly process, Characteristics and applications, Example of common assembly, Economic significance of assembly, General taxonomies of assembly operation and systems, Assembling a product, Design for Assembly: Introduction, Design consideration, Design for Fasteners: Introduction, Design recommendation for fasteners.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Introduction to CAD:</b> Geometric Representation in CAD, Extraction of part feature	<b>(06 Hours)</b>

	information from CAD Model: Introduction, Feature recognition techniques, Free Form Features, Hybrid Techniques, Reference, Extraction of assembly feature information from CAD Model: Introduction, Assembly features, Definition of assembly feature attributes, Characterization of assembly feature, Examples of Assembly feature, Overview of procedure to extract assembly features from CAD model of Assembly, Description of steps in the assembly feature extraction procedure, Examples of assembly feature extraction: Aircraft wing and automotive chassis assembly.	
<b>Term Work/Practical's:</b>		
1. Introduction to DFMA		
2. Sand casting and Powder metallurgy		
3. CAD		
<b>Assignments:</b>		
1. Design for Machining		
2. Metal Extrusion and Forging		
3. Design for Assembly		
<b>Text Books/Reference Books:</b>		
1	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.	
2	J. Lesko, (1999) Industrial Design, Materials and Manufacture Guide, John Willy and Sons, Inc	
3	George E. Dieter and Linda C. Schmidt (2009), Engineering Design, Fourth edition, McGraw-Hill companies, New York, USA	
4	Geoffrey Boothroyd, Peter Dewhurst and Winston Knight (2002) Product Design for Manufacture and Assembly, Second Edition, CRC press, Taylor & Francis, Florida, USA	
5	O. Molloy, S. Tilley and E.A. Warman (1998) Design for Manufacturing and assembly, First Edition, Chapman &Hall, London, UK.	
6	D. E. Whitney, (2004) Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development, Oxford University Press, New York	
7	A.K. Chitale and R.C. Gupta, (1999) Product design and Manufacturing, Prentice Hall of India, New Delhi.	
8	James G. Bralla (1998) Design for Manufacturability Handbook, Second Edition, McGraw-Hill companies, New York, USA	
9	Geoffrey Boothroyd (2005) AssemblyAutomation and Product Design, Second Edition, CRC press, Taylor & Francis, Florida, USA	
10	G. Q. Huang (1996) Design for X, Concurrent Engineering Imperatives, First Edition, Chapman &Hall, London, UK A joint venture by IISc and IITs, funded by MHRD, Govt of India	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

<b>Subject : ELECTIVE I NON TRADITIONAL MANUFACTURING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance : 10 Marks	01 Credit
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Conventional manufacturing Processes	
2.	Engineering materials and its properties	
3.	Basics of electrical, thermal and chemical energy.	
<b>Course Objectives:</b>		
	To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Appreciate use of nonconventional machining methods	
2.	The working principles and working parameters of mechanical processes.	
3.	Electrochemical and electro chemical grinding processes.	
4.	Various techniques in chemical machining process	
5.	Terminology used in (EDM) nontraditional manufacturing industries.	
6.	Various techniques in laser beam machining.	
<b>UNIT - I</b>	<b>INTRODUCTION:</b> Non Traditional machining, Definitions of various processes. Classification of NCMP, Historical background of New - Technological processes.	<b>(06 Hours)</b>

<b>UNIT - II</b>	<b>MECHANICAL PROCESSES:</b> Processes principles, equipment process Parameters and applications. Examples of Abrasive jet machining, Ultrasonic machining, Abrasive flow machining, water jet machining, magnetic abrasive machining. Evaluation of material removal rate (MRR) in AJM	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>ELECTRO CHEMICAL MACHINING (ECM):</b> Background of ECM process, Classification of ECM processes introduction to ECD fundamental principles of ECM. Electrochemistry of ECM, Equipment required in ECM. Process capabilities processes parameters and application examples. Trouble shootings. Evaluation of MRR of pure metal in ECM. <b>ELECTRO CHEMICAL GRINDING:</b> Process principles, process parameters, Applications.	<b>(08 Hours)</b>
<b>UNIT - IV</b>	<b>CHEMICAL MACHINING:</b> Introduction, Fundamental principles, process parameters, classification and Selection of etchant resistant materials, Photo chemical machining	<b>(04 Hours)</b>
<b>UNIT - V</b>	<b>ELECTRICAL DISCHARGE MACHINING (EDM):</b> Fundamental principle of EDM, Equipments required for EDM process Parameters, process capabilities. Application example trouble shooting, Introduction to wire EDM, Process principle and parameters, process Capacities and its applications.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>LASER BEAM MACHINING (LBM):</b> Introduction, Background of laser action, production of photon cascade in solid optical laser. Machining applications of laser wire drilling, cutting, marking, welding, heat treating, cladding. Introduction and process principle of thermal energy method, EBM. <b>PLASMA ARC CUTTING (PAC):</b> Process principles, equipment, applications, and examples	<b>(08 Hours )</b>
<b>Term Work/Practical's: List of Practical (Any Eight)</b>		
1) study and demonstration of ECM		
2) Study and demonstration on EDM		
3) study and demonstration of ECDM		

<b>4) study and demonstration of ECM with ultrasonic vibrations</b>	
<b>Assignments:</b> - Six assignments based on above syllabus	
<b>Text Books/Reference Books:</b>	
1	Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi, 2007
2	Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York (1987).
3	Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (2007).
4	Mc Geough, “Advanced Methods of Machining” Chapman and Hall, London (1998).
5	Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd., New Delhi ,8th Edition, 2001.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

**PRODUCTION ENGINEERING SYLLABUS AND STRUCTURE**

**B. Tech (Production) Syllabus Structure**

**PRODUCTION ENGINEERING- SEM-VII**

S. N	Course Code	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks							Total Credit				
			L	T	P	End Sem Exam	Continuous Assessment			TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total
							UT	Att	Ass								
1.		Operations Research	3	-	-	60	20	10	10	-	-	-	100	3	-	-	3
2.		Machine Tool Design	3	-	2	60	20	10	10		50	-	150	3		1	4
3.		Mechatronics and Automation	3	-	2	60	20	10	10		50	-	150	3		1	4
4.		Elective II	3	-	-	60	20	10	10		-	-	100	3		-	3
5.		Total Quality Management	3			60	20	10	10				100	3	0	0	3
6.		Computer Aided Manufacturing	-	-	2	-	-	-	-		50	-	50	-		1	1
7.		Inplant Training	-	-	-	-	-	-	-	-	50	-	50	-		3	3
8.		Project Stage I	-	-	2	-	-	-	-	-	50	-	50	-		4	4
		<b>Total</b>	<b>15</b>	<b>0</b>	<b>8</b>	<b>300</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>0</b>	<b>250</b>	<b>0</b>	<b>750</b>	<b>15</b>	<b>0</b>	<b>10</b>	<b>25</b>

**List of Elective II**

1. Powder Metallurgy
2. Materials Management
3. Manufacturing system and simulation

**PRODUCTION ENGINEERING SYLLABUS AND STRUCTURE**

**B. Tech (Production) Syllabus Structure**

**PRODUCTION ENGINEERING- SEM-VIII**

S. N	Course Code	Course Title	Scheme of Teaching Contact Hrs/week			Examination Scheme-Marks							Total Credit				
			L	T	P	End Sem Exam	Continuous Assessment			TW	TW/OR	TW/Pr	Total	TH	T	Pr	Total
							UT	Att	Ass								
1.		Process Planning and Tool Design	3	-	2	60	20	10	10	-	50	-	150	3		1	4
2.		Industrial Robotics	3	-	2	60	20	10	10	-	50	-	150	3		1	4
3.		Financial management and Cost Control	3	1		60	20	10	10	-		-	100	3	1		4
4.		Elective III	3	-	2	60	20	10	10	-	50	-	150	3		1	4
5.		Computer Aided Engineering	-	-	2	-	-	-	-		50	-	50	-		1	1
6.		Project Stage II	-	-	4	-	-	-	-	-	150	-	150	-		8	8
		<b>Total</b>	<b>12</b>	<b>1</b>	<b>12</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>0</b>	<b>350</b>	<b>0</b>	<b>750</b>	<b>12</b>	<b>1</b>	<b>12</b>	<b>25</b>
		Environmental Studies	3			100							100	3			3

**List of Elective II**

1. Human Resource Management
2. Manufacturing of Composite Material
3. Design and Analysis of Experiments
4. Finite Element Analysis
5. Computer Integrated Manufacturing
6. Knowledge Based Systems



**B Tech Prod**  
**SEM VII**

<b>OPERATIONS RESEARCH</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	--
Tutorial : --		03 Credits
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of Mathematics.	
2.	Basic knowledge of inventory control.	
3.	Basic knowledge of project management.	
<b>Course Objectives:</b>		
The student should understand and apply the correct operation research model Engineering Problems to satisfy the objective function.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Identify and develop operational research models from the verbal description of the real system and solve optimization problems using linear programming.	
2.	Use the acquired knowledge to design a transportation and assignment model.	
3.	Use the acquired knowledge to select and apply the proper inventory control system for industry.	
4.	Apply the correct sequence for sequencing problems as well as identify the queuing system and analyze it from the given data.	
5.	Use the acquired knowledge to decide the replacement policy and solve the game theory problems for different cases.	
6.	Use the network technique (PERT/CPM) to find the project costing and its duration.	
<b>UNIT-I</b>	<b>Introduction to Operation Research and Linear Programming:</b> Basics definition, scope, objectives, phases, models, advantages, limitations and applications of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Big-M method, duality in linear programming problem.	(06 Hours)
<b>UNIT-II</b>	<b>Transportation and Assignment Models:</b> <b>Transportation:</b> Formulation, Finding initial basic feasible solution by different methods, Optimality test: MODI method, unbalanced Transportation problem. <b>Assignment:</b> Formulation, Hungarian method for optimal solution. Solving unbalanced problem, restrictions on assignments and Traveling salesman problem.	(06 Hours)
<b>UNIT-III</b>	<b>Inventory Control:</b>	(06 Hours)

	<p>Introduction to inventory, cost associated with inventory, stock out inventory models, probabilistic models, price-break models, inventory models under uncertainty and risk. Methods of selective inventory control.</p> <p>Introduction, application, Different problems solved by dynamic programming,</p>	
<b>UNIT-IV</b>	<p><b>Sequencing and Queuing Models:</b></p> <p><b>Sequencing models:</b> Solution of Sequencing Problem – Processing n Jobs through 2 Machines, Processing n Jobs through 3 Machines, Processing 2 Jobs through m machines, Processing n Jobs through m Machines.</p> <p><b>Queuing Models:</b> Operating characteristics, Poisson single and multi-channel queuing system (M/M/1): (<math>\infty/\infty</math>/FCFS), (M/M/1): (<math>\infty/\infty</math>/SIRO), (M/M/1): (N/<math>\infty</math>/FCFS), (M/M/c): (N/<math>\infty</math>/FCFS)</p>	(06 Hours)
<b>UNIT-V</b>	<p><b>Replacement models and Games Theory:</b></p> <p><b>Replacement models:</b> Replacement of capital equipment that deteriorates with time, Time value of money. Cases in which time value of money remains same and changes with constant rates during period. Group and individual replacement.</p> <p><b>Games Theory:</b> Introduction, Two -person zero sum game, Minimax and Maximin principle, Saddle point, Methods for solving game problems with mixed strategies.</p>	(06 Hours)
<b>UNIT-VI</b>	<p><b>Network Modelling:</b></p> <p>Fundamentals of CPM and PERT networks, CPM: Construction of networks, Critical paths, Forward and backward pass, Floats and their significance, crashing for optimum and/or minimum duration and the cost, PERT: Time estimates, Construction of networks, Probability of completing projects by given date.</p>	(06 Hours)
Term work: <b>NA</b>		
<p><b>Assignments:</b></p> <ol style="list-style-type: none"> <li>1. Assignment on formulation of LPP and its solution.</li> <li>2. Assignment on formulation of transportation problem.</li> <li>3. Assignment on Assignment model.</li> <li>4. Assignment on inventory control.</li> <li>5. Assignment on price break models.</li> <li>6. Assignment on Sequencing models.</li> <li>7. Assignment on queuing models.</li> <li>8. Assignment on replacement models.</li> <li>9. Assignment on game theory.</li> <li>10. Assignment on calculation of the total cost and duration of the project.</li> </ol> <p>The typical softwares are to be used for any of the 3 assignments.</p>		

**Text Books / References**

- Sharma S.D., "Operations Research", Kedarnath Ramnath and company publications.
- Gupta P.K., Hira D.S., "Operations Research", S Chand and Co. Ltd., New Delhi.
- Taha H.A., "Operations Research - An introduction", Prentice Hall Pvt. Ltd.
- J. K Sharma., "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
- Panneerselvam R., "Operations Research", Prentice Hall of India Ltd., New Delhi.
- N. D. Vora, "Quantitative Techniques and Management", Tata McGraw-Hill Education.
- Kanthi Swarup and others, "Operation Research", S Chand and Co. Ltd.
- Basu S.K., Pal D.K., and Bagchi H., "Operations Research for Engineers", Oxford and IBH Publishing Co. Pvt. Ltd.,

**Syllabus for Unit Test**

Unit Test 1	Units I , II and III
Unit Test 2	Units IV, V and VI

<b>MACHINE TOOL DESIGN</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Practical: 02 Hrs / Week	TW/OR : 50 Marks	01 Credits
<b>Course Pre-requisites:</b>		
1.	Basic knowledge of conventional and non conventional Machines.	
2.	Knowledge of material science.	
3.	Knowledge of Strength of Material.	
<b>Course Objectives:</b>		
The students should be able to understand the design methodology of machine tools.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Understand the fundamentals of machine tool design.	
2.	Select the type of gear box for applications in machine tool and design the sliding cluster gear box.	
3.	Understand the design considerations for machine tool structures.	
4.	Select the guideways and design the power screws.	
5.	Select the spindle bearings	
6.	Design cams for single spindle automate.	
<b>UNIT-I</b>	<b>Introductions to Machine Tools</b> General Principles of Machine Tool Design: Working and Auxiliary Motions in Machine Tools. Parameters Defining Working Motions of a Machine Tool. Techno-Economical Prerequisites for Undertaking the Design of New Machine Tool. General Requirements of Machine Tool Design. Engineering Design Process Applied to Machine Tools. Layout of Machine Tools, Modular Concept of Machine tool design.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Drives:</b> Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed	<b>( 06 Hrs)</b>

	gear box. Stepless drives: Design considerations of Stepless drives, electromechanical system of regulation, friction, and Kopp variators, Toroidal and Reeves Mechanisms , PIV drive, Epicyclic drive, principle of self locking, VFD and VVFD drives-Design Considerations.	
<b>UNIT-III</b>	<b>Design of Machine Tool Structures:</b> Functions of Machine Tool Structures and their requirements – Design criteria for machine tool structures – Materials of machines Tools structures – Static and Dynamic stiffness – Profiles of machine tool structures – Basic Design procedure of machine tool structures Analysis of forces on machine tool structure, static & dynamic stiffness. Design of beds, columns, housings, bases and tables.	<b>( 06 Hrs)</b>
<b>UNIT-IV</b>	<b>Design of Guideways &amp; Power Screws :</b> Functions & types of guideways, design criteria & calculation for sideways, design of hydrodynamic ,hydrostatic and aerostatic slideways , Design of Anti-Friction Guideways – Combination Guideways –Protecting devices for slideways Stick-Slip motion in slideways. Design of power screws: Distribution of load & rigidity analysis.	<b>( 06 Hrs)</b>
<b>UNIT-V</b>	<b>Design of Spindles and Spindle Supports:</b> Functions of Spindle Unit and requirements – Materials of Spindles – Effect of machine tool compliance on machining accuracy- Design calculations of spindles– Anti friction bearing – Sliding bearings. Preloading of bearings. Bearings selection for machine tools.	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Automatic Drives for Machine tools:</b> Principles of automation. Automatic lathes with mechanical control.Design of cams for automatic screw cutting machines.Automatic loading and feeding of workpieces. Transfer devices in automatic machine tool systems. Modular design and unit heads for machine tools. Automatic in-process gauging.	<b>( 06 Hrs)</b>
	<b>Term work:</b> Term work shall consist of record of assignments on following topics. 1. Design and working drawing of speed gear box 2. Design and working drawing of feed gear box 3. Study of stepless drives 4. Design of bed or column. 5. Design for spindle or power screw. 6. Design for guide ways and sideways. 7. Internet assignment based on any one of the topics above.	
	<b>Assignments</b> 1. Assignment on Introductions to Machine Tools	

<ol style="list-style-type: none"> <li>2. Assignment on Drives.</li> <li>3. Assignment on Design of Machine Tool Structures.</li> <li>4. Assignment on Design of Guideways &amp; Power Screws</li> <li>5. Assignment on Design of Spindles and Spindle Supports.</li> <li>6. Assignment on Automatic Drives for Machine tools.</li> </ol>					
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. N. K. Mehta, "Machine Tool Design", Tata McGraw Hill, ISBN 0-07-451775-9.</li> <li>2. A. Bhattacharya and S. G. Sen., "Principles of Machine Tool", New central book agency Calcutta, ISBN 81-7381-1555.</li> <li>3. D. K Pal, S. K. Basu, "Design of Machine Tool", 4th Edition. Oxford IBH 2005, ISBN 81-204-0968.</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. N. S. Acherkan, "Machine Tool", Vol. I, II, III and IV, MIR publications.</li> <li>2. F. Koenigsberger, "Design Principles of Metal Cutting Machine Tools", The Macmillan Company New York 1964.</li> </ol>					
<p><b>Syllabus for Unit Test</b></p> <table border="1"> <tr> <td>Unit Test 1</td> <td><b>Units I, II and III</b></td> </tr> <tr> <td>Unit Test 2</td> <td><b>Units IV, V, VI</b></td> </tr> </table>	Unit Test 1	<b>Units I, II and III</b>	Unit Test 2	<b>Units IV, V, VI</b>	
Unit Test 1	<b>Units I, II and III</b>				
Unit Test 2	<b>Units IV, V, VI</b>				

<b>MECHATRONICS &amp; MANUFACTURING AUTOMATION</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks	01 Credits
	Assignments : 10 Marks	
	Unit Test : 20 Marks	
	TW/OR: 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Mechatronics systems.	
2.	Basic knowledge of sensors and system response.	
3.	Basic knowledge of automation.	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of finite element analysis.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Identify the suitable sensor and actuator for a Mechatronics system	
2.	Develop the skill required for interfacing the electromechanical system.	
3.	Illustrate basic aspects of design and development of a Mechatronics system	
4.	Apply automation techniques to manufacturing set-ups.	
5.	Design and develop pneumatic and hydraulic control circuits of medium complexity.	
6.	Illustrate the use of PLC in control systems and Model the system and check the stability of a mechanical system.	
<b>UNIT-I</b>	<b>Introduction to Mechatronics and Measurement Systems:</b> Introduction, concepts of Mechatronics, Principles, Objectives and applications. Elements of Mechatronics System. <b>Sensors:</b> Position and speed Measurement: Proximity sensors and Switches, Potentiometer, LVDT, Digital optical Encoder. Stress and Strain Measurement: Electrical Resistance Strain Gauge, Measuring Resistance Changes With a Wheatstone Bridge, Measuring Different States of Stress With Strain Gauges, Force Measurement With Load Cells Temperature Measurement: Liquid –in Glass Thermometer, Bimetallic Strip, Electrical Resistance Thermometer, and Thermocouple. Vibration and Acceleration Measurement: Piezoelectric Acceleration, Pressure and Flow Measurement, Semiconductor Sensors & Microelectromechanical Devices.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>System Response:</b> Introduction, Amplitude linearity, Fourier Series representation of signals, Bandwidth and Frequency response, Phase linearity, Distortion of signals , Dynamic characteristics of systems, Zero order system, First order system:- Experimental testing of a first order system. Second order system, step response of a second order system, frequency response of a system, System modeling and analogies.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>Signal Conditioning:</b>	<b>( 06 Hrs)</b>



	Introduction, The operational amplifier, Filtering, Wheatstone bridge, Digital signals, Multiplexers, Data acquisition, Digital signal processing, and Pulse modulation. <b>Data Acquisition:</b> Introduction, Quantizing theory, Analog to Digital conversion, Digital to Analog conversion, Virtual Instrumentation, Data acquisition and control.	
<b>UNIT-IV</b>	<b>Basics of Automation:</b> Definition, Automation in Production systems, Basic elements of automated systems, Types of Automation, Need, Advantage And Disadvantages of automation, Levels of Automation. Special purpose machine, High speed machines.	<b>( 06 Hrs)</b>
<b>UNIT-V</b>	<b>High Volume Manufacturing System:</b> Transfer lines, Material handling systems, Manufacturing cell, Group technology, Cellular manufacturing, Flexible manufacturing systems, Automated quality control and inspection systems, Automated assembly systems and line balancing, Automated flow lines and its technology.	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Programmable Automation And Control Systems:</b> Programmable logic controller, Ladder diagram, Microprocessor, PIC 16F84 OR 8085 Microprocessor, Logic gates and control, Electrical drives, Thermal relays, PID, Industrial control devices, Computer based industrial controls.	<b>( 06 Hrs)</b>
<p><b>Term work:</b>  <b>List of Experiments: ( Any Five)</b></p> <ul style="list-style-type: none"> <li>• Study of Switches and relays.</li> <li>• Study and experiment of different types of sensors.</li> <li>• Study and experiment of ADC and DAC.</li> <li>• Study and experiment of PLC</li> <li>• Study and experiment of 8085 Microprocessor</li> <li>• Study and experiment of PID.</li> </ul>		
<p><b>Assignments:</b></p> <ul style="list-style-type: none"> <li>• Different types of Sensors and Transducers.</li> <li>• Assignment on system response of mechatronics systems.</li> <li>• Assignment on signal conditioning and data acquisition.</li> <li>• Basics of automation.</li> <li>• High volume automation.</li> <li>• PLC, PID, 8085 Microprocessor.</li> <li>• Industrial Visit.</li> </ul>		
<p><b>Oral/Practical</b>  Term work and oral will be based on above syllabus.  <b>Text Books / References</b></p> <ul style="list-style-type: none"> <li>• Vickers manual on hydraulics.</li> </ul>		

- W. Bolten, "Mechatronics Electronics Control system in Mechanical and electrical Engineering", Person Education (Singapore) Pvt. Ltd. ISBN 81-7808-339-6
- "HMT Mechatronics", HMT ISBN- 0-07-462147-5
- Ramesh Gaonkar, "Microprocessor", Penram International Publication Pvt. Ltd. ISBN 81-900-828-7-6
- David G.Alcitore, B.H. Histon, "Introduction to mechatronics and measurement systems", Tata McGraw Hill, ISBN-0-07-052910-8
- Peter Rohne, "Industrial hydraulic control".
- Werner Deppert and Kurt Stol, "Mechanization by Pneumatic Control", Vol-1, Vol-2.
- Mikell P. Groover; "Automation, Production systems, and computer integrated Manufacturing", Prentice Hall.

### **Syllabus for Unit Test**

Unit Test 1	<b>Units I, II and III</b>
Unit Test 2	<b>Units IV, V ,VI</b>

<b>Elective II: Powder Metallurgy</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: N A	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge of engineering Metallurgy.	
<b>Course Objectives:</b>		
	Student will understand the concepts of Powder Metallurgy and also able to understand Manufacturing of components by Powder metallurgy.	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	To select the manufacturing of metal powders by different methods .	
2.	To select proper process and understand characteristics of Metal powder .	
3.	To select different methods of compacting of metal powders .	
4.	To select various design of dies for compacting of metal powders.	
5.	Mechanism of Sintering .	
6.	To select advance processes and understand its defects and remedies in powder metallurgy.	
<b>UNIT - I</b>	<b>Fundamentals of Metal Powder productions :</b> Introduction of Powder Metallurgy processes. Advantages and limitations of processes, production of metal powder by Machining, milling, atomization, electrodeposition, reduction from oxide, carbonyl process, production of alloy powders, New development etc..	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Characteristics of metal powder:</b> Particle size, shape and size distribution, Characteristics of powder mass such as apparent density, tap density, flow rate, friction conditions. Properties of green compact and sintered compact; Powder conditioning, Mixing and blending, processes details.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Fundamentals of powder compaction;</b> Types of compaction presses, compaction tooling and role of lubricants, Single and double die compaction, isostatic pressing,	<b>(06 Hours)</b>

	hot pressing, Powder rolling, powder forging, powder extrusion and explosive forming technique, pressure less compacting .	
<b>UNIT - IV</b>	<b>Design of Press Tools in compacting:</b> General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations. Design and calculations for above press working dies. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants, hot dies for compacting. Tooling materials	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Sintering</b> Definition, Theories of sintering: Sintering mechanism, Roll of diffusion, Recrystallization, Pore-growth and coalescence. Liquid phase sintering and related processes. Effect of compacting pressure, sintering temperature and time on sintered properties stages, effect of variables, sintering atmospheres and furnaces, infiltration process.	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Production Methods for typical components :</b> Study of sintered bearings, cutting tools, and metallic filters, Study of friction and antifriction parts and electrical contact materials, hard metals, refractory metals, magnetic materials, structural parts, dispersion strengthened materials.	<b>(06 Hours)</b>
<b>Assignments:</b>		
1. Write the production of metal powder by carbonyl processes in details , Write the production of metal powder by Electrolysis method.		
2. Write different methods for measurement of particle size ,shape and size distributions.		
3. Explain in details advantages of Isostatic compacting , Slip casting ,and powder rolling .		
4. Design tooling system for powder compacting for given shape of components.		
5. Give the sintering temperatures and atmospheres used for different metallic components.		
6. Write complete Flow chart of productions of few components by powder metallurgy, such as Tungsten carbide tools. Clutch, etc.		
<b>Text Books/Reference Books:</b>		
1	Gopal S. Upadhayay. Powder Metallurgy “ Science ,Technology and Materials” -University press	
2	P. N. Rao, Manufacturing Technology, Tata McGraw Hill	
3	Powder Metallurgy ASM Metal hand book Vol: 7	
4	A K Shinna Powder Metallurgy ; Dhanpatrai Publications	

5	Gopal S. Upadhayay. Cemented Tungsten carbide Production, properties and testing- University press	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	Unit I to III	
Unit Test -2	Unit IV to VI	

<b>Elective II: Materials Management</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	--
Tutorial : --		03 Credit
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of management	
2.	Basic knowledge of purchasing	
3.	Basic understanding for stores operations	
<b>Course Objectives:</b>		
The students should be able to apply different materials management techniques for the maximization of the profit and minimization of the production cost.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Understand various types of values and value analysis techniques.	
2.	Use the proper inventory control system for the industry	
3.	Take correct decision for make or buy for a situation.	
4.	Understand the various techniques of logistic management	
5.	Understand the various warehousing techniques	
6.	Understand and apply import export substitutions in given situation	
<b>UNIT-I</b>	Introduction to Materials Management <b>Functions of Materials Management</b> – Sourcing/Procurement, Inventory, Stores, Vendor Development, value analysis and value engineering. Classification and Costs of Inventories: Types, Objective of holding inventories, Different types of Inventories, Costs Associated with Inventory - Carrying cost, Procurement cost. EOQ - Concept, Assumptions of EOQ Model, Practical Constraints – Numerical Analysis, Quantity Discounts. EMQ Model - Carrying cost, Set up cost. EOQ Special Considerations – Spares, Bought-outs, etc. <b>Organization of Materials Management Function</b>	(06 Hours)
<b>UNIT-II</b>	<b>Replenishment Systems and Inventory Management</b> A. <b>Replenishment Systems:</b> Introduction, Concept of lead time and its effects on Inventory, Components of Lead Time - Internal and External. Variability in demand and lead time. Safety Stock Evaluation and ways to minimize lead time, Different types of replenishment systems like Fixed order quantity system, Fixed order interval system, Combination of fixed order interval and quantity system, Two Bin System. Forecasting - Methods of forecasting - Moving Average Method, Regression Analysis, Exponential Smoothing Method	(06 Hours)

	B. Probabilistic Replenishment System. Selective Inventory Control - VED analysis, HML analysis, SDE analysis, SOS analysis, FSN analysis, GOLF analysis.	
<b>UNIT-III</b>	<p><b>Procurement Management</b></p> <p>A. Procurement Management: Responsibilities of Purchase Department. Procurement Procedure, Documents in Procurement, Types of Buying, Methods of Buying, Legal Aspects of Buying, Vendor Selection, Vendor Development, Vendor Rating.</p> <p>B. Documentation – Bin Cards, Stores Ledger, Goods Receipt Note, Material Requisition, Purchase Order – Format, Terms &amp; Conditions. Documentation in Imports</p>	(06 Hours)
<b>UNIT-IV</b>	<p><b>Logistics Management</b></p> <p>A. Definition, Logistics Function: Transportation – Significance, Modes of Transportation, Warehousing – Objectives, Warehousing Functions, Types of Warehouses, Inventory Management, Order Processing – Role of IT, Material Handling Transportation: Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages &amp; Disadvantages, Concept of TL, LTL, FTL. Selections of Appropriate Modes of Transportation B. Modes of Transportation – Rail, Road, Pipelines, Water Air – Advantages &amp; Disadvantages</p>	(06 Hours)
<b>UNIT-V</b>	<p><b>Stores Management and Warehouse Management</b></p> <p>A. <b>Warehouse Management:</b> Concept of SKUs, Warehousing Principles &amp; Best Practices in Receiving, Shipping, Order Picking, Storage &amp; Put away, Warehouse Activity Profiling, Warehouse Layout Planning. Stores Management: Functions of Stores, Stores Procedure – Documentation. Need of physical stock taking, method of stock taking like annual, continuous, reorder point stock taking, Inventory records. Surplus and Obsolete stocks: Introduction, Genesis of surplus materials. Disposal of surplus and obsolete materials</p> <p>B. Stores Documentation – Bin Cards, Stores Ledger. WMS Systems in Practice</p>	(06 Hours)
<b>UNIT-VI</b>	<p><b>Import Export and supply chain management:</b></p> <p>Factors affecting National and International markets, Import procedure and documents, current EXIM policies, import substitution, E-procurement.</p> <p><b>Supply chain management:</b></p> <p>Basic concepts of SCM, design considerations, role of safety inventory, planning and managing inventories, order processing, economic considerations.</p>	(06 Hours)
Term work: <b>NA</b>		
<p><b>Assignments:</b></p> <ol style="list-style-type: none"> <li>1. Assignment on materials management</li> <li>2. Assignment on replenishment systems</li> <li>3. Assignment on inventory control</li> <li>4. Assignment on procurement and documentation</li> <li>5. Assignment on logistic management</li> </ol>		

<ol style="list-style-type: none"> <li>6. Assignment on material handling</li> <li>7. Assignment on stores management</li> <li>8. Assignment on warehouse management</li> <li>9. Assignment on import exports</li> <li>10. Assignment on supply chain management</li> </ol> <p>Students are required to present case studies on any two topics.</p>					
<p><b>Text Books / References</b></p> <ol style="list-style-type: none"> <li>1. K S Mennon, "Purchasing management and inventory control", Wheeler Publication, ISBN 81-85814-10-4.</li> <li>2. P Gopal Krishnan, "Purchasing and materials management", Tata McGraw-Hill Education.</li> <li>3. L. D. Miles, "Techniques of Value Analysis and Engineering", Tata McGraw-Hill.</li> <li>4. L.C. Jhamb, "Inventory management", Everest Publishing House.</li> <li>5. Tony Arnold, "Materials Management", Pearson Publication.</li> <li>6. L. Lee, D. Dobler, "Purchasing and Material Management", McGraw-Hill.</li> </ol>					
<p>Syllabus for Unit Test</p> <table border="1"> <tr> <td>Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V and VI</td> </tr> </table>	Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V and VI	
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V and VI				



<b>Elective II: MANUFACTURING SYSTEM AND SIMULATION</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Manufacturing System.	
2.	Basic knowledge of advance manufacturing system .	
3.	Basic knowledge of Simulation.	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of modeling, simulation and analysis of advanced manufacturing systems.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The basics of manufacturing system.	
2.	Discuss the information system about manufacturing machine tools.	
3.	The modeling and analysis of manufacturing system.	
4.	Describe the continuous path of simulation process.	
5.	The simulation and programming languages.	
6.	Develop the simulation process in industry.	
<b>UNIT-I</b>	<b>Manufacturing Systems:</b> Definition of systems, basic concepts and problems concerning systems. Systems design: Decision making procedures, Structural, Transformational and procedural aspects of manufacturing, Modes of production. Process systems for manufacturing, logistic systems, material flow & technological information flow. Management and information systems for manufacturing: Managerial information flow in manufacturing systems.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Information Systems:</b> Fundamentals of information technology, information systems, information networking, and parts oriented production information systems, and computerized production scheduling, online production control systems. Computer based production management systems. Automation systems for manufacturing: Industrial automation, kinds of automation, principles of CIM, effectiveness of CIM, factory automation, automatic machine tools for mass production, NC machine tools, and computer controlled manufacturing systems, FMS, automated assembly, automatic material handling, automatic inspection and testing, computer integrated automation systems unmanned factory.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>System Models:</b> Concepts, continuous and discrete systems, systems modeling, type of models, subsystems, corporate model, and system study. System	<b>( 06 Hrs)</b>

	simulation, Techniques, comparison of simulation and analytical methods, types of simulation, distributed log model, cobweb models.	
<b>UNIT-IV</b>	<b>Continuous System Simulation:</b> Numerical solution of differential equation, analog computers, hybrid computers, continuous system simulation languages CSMP, system dynamic growth models, logistic curves. Discrete systems simulation: Events generation of arrival patterns, simulation programming tasks, analysis of simulation output. Queuing theory: Arrival pattern distribution, service times, queuing disciplines, and measure of queues.	<b>( 06 Hrs)</b>
<b>UNIT-V</b>	<b>GPSS and SIMSCRIPT:</b> General description of GPSS and SIMSCRIPT, programming in GPSS Simulation Programming Techniques: Data structures, implementation of activities, event and queues, event scanning, simulation algorithms in GPSS and SIMSCRIPT.	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Application of Simulation:</b> Flow shop system, Job shop system, M/M/1 Queues with infinite and finite capacities, Simple fixed inventory system, Output data analysis, steady state analysis, Building of simulation validation.	<b>( 06 Hrs)</b>

**Assignments:**

- Basic concepts of manufacturing system.
- Advanced manufacturing system.
- Modeling and simulation of any manufacturing system.
- Assignment on continuous simulation process used in manufacturing system.
- GPSS and SIMSCRIPT programming techniques.
- Application of simulation in automated industry.
- Industrial visit

**Text Books / References**

- David Bedworth & James Bailey, Integrated production control system management, analysis & design, 2nd ed., John Wiley & Sons Ltd.
- Katsundo Hitomi, Manufacturing System Engineering.
- Y Narahari and N Vishwanadhan, Performance Modeling and Automated Manufacturing System, Prentice hall India 1994.
- Stanley B Gershwin, Manufacturing Systems, Engineering PHI latest Edition.
- Ronald Zskin & Charles Standridge, Modeling and Analysis of Manufacturing Systems, John Wiley & Sons Ltd.
- Geofery Gordan, Systems Simulation, Prentice Hall, 1980.
- Deo. N., System Simulation with Digital Computers, Prentice Hall, 1980.

**Syllabus for Unit Test**

Unit Test 1	<b>Units I , II and III</b>
Unit Test 2	<b>Units IV, V ,VI</b>

<b>TOTAL QUALITY MANAGEMENT</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits *
	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basics of Quality Control	
<b>2.</b>	Basics of Measurements and measuring Instruments	
<b>3.</b>	Knowledge of Statistics.	
<b>Course Objectives:</b>		
To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management and to understand the statistical approach for quality control.		
<b>Course Outcomes:</b>		
<b>1.</b>	Implement the principles of total quality management.	
<b>2.</b>	Apply six sigma concepts and increase the quality of product.	
<b>3.</b>	Make use of Advanced Techniques	
<b>4.</b>	They will be able to implement TQM Tools.	
<b>5.</b>	Execute Quality standards in companies	
<b>6.</b>	Make use of Advanced Techniques of Total Quality Management like Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering	
<b>UNIT-I</b>	<b>Quality &amp; Total Quality Management:</b> Quality, New philosophy of quality, Product quality, & its prospects. Overview of TQM: Concept & definition, Fundamentals, Principles of TQM, Elements of TQM, Approaches of TQM, Models of TQM, Zero defect concept, Benefits of TQM.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Quality Assurance:</b> Basic concepts, Quality assurance input – process – output. Significance of feedback for Quality assurance, Process capability analysis, Concept of Six Sigma. Internal customer approach, Customer – Satisfaction, data collection & complaint, Redressal mechanism.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>TQM PRINCIPLES:</b>	<b>( 06 Hrs)</b>

	Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure, Just – in- Time.	
<b>UNIT-IV</b>	<b>TQM TOOLS</b> Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.	<b>( 06 Hrs)</b>
<b>UNIT-V</b>	<b>Quality Systems :</b> Policy & objectives, Quality standards, Concept of quality system standards, Relevance & origin of ISO 9000–2000 standard & certification, Benefits. Elements of ISO 9001, 9002, 9003 series–Clauses, contents, interpretations & implementation. TS - 16949, QS-9000, ISO 14000, OHSAS	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Advanced Techniques of Total Quality Management:</b> Design of experiments, Failure mode effect analysis, Taguchi method Taguchi's quality engineering –Loss function, orthogonal arrays, Signal to noise ratio, parameter design & tolerance design.Total Quality in service sector. S. S. Technique, Kaizen.	<b>( 06 Hrs)</b>
<b>Term work:</b>	Detail Study and Presentations on Above topics to be submitted.	
<b>Assignments</b>		
	<ol style="list-style-type: none"> <li>1. Assignment on TQM</li> <li>2. Assignment on Six sigma concept.</li> <li>3. Assignment on TQM principles.</li> <li>4. Assignment on TQM tools.</li> <li>5. Assignment on Quality Systems</li> <li>6. Assignment on Advanced Techniques of Total Quality Management</li> </ol>	

**Text Books/ References**

1. Sundar Raju, "Total Quality Management", Tata McGraw Hills.
2. M. Zairi, "Total Quality Management for Engineers", Aditya Books.
3. ISO 9000 Quality System", Dalela & Saurabh, Standard Publishers.
4. R.C. Gupta, "Statistical Quality Control".
5. Grant E. L. & R. Leavenworth, "Statistical Quality Control", Tata McGraw Hills
6. Tapan Bagchi, "Taguchi Methods Management", Pearson Education.
7. Feigenban, "Total Quality Control", Tata McGraw Hills.
8. Total Quality Management Handbook, J. K. Hradeskym, Tata McGraw Hills.

**Syllabus for Unit Test**

Unit Test 1	<b>Units I , II and III</b>
Unit Test 2	<b>Units IV, V ,VI</b>

<b>Computer Aided Manufacturing</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory:	End Semester Examination: Nil	
Practical: -- 02 Hrs/Week	Internal evaluation: NIL Assignments : Nil Unit Test : NIL	01 Credit
Tutorial : --	TW/OR – 50 Marks	
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of mechanical drawing	
2.	Knowledge of various symbols of dimensioning and tolerancing	
3.	Basic knowledge of process planning and programming	
<b>Course Objectives:</b>		
To provide proper interfacing between theoretical aspects and the practical aspects of computer aided manufacturing.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Students will describe basic concepts of CAM application and understand CAM wheel	
2.	Students will prepare CNC programs for manufacturing of different geometries on milling and lathe machines.	
3.	Students will classify different components using different techniques of group technology	
4.	Students will select layouts of FMS for industrial applications	
5.	Students will classify different components using different techniques of group technology	
6.	Students will prepare Process planning for different components	
<b>Term Work</b>		
	<b>1. Cim Model For Any Industry:</b> Term work assignment based on background theory of CIM System, actual visit to any industry to see and study the different aspects of CIM system	
	<b>2. Simulation on CNC lathe and CNC mill enabling the learning of following points,</b> <b>1. Simulation on CNC lathe</b> -Description of codes, Description of codes, Directives, programs covering basics operations <b>2. Simulation on CNC Mill-</b> Description of M codes, Description of codes, Directives, programs covering basics operations, Liner Interpolation, Circular Interpolation	
	<b>3. Manual part programming on CNC lathe, milling And drilling enabling learning of</b> a) NC technology, CNC components, Part programming techniques, Manual part programming technique, Interpretation of codes, Usage of codes, Formulation of part program, Compete sketch with Dimensions b) Execution of complete part program on CNC machine.	

	<p><b>4. Study and demonstration on robots:</b></p> <p>a. Term work assignment based on Introduction to Cybernetics, Robot Anatomy, Joints and Links, Common Robot configurations, Drive System, End Effectors, Types of sensors, Robot Economics, Robot applications in manufacturing</p> <p>b. Robot programming – actual execution of the programme on the robot</p>	
	<p><b>5. Computer aided process planning:</b></p> <p>a. Term work assignment based on Traditional Process plan, Introduction to Computer Aided Process Plan (CAPP), Types of CAPP, Algorithm for process planning software.</p> <p>b. One recent paper or Case Study of CAPP.</p>	
	<p><b>6. Exercise on group technology, part coding enabling learning of</b></p> <p>Introduction to GT, Concept of Part Family, Methods of grouping part into part family, Parts classification and Coding, Opitz classification and coding system, Two Examples on FORM code.</p>	
	<p><b>7. Computer aided quality control:</b></p> <p>a. Term work assignment based on Quality control, Concept of 100% inspection, Automated Inspection principles and methods, On Line inspection system, Off Line Inspection System.</p> <p>b. Actual measurement of any standard component on Coordinate Measuring Machine (CMM).</p>	
	<p><b>8. Introduction to CAM software:</b></p> <p>a. Term work assignment based on Fundamentals of CAM, applications.</p> <p>b. Use of CAM software for specific application.</p>	
	<p><b>9. Study of computer controlled business functions:</b></p> <p>Term work assignment based on Purchase order receiving, Sales and marketing, Job costing, Bill of Material, Financial control, Inventory management</p> <p>b. One recent paper or Case Study of computer controlled business functions.</p>	
	<p><b>10. Generation of any one simple model using Any CAM software:</b></p> <p>1) simulate the process</p> <p>2) tool path generation</p>	
<b>Assignments: NA</b>		

**Text Books / References**

1. Computer Aided Manufacturing by Tien Chien Chang, Pearson Education
2. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P Groover, Pearson Education
3. Robotics Technology and Flexible Automation, by S R Deb, S Deb, McGraw Hill Education Private Limited.
4. Flexible Manufacturing Cells and System -William. W. Luggen Hall, England Cliffs, Newjersy
5. P. Radhakrishnan, " Computer Numerical Control ", New Central Book Agency, 1992.
6. Computer integrated manufacturing -S. Kant Vajpayee – Prentice Hall of India.
7. System Approach to Computer Integrated Manufacturing. Nanua Singh, Wiley and sons Inc, 1996.
8. Computer Aided Manufacturing- Rao, Tewari, Kundra, McGraw Hill, 1993
9. CAD/CAM, Principles and Applications –P N Rao, McGraw Hill, 2010
10. CAD/CAM, Introduction, -Ibrahim Zeid, Tata McGraw Hill, 2007

Syllabus for Unit Test

NA



<b>INPLANT TRAINING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: -		
Practical: -	Term Work and Oral Examination: 50Marks	03 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of theoretical subjects of Production Engineering	
<b>2.</b>	Basic knowledge of Industrial Management	
<b>3.</b>	Basic knowledge of Manufacturing Processes	
<b>Course Objectives:</b>		
To help to correlate the lessons learnt in theory and actual practices followed in the industries, expose to an industrial environment, make aware of the psychology of the workers, their habits, attitudes and to prepare them to approach the problems.		
<b>Course Outcomes:</b>		
Students will be able to		
<b>1.</b>	Get an opportunity to apply their knowledge in problem solving and eventually develop that skill.	
<b>2.</b>	Demonstrate understanding of various constraints of time and cost within which goods are produced and services rendered in a specified quantum.	
<b>3.</b>	Get familiarized with various technological trends, approaches and applications along with managerial exposure.	
<b>4.</b>	Develop a positive attitude, which will bring in a visible change in their approach while dealing with technical and interpersonal issues.	
<b>5.</b>	Describe the scope, functions and job responsibilities in various departments of an organization.	
<b>6.</b>	Appreciate and realize the size and scale of operations in Industry.	
<b>Training:</b>		
The student shall undergo training programme prepared by the industry in following manufacturing and functional areas:		
<ol style="list-style-type: none"> <li>1. Industrial Engineering: Method Study, Work Measurement, Ergonomics and Productivity Improvement Technique.</li> <li>2. Production Planning &amp; Control, Quality Assurance.</li> <li>3. Material Management: Inventory Control, Vendor Development, Vendor Rating, Raw Material and Finished Goods stores.</li> <li>4. Plant Engineering: Plant Layout, Plant Maintenance, Housekeeping, Material Handling &amp; safety.</li> <li>5. Costing and Cost Control.</li> <li>6. Management Information System (M.I.S.).</li> <li>7. Incentive Schemes, Labour Laws. Factory Acts.</li> <li>8. Import Export Procedures.</li> <li>9. Incentive schemes, labour laws, factory laws.</li> </ol>		

10. Machine / Process Diagnosis.
11. Quality Assurance, Quality Improvement.
12. Improvement in tool layout, tool selection machine selection.
13. Maintenance of machines, housekeeping, safety precautions.
14. Computer based information study for stores, purchase wastage of material.

### Term Work

Term work will consist of a comprehensive report based on his observation, training received and assignments completed during 45 Days of training. The report shall also include good drawing figure, process sheets, machine and product specifications.

Some instructions for Inplant Training Report:

Language	The report should be written in <b>English</b>
Printing	<ul style="list-style-type: none"> <li>• Report must be printed single sided.</li> <li>• Printing must be of high quality. Text and figures must be clear and legible</li> </ul>
Number of Copies	Final Report (3 copies)
Page Margin	Left, Right, Top, Bottom margins: 2.5 cm
Title / Paragraph Margin	<ul style="list-style-type: none"> <li>• Chapter number and title should be centered.</li> <li>• Subsection number should align with the left margin</li> <li>• Subsection title should be indented 1.5 cm from the left margin.</li> <li>• The first paragraph in a subsection should align with left margin.</li> <li>• The subsequence paragraphs should be indented 1.27 cm from the left margin.</li> <li>• General alignment for texts in paragraph should be "justified".</li> </ul>
Numbering the Chapters and Subsections	<p>All chapters and their subsections must be numbered and titled. Example:</p> <p>Chapter 2 Title of Chapter 2.1 Title of the subsection (second level) 2.1.1 Title of the sub-subsection (third level) 2.1.1.1 Title of the sub-sub-subsection (fourth level)</p>
Typesetting	<ul style="list-style-type: none"> <li>• Font Type : Times New Roman</li> <li>• Font Size : 12 pt</li> <li>• Chapter Title : Uppercase, Bold, Centered</li> <li>• Chapter Sub-section : Title Case, Bold, Align left</li> </ul>
Page Numbering	Page numbering should start from chapter-1 in number format (1,2,3,4 etc)
Report Submission	The report to be submitted within fifteen days from completion of the training.

### Examination

Oral Examination shall be conducted after training by appointing one internal examiner and one external examiner from industry .45 Days Industrial Inplant Training successful completion certificate is essential for granting the term of student.

<b>PROJECT STAGE-I</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Practical: 02 Hours / Week	TW/OR : 50 Marks	04 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of conventional and non-conventional Machines.	
<b>2.</b>	Knowledge of material science.	
<b>3.</b>	Knowledge of Strength of Material.	
<b>Course Objectives:</b>		
To prepare the students to carry out a comprehensive study of any design or process or phenomenon, to encourage the process of independent / creative thinking and working in groups and to expose them to industrial atmosphere of accountability.		
<b>Course Outcomes:</b>		
Students will be able to		
<b>1.</b>	Work in Team	
<b>2.</b>	Allocate work among students according to expertise in specific field	
<b>3.</b>	Break the Project into Tasks.	
<b>4.</b>	Develop Leadership quality	
<b>5.</b>	Carry out Purchasing activity	
<b>6.</b>	Carry out fabrication and assembly of components.	
<b>Term Work</b>		
<p>While selecting the projects preference should be given to industrial projects, social impact projects, productivity improvement and renewable energy resources or development of manufacturing technique. The students in a group of not more than FOUR will work under the guidance of the faculty member on the project work undertaken by them. The work started in Semester VII will be continued in the Semester VIII. There will be an end semester University Exam on work done in semester VII. Different tools should be used for Project Management like PERT technique or use of software for analysis of data etc. Three reviews will be conducted throughout the semester and the reference of these reviews will be considered during final assessment. An interim report of the work completed in Semester VII in the form of report and yellow card shall be submitted for the term work along with the synopsis. The report will be assessed by the Project Guide and External faculty member appointed by the Head of the Department / concerned responsible official of the sponsoring industry (Co-guide). The synopsis shall be endorsed by the Head of Department.</p> <p>The work to be completed in Semester VII shall include,</p> <ol style="list-style-type: none"> <li>a) Literature Review</li> <li>b) Problem Identification/Definition</li> <li>c) Design and Methodology / CAD simulation of component or Mechanism</li> <li>d) Activity planning for the time frame and division of responsibility to each student.</li> </ol>		

**The oral examination shall be based on the work planned and completed in Semester VII.**

**CERTIFICATE**

This is to certify that Mr. /Ms .....

(Seat No.)..... has carried out a Project entitled ,..... (Project Stage –I) for partial fulfillment of the requirement of the B.Tech. Production Engineering Course during the academic Year .....

Date:

Place:

(Guide)

(Project Co-Ordinator)

(Examiner)

(Head of Department)

**B Tech Prod**

**SEM VIII**

<b>Subject: Process Planning and Tool Design</b>		
<b><u>EACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
	Attendance : 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	
Practical: 02 Hours / Week	TW/OR : 50 Marks	01 Credit
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Knowledge of Machines and Processes	
2.	Knowledge of Tooling's used in Machine shops	
3.	Knowledge of using Machining data.	
<b>Course Objectives:</b>		
	The students should be able to do Prepare process sheets.	
<b>Course Outcomes:</b>		
Students will be able to		
1.	Perform part print analysis for Establishing general characteristics of work piece, Auxiliary methods for visualizing part print, Functional surfaces, nature of Work piece, finishing and identifying operations, relating the part to assembly.	
2.	Perform dimensional and tolerance analysis	
3.	Identify operations for classification based on importance.	
4.	Carry out Selection of Equipment and toolings from manufacturers catalog	
5.	Select and plan the process and carryout process planning with holistic approach.	
<b>UNIT - I</b>	<b>Product and Process Engineering</b> General Manufacturing processes, Product Engineering, Process Engineering, communications, relation with other departments, classification of processes, manufacturing operations. Part Print analysis-Establishing general characteristics of work piece,Auxiliary methods for visualizing part print, Functional surfaces, nature of work piece, finishing and identifying operations, relating the part to assembly.	<b>(06 Hours)</b>
<b>UNIT – II</b>	<b>Dimensional and tolerance analysis</b> Types of dimensions, concept of straightness, squareness, roundness, and concentricity symmetry, surface quality and surface integrity, surface finish affecting product properties and product cost, base lines, direction of specific dimensions. Tolerance analysis-causes of work piece variations, to express limits and tolerance, tolerance stack, purpose of tolerance chart,	<b>(06 Hours)</b>

	balancing the Tolerance Chart, Rules for adding and subtracting tolerances , layout of tolerance chart.	
<b>UNIT - III</b>	<b>Work piece Control &amp; Classifying operations</b> Work piece control theories, Causes of Work piece variation, shape of part affecting processing, Mechanical, Geometric and Dimensional Control Variables influencing Work piece control, Classifying operations: Basic process operations, principal process operations, major operations, qualifying and requalifying operations, auxiliary process operations.	(06 Hours)
<b>UNIT - IV</b>	<b>Selection of Equipment and tooling's</b> Process capability of Equipments, prime accuracies and producible accuracies of Equipments, Factors influencing make or buy decisions, relation between Process selection and Machine selection, sources for selection , General purpose, special purpose machines, factors in machine selection in terms of cost and design factors, cost analysis, operating cost, comparative cost analysis. Classification of tooling: Factors affecting selection of Tooling, sources of tooling, tool holders, work piece holders, jigs fixtures, moulds, pattern, core boxes, dies, templates, gauges.	(06 Hours)
<b>UNIT - V</b>	<b>Selecting and planning the process</b> Function, Economy and appearance, fundamental rules for manufacturing process, Engineering approach, basic design of product, influence of process engineering on product design, specifications, materials and its cost analysis, eliminating operations, combined operations, availability of equipment, effect of operations speed on performance of economy, Computer aided process planning	(06 Hours)
<b>UNIT - VI</b>	<b>Process sheet design</b> Determining manufacturing sequence, Factors affecting operation sequence, major process sequence, combining operations, Operation routing, routing uses routing description, process picture, process picture sheet, processing dimensions and views	(06 Hours)
<b>Term Work/Practical's</b> (All the assignments include time estimation of processes):		
1. Part print analysis of one industrial component drawing		
2..Process design of one component on GPM/CNC for batch production.		
3. Process design of one component for mass production		
4. Time estimation for one component on GPM / CNC for batch production		
<b>Assignments:</b>		
1. Assignment on Product and Process Engineering.		
2. Assignment on Dimensional and tolerance analysis		

3. Assignment on work piece control and classifying operations.
4. Assignment on Selection of equipment and toolings.
5. Assignment on selecting and planning the process
6. Assignment on process sheet

**Text Books/Reference Books:**

1	D.F.Eary, G.E.Johnson, "Process Engineering for Manufacturing", Prentice-Hall
2	P.W.Wang, J.Kelly, " Computer Aided Process Planning".
3	Nanua singh, "System Approach to Computer Integrated Design and Manufacturing"
4	H.W.Wage, "Manufacturing Engineering", McGraw hill
5	"Manufacturing catalogues for cutting tools and inspection equipments" P.Radhakrishnan, S.Subrmaniyum, V.Raju, "CAD\CAM\CIM", New Age Interanational Pvt. Ltd.
6	K.Hitomi , "Manufacturing Systems Engg", John Willey
7	Groover Mikell. P. "Fundamentals of Modern Manufacturing", Materials, Processes and Systems", 2nd edition, Willey 2002.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI



<b>INDUSTRIAL ROBOTICS</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credits
	TW/OR: 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Industrial robotics	
2.	Basic knowledge of Sensors and Grippers and Vision system.	
3.	Basic knowledge of Programming.	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of industrial robotics.		
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	The basic concepts of mechatronics and robots.	
2.	Develop skills in understanding various sensors, robot peripherals and their use & deployment in manufacturing system.	
3.	Acquire skills in understanding robot language and programming.	
4.	The concept of kinematics and dynamics equations.	
5.	Acquire skill in robot task planning for problem solving.	
6.	Develop skills in identifying areas in manufacturing where robotics can be deployed for enhancing productivity.	
<b>UNIT-I</b>	<b>Basic concept in Robotics:</b> Automation and robotics, robot anatomy, basic structure of robots, resolution, accuracy and repeatability. Classification and structure of robotics system Point to point and continuous path system control loops of robotics system, manipulators, wrist motions and grippers.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Drives</b> Control Loops, Basic Control System Concepts & Models, Control System Analysis, Robot Activation & Feedback Components, Position & Velocity Sensors, Actuators and Power Transmission system. <b>Robot &amp; its Peripherals</b> <b>End Effectors:</b> Type mechanical and other grippers, Tool as end effector. <b>Sensors:</b> Sensors in Robotics, Tactile Sensors, Proximity & Range Sensors, Sensor Based Systems, Vision systems and Equipment.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>Machine vision</b> Introduction, Low level & High level Vision, Sensing & Digitizing, Image Processing & analysis, Segmentation, Edge detection, Object Description & recognition, interpretation and Applications. <b>Programming for Robots</b>	<b>( 06 Hrs)</b>

	Method, Robot Programme as a path in space, Motion interpolation, motion & task level Languages, Robot languages, Programming in suitable languages and characteristics of robot.	
<b>UNIT-IV</b>	<b>Robot Kinematics and Dynamics</b> Forward, reverse & Homogeneous Transformations, Manipulator Path control and Robot Dynamics. The direct kinematics problem, the inversion kinematics solution, Lagrangian –Euler formation, generalized D’Almbert equations of motion. Denavit Hartenberg convention and its application.	<b>( 06 Hrs)</b>
<b>UNIT-V</b>	<b>Root Intelligence &amp; Task Planning</b> Introduction, State space search, Problem reduction, use of predictive logic, Means. Ends Analysis, Problem solving, Robot learning and Robot task planning. <b>Implementation Principles and Issues</b> An Approach for implementing robotics, Safety, Training, Maintenance and Quality. And Social issues and The future of Robotics.	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Robot application in manufacturing</b> Material transfer, machine loading & un loading, processing operation, Assembly & inspectors, robotic Cell design & control, Social issues & Economics of Robotics. Interfacing robot with PC, handshaking, hardware handshaking, RS232C serial interface.	<b>( 06 Hrs)</b>

**Term work:**

**List of Experiments: ( Any Five)**

- Study of elements of industrial robots.
- Study of model a work space for robot application.
- Design a robot gripper.
- Study of vision systems in industrial robots.
- Design a pick and place robot.
- Programming of pick and place robot.
- Make individual model of robot.

**Assignments:**

- Assignment on basic concepts of robots.
- Drives and control systems for robot application.
- Different types of sensors and grippers used in robots.
- Advances in robot programming
- Robot applications in manufacturing systems.
- Industrial visit

**Oral/Practical**

Term work and oral will be based on above syllabus

**Text Books / References**

- S. R. Deb. “Robotics”, Tata McGrawHill Publishing Co. Ltd., ISBN 0-07-460090-7.

- Yoren Koren, “Robotics for Engineers”, McGraw Hill Book Co., ISBN 0-07-035341-7.
- M. P. Grover, M. Weiss, R. N. Nagel, N. G. Odrey, “Industrial Robotics Technology”, ISBN 0-07-100442-4.
- K. S. Fu, C. G. S. Lee, R. C. Gonzaler, “Robotics Control, Sensing, Vision and Intelligence”, Tata McGraw Hill, ISBN 0-07-100421-4.
- H. Asada John, “Robot Analysis and Control”.
- M. W. Thring, “Robots and Telechirs”, Ellis Horwood Limited, ISBN 0-85312-274-1.
- Hall A. S., “Kinematics and Linkage Dynamics”, Jr. Prentice Hall.
- J. Hirchhorn,, “Kinematics and Dynamics of Machinery”, McGraw Hill Book Co.
- Kafler, “Robotics Engineering”, Prentice Hall India Pvt. Ltd., ISBN 81-203-0842-5.
- Jankiraman, “Image Processing and Analysis”

### Syllabus for Unit Test

Unit Test 1	<b>Units I , II and III</b>
Unit Test 2	<b>Units IV, V ,VI</b>

<b>FINANCIAL MANAGEMENT &amp; COST CONTROL</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: --	Attendance: 10 Marks	01 Credit
Tutorial - 01 Hrs/Week	Assignments : 10 Marks Unit Test : 20 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of Mathematics.	
<b>2.</b>	Basic knowledge of Production Planning And Control	
<b>3.</b>	Basic knowledge of Manufacturing Process And Inventory Control	
<b>Course Objectives:</b>		
The student should understand the scope, objective and application of financial management & costing control		
<b>Course Outcomes:</b>		
Students will be able to understand		
<b>1.</b>	Function, scope, goals and tools used for financial management & costing control	
<b>2.</b>	Control of Capital Expenditure.	
<b>3.</b>	Concept and design of Working Capital.	
<b>4.</b>	Methods of costing and Depreciation cost.	
<b>5.</b>	Budgetary control and variance Analysis.	
<b>6.</b>	Concept, development & use of standard costing.	
<b>UNIT-I</b>	<b>Financial Management</b> Financial function, Scope, goals and tools. Sources of finance, corporate planning and financial management. Financial Statements: Balance sheet, profit and loss account. Ratio Analysis: Classification, Ratio Analysis and its limitations. Operating and Financial Leverage.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Capital Budgeting</b> Control of Capital Expenditure, Evaluation Process-Payback approach, Accounting of Rate of Return, Present Value Method Vs Internal Rate of Return. Replacement cost and discounted cash flow.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>Working Capital Management</b> Concept and design of Working Capital, types of working capital, sources of working capital, time value of money, cost and capital, cost of capital. Funds Flow Analysis: Concepts, Objectives, and Techniques of Funds Flow Statement, cash flow statement.	<b>( 06 Hrs)</b>
<b>UNIT-IV</b>	<b>Costing And Cost Accounting</b> Methods of costing and elements of cost. Type of cost, Material Cost: Different methods of pricing of issue of materials. Material losses - Wastage and its consideration. Labour Cost: Different methods wages and incentive plans. Principles of good remunerating system, labour turnover and its methods.	<b>( 06 Hrs)</b>

	<b>Job And Process Costing:</b> Job costing, Factory job costing, Contract cost a) Unit costing:, output and operating cost b) Process costing; Normal and abnormal losses, abnormal gains, waste, scrap, by-products	
<b>UNIT-V</b>	<b>Standard Costing And Marginal Costing:</b> <b>Standard Costing:</b> Material, Labour, Overhead, Sales. Profit, Product-mix and Yield Variance. Capital cost control repetitive operating cost, standard costs, cost reporting and corrective action. Advantages and disadvantages. <b>Marginal Costing:</b> Concept ,Profit Volume relationship, Breakeven chart, contribution, breakeven point, Margin of Safety, Advantages and disadvantages	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Depreciation And Overheads:</b> <b>Depreciation:</b> Concept, importance and different methods of depreciation. Estimation of material, machining and labour cost machining. <b>Overheads:</b> Classification, collection of overheads, Primary and Secondary apportionment of overheads, absorption of overheads. Machine hour and labour hour rate. Under and over absorption of overheads. Estimation of overheads	<b>( 06 Hrs)</b>
<b>Assignments:(Any six)</b>		
<ul style="list-style-type: none"> <li>• Assignment on Financial Management</li> <li>• Assignment on Capital Budgeting.</li> <li>• Assignment on Working Capital Management..</li> <li>• Assignment on Costing Cost Accounting</li> <li>• Assignment on Standard Costing And Marginal Costing</li> <li>• Assignment on Depreciation And Overheads</li> <li>• Case Study</li> </ul>		
<b>Text Books</b>		
1. N. K. Prasad, "Principles and Practice of Cost Accounting", Syndicate Pvt. Ltd., Calcutta		
2. M. Pandey, "Financial Management", New Delhi Vikas Publication House Pvt. Ltd., ISBN 81-259-0638-X		
3. M. Y. Khan, P. K. Jain, "Financial Management", Tata McGraw Hill Publishing Ltd.		
4. B. K. Bhar, "Cost Accounting Methods and Problems", Academic Publishers, Calcutta		
5. P.C.Tulsian "Cost Accounting" Sultan Chand & Co.,		
6. P.C.Tulsian "Financial Management" Sultan Chand & Co.,		
<b>Reference Books:</b>		
1. Henry M. Steiner, "Engineering Economics Principles", McGraw Hill Publication.		
2. C.B. Gupta, "Fundamentals of Business", Sultan Chand & Co.,		
3. P. A. Samuelson, "Economics", McGraw Hill International.		
4. K. K. Dewett, "Modern Economic Theory", Sultan Chand & Co., ISBN 81-219-0331-1		
5. Colin Drury, "Management and Cost Accounting", English Language Book Society, Chapman & Hall London.		
<b>Syllabus for Unit Test</b>		
Unit Test 1	<b>Units I, II and III</b>	
Unit Test 2	<b>Units IV, V ,VI</b>	

<b>Elective III - Human Resource Management</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hrs/Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
Tutorial: --	TW/OR: 50 Marks	
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of business management	
2.	Knowledge of employee welfare	
3.	Basic knowledge of factory acts and labour laws	
<b>Course Objectives:</b>		
The student should be able to understand and apply the principles of human resource management.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Understand the concept of human resource management	
2.	Use proper HR forecasting techniques for successful planning	
3.	Understand the concept of training and development	
4.	Understand the concept of performance appraisal and compensation	
5.	Use the various methods of job evaluation, analysis and design	
6.	Understand the grievance procedure and employee welfare	
<b>UNIT-I</b>	<b>Introduction to Human Resource Management:</b> Introduction, Concept of Human Resource Management, Scope of Human Resource Management, History of Human Resource Management, Function of Human Resource Management, Role of HR Executives Changing Role of Human Resource in India, Globalization, Its Impact on HR.	(06 Hours)
<b>UNIT-II</b>	<b>Human Resource Planning:</b> Process of Human Resource Planning, Need for Human Resource Planning, HR Forecasting Techniques, Successful Human Resource Planning <b>Recruitment and Selection:</b> Concept of Recruitment, Factors Affecting Recruitment, Sources of Recruitment, Recruitment Policy, Selection, Selection Process, Application Forms, Selection Test, Interviews, Evaluation, Placement, Induction	(06 Hours)
<b>UNIT-III</b>	<b>Training and Management Development:</b> Meaning of Training, Area of Training, Methods of Training, Concept of Management Development, Management Development Methods, Differences Between Training and Development, Evaluation of Training and Management Development	(06 Hours)

	<b>Employee Career Planning and Growth:</b> Concept of Employee Growth, Managing Career Planning, Elements of a Career Planning Programme, Succession Planning.	
<b>UNIT-IV</b>	<b>Performance Appraisal:</b> Concept and Need for Performance, Reviews, Overview of Performance Appraisal, Types of Appraisal Methods, 360 degree appraisal, Benefits <b>Compensation Management:</b> Wage and Salary Administration, Managing Wages, Concept of Rewards and Incentives, Managing Benefits in Organisations <b>Labour Laws:</b> introduction to labour laws and factory act.	(06 Hours)
<b>UNIT-V</b>	<b>Job Evaluation:</b> Concept of Job Evaluation, Objectives, Techniques, Advantages and Limitations, Introduction to Competency <b>Job Analysis and Design:</b> Concept of Job Analysis and Design, Process of Job Analysis, Methods of Job Analysis, Job Analysis Information, Concept of Job Design, <b>Human Resource Information System:</b> Introduction, Concept, Components, Types, Application, Implementation, Benefits, Impact,	(06 Hours)
<b>UNIT-VI</b>	<b>Employee Welfare and Working Conditions:</b> Concept of Employee Welfare, Welfare Measures, Types, Employee Welfare Responsibility, the Business Benefits of Employee Welfare Activities <b>Grievance and Grievance Procedure:</b> Concept of Grievance, Causes of Grievances, Forms and Effects of Grievance, the Grievance Handling Procedure, Need for Grievance Redressal Procedure <b>Emerging Trends in HRM:</b> Competency Mapping, Business Process Outsourcing, Right Sizing of Workforce, Flexi time, Talent Management, Employee Engagement	(06 Hours)
Term work:		
<ol style="list-style-type: none"> <li>1. Introduction to Human resource management</li> <li>2. Exercise covering human resource planning, recruitment and selection.</li> <li>3. Exercise on training and development</li> <li>4. Assignment on employee career planning and growth</li> <li>5. Exercise on career planning and compensation.</li> <li>6. Exercise on job evaluation, analysis and design.</li> <li>7. Assignment on employee welfare and working conditions.</li> <li>8. Exercise on grievance procedure and emerging trends in HRM.</li> </ol>		
<b>Assignments:</b>		
<ol style="list-style-type: none"> <li>1. Assignment on cost effective recruitment</li> <li>2. Assignment on use of portals for recruitment.</li> <li>3. Assignment on training need analysis.</li> <li>4. Assignment on compensation benchmarking.</li> <li>5. Assignment on mandatory requirements of factories act.</li> <li>6. Assignment on design of appraisal system.</li> <li>7. Assignment on employee satisfaction survey.</li> </ol>		

**Text Books / References**

1. Aswathappa, "Human Resource and Personnel Management", Tata McGraw Hill.
2. C.B. Mammoria, "Personnel Management",
3. Dessler, "Human Resource Management", Prentice Hall India.
4. DeCenzo & Robbins, "Personnel/Human Resource Management: "Prentice Hall India.
5. D. K. Bhattacharya, "Human Resource Management", Excel Books; 2nd edition
6. V. S. P. Rao, "Human Resource Management", Excel Books.
7. Gomez, "Managing Human Resource", Prentice Hall India.
8. Dr P Jyothi and Dr D.N Venkatesh, "Human Resource Management", Oxford Publications.

**Syllabus for Unit Test**

Unit Test 1	Units I, II and III
Unit Test 2	Units IV, V and VI



<b>Elective III: Manufacturing of Composite Materials</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 03 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of conventional manufacturing processes.	
2.	Knowledge of material science.	
3.	Knowledge of engineering Metallurgy.	
<b>Course Objectives:</b>		
	Student will understand the concepts of Composite and also able to understand the Manufacturing of Composite Materials .	
<b>Course Outcomes:</b>		
Students will be able to understand		
1.	Different types of composite and its classification .	
2.	To select proper process and understand characteristics of fibers .	
3.	To select different methods of reinforcement of materials .	
4.	To select various design of dies for manufacturing .	
5.	Mechanism of curing.	
6.	To select advance processes and understand its defects and remedies in Manufacturing of Composite Materials	
<b>UNIT - I</b>	<b>Introduction:</b> Definition of composite material, Classification based on matrix and topology, Constituents of composites, Interfaces and Interphases, Distribution of constituents, Nano-composites,	<b>(06 Hours)</b>
<b>UNIT - II</b>	<b>Performance of Structural Composites:</b> Combination effects Fabrication and processing of metal matrix (MM), polymer Matrix (PM) and ceramic matrix (CM) composites and their characterization; Fabrication of nano-composites; Secondary processing and joining of various composite materials for structural applications and their fracture behaviour and safety.	<b>(06 Hours)</b>
<b>UNIT - III</b>	<b>Strengthening mechanisms,</b> Stress distribution in fibre and the matrix (shear stress and axial tensile stress in the fibre along its length), critical length of fibre for full strengthening, Analysis of uniaxial tensile stress-strain curve of unidirectional continuous and short fibre composites, Estimation of the required minimum amount of fibre and critical amount of fibre to gain a composite strength, Analysis of strength of a composite during loading at an angle to the fibres,	<b>(06 Hours)</b>

<b>UNIT - IV</b>	<b>Characterisation Composites</b> :Control of particle/fibre and porosity content, particle/fibre distribution, Interfacial Reaction of matrix-reinforcing component, Coating of reinforcing component, Strength analysis Performance of Composite in Non-structural Applications :Composites in Electrical, Superconducting and Magnetic Applications, Nano-composite devices	<b>(06 Hours)</b>
<b>UNIT - V</b>	<b>Fabrication Composites</b> :Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites - XD process ,Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes - Stir-casting & Compocasting, Screw extrusion, Liquid- metal impregnation technique - Squeeze casting, Pressure infiltration, Lanxide process), Pinciple of molten alloy infiltration, rheological behaviour of melt -particle slurry, Synthesis of In situ Composites;	<b>(06 Hours)</b>
<b>UNIT - VI</b>	<b>Fabrication of Polymer Matrix Composites</b> - Commonly used Matrices Basic Requirements in selection of Constituents, Moulding method, Low pressure closed molding, pultrusion, Filament winding, Fabrication of ceramic matrix composites - Various techniques of vapour deposition, Liquid phase method and Hot pressing etc. Fracture & Safety of Composite : Fracture behavior of composites, Mechanics and Weakest link statistics,Griffith theory of brittle fracture and modification for structural materials, Basic fracture mechanics of composite	<b>(06 Hours)</b>
<b>Term work:</b>		
<b>List of Experiments: ( Any six )</b>		
<ul style="list-style-type: none"> <li>• Manufacturing of Fibres on Electrospin Machine</li> <li>• Study of different binders</li> <li>• Manufacturing of composite by Hand Lay up processes .</li> <li>• Manufacturing of composite by VARTUM</li> <li>• Study of MMC .</li> <li>• Study of CMC.</li> <li>• Study of different Matrix Materials and reinforced materials</li> <li>• Testing of composite component</li> </ul>		
<b>Assignments:</b>		
<ol style="list-style-type: none"> <li>1. Explain the different types of composite ,Interfaces and Interphases.</li> <li>2. Discuss the Fabrication of nano-composites in details</li> <li>3. Explain the Stress distribution in fiber and the matrix.</li> <li>4. How the carbon and glass fiber are manufactured.</li> <li>5. What is Liquid- metal impregnation technique?</li> <li>6. Explain the basic requirements in selection of Constituents in composite .</li> </ol>		

<b>Text Books/Reference Books:</b>	
1	Composite materials, K.K. Chawala, 2nd ed., (1987) Springer-Verlag, New York. 2
2	Nanocomposite Science and Technology, P.M. Ajayan, L.S. Schadler, P. V. Braun, (2003), Wiley-VCH Verlag GmbH Co. KGaA, Weinheim.
3	Ceramic matrix composites, K.K. Chawala, 1sted., (1993) Chapman & Hall, London
4	Advances in composite materials, G. Piatti, (1978) Applied Science Publishers Ltd., London.
<b>Syllabus for Unit Test:</b>	
Unit Test -1	Unit I to III
Unit Test -2	Unit IV to VI

<b>Elective III: KNOWLEDGE BASED SYSTEMS</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW/OR : 50 Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic Knowledge of Information Technology	
<b>2.</b>	Introductory computer course.	
<b>3.</b>	Information systems course.	
<b>Course Objectives:</b>		
The basic purpose of the course is to discuss the application of artificial intelligence techniques and more specifically knowledge based systems, in information processing and information systems design. Discuss methodological and project management approaches to developing knowledge based systems.		
<b>Course Outcomes:</b>		
Students will be able to		
<b>1.</b>	Understand the knowledge-based systems representation.	
<b>2.</b>	Understand automatic reasoning.	
<b>3.</b>	Understand inductive and deductive learning.	
<b>4.</b>	Implement a small knowledge- based system.	
<b>5.</b>	Understand Methodologies for building knowledge based systems	
<b>6.</b>	Understand Organizational and Managerial Issues	
<b>UNIT-I</b>		<b>( 06 Hrs)</b>
<b>Artificial Intelligence and Information Systems:</b> Fourth & fifth generation languages, Nonprocedural Paradigms, Data and Knowledge.AI, knowledge based systems, Expert Systems. Basic architecture of knowledge based systems		
<b>UNIT-II</b>		<b>( 06 Hrs)</b>
<b>Knowledge representation and the knowledge base:</b>  First-Order Logic, Production Rules, Horn Clauses, Frames, Semantic Networks, Objects. Metaknowledge, Conceptual modelling.		

<b>UNIT-III</b>	<b>( 06 Hrs)</b>
<b>Interfaces:</b> User interface: explanation facilities, unknown values. Systems interface: language and database hooks. Developer interface: knowledge acquisition, testing & debugging	
<b>UNIT-IV</b>	<b>( 06 Hrs)</b>
<b>Methodologies for building knowledge based systems:</b> Development lifecycle, structured development and prototyping. Knowledge acquisition techniques, protocol analysis, repertory grid. Integration with databases, data processing and information systems methodologies	
<b>UNIT-V</b>	<b>( 06 Hrs)</b>
<b>Expert system building tools:</b> AI-Languages, Knowledge representation languages, E.S.-shells, products and environments .Knowledge base management systems	
<b>UNIT-VI</b>	<b>( 06 Hrs)</b>
<b>Organizational and Managerial Issues:</b> Knowledge as a strategic asset in the organization, knowledge problems and management. Applications, pitfalls and successes.	
<b>Term work:</b> <b>List of Experiments: ( Any Five)</b> <ol style="list-style-type: none"> <li>1. Study of Artificial Intelligence</li> <li>2. Study of Basic architecture of knowledge based systems</li> <li>3. Conceptual modelling.</li> <li>4. Study of Developer interface.</li> <li>5. Data processing and information systems methodologies.</li> <li>6. Knowledge base management systems.</li> <li>7. Study of knowledge problems and management.</li> </ol>	
<b>Assignments: ( Any Six)</b> <ol style="list-style-type: none"> <li>1. Study of Expert Systems.</li> <li>2. Knowledge based systems.</li> <li>3. Study of Production Rules.</li> <li>4. Study of Semantic Networks.</li> <li>5. Study of Systems interface.</li> <li>6. Study of protocol analysis.</li> </ol>	

<p>7. Study of AI-Languages.  8. Different Knowledge acquisition techniques.  9. Study of Knowledge representation languages.  10. Study of products and environments.  11. Knowledge as a strategic asset in the organization</p>					
<p>‡ <b>Text Books / References</b></p> <ul style="list-style-type: none"> <li>• VANTHIENEN J., Knowledge Based Systems (Wouters Bookstore)</li> <li>• HARMON, P., HALL, C., <i>Intelligent Software Systems Development</i> , Jojn Wiley &amp; Sons, Inc., 1993, 472 pp.</li> <li>• LUGER, G., STUBBLEFIELD, W., <i>Artificial Intelligence</i> , Second edition, Benjamin/Cummings, 1993.</li> <li>• TURBAN, E., LIEBOWITZ, J. (Eds), <i>Managing Expert Systems</i> , Idea Group Publishing, 1992.</li> <li>• PATTERSON, D., <i>Introduction to Artificial Intelligence and Expert Sytems</i>, Prentice-Hall, 1990.</li> <li>• Peter Jackson, <i>Introduction to Expert Systems</i>, Addison-Wesley (3rd Ed), 1998</li> </ul>					
<p><b>Syllabus for Unit Test</b></p> <table border="1"> <tr> <td>Unit Test 1</td> <td>Units I , II and III</td> </tr> <tr> <td>Unit Test 2</td> <td>Units IV, V ,VI</td> </tr> </table>	Unit Test 1	Units I , II and III	Unit Test 2	Units IV, V ,VI	
Unit Test 1	Units I , II and III				
Unit Test 2	Units IV, V ,VI				

### Elective III: Design And Analysis of Experiments.

<b>Elective III: Design And Analysis of Experiments.</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 03 Hrs/Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Attendance: 10 Marks Assignments : 10 Marks Unit Test : 20 Marks	01 Credit
	TW &OR :50Marks	
<b>Course Pre-requisites:</b>		
The Students should have		
1.	Basic knowledge of Introduction to Statistics or a similar basic statistics course	
2.	Basic knowledge of Graphical Representation.	
3.	Basic knowledge of some Software's such as statease and Minitab.	
<b>Course Objectives:</b>		
This course provides an introduction to designing experiments and analyzing their results.		
<b>Course Outcomes :</b>		
Students will be able to understand		
1.	Design of Experiments	
2.	Selection of Levels and Parameters.	
3.	Factorial Design. The $2^k$ Factorial Design	
4.	Analysis of Variance (ANOVA)	
5.	Model building using the method of least squares.	
6.	Performing hypothesis tests,	
<b>UNIT-I</b>	<b>Introduction to design of experiments:</b> Strategy of Experiment, Basic Principles, Guide Lines for designing Experiment, Brief History of Stastical Design. Using Stastical Techniques in Experimentation. A typical application of Experimental Design.	<b>( 06 Hrs)</b>
<b>UNIT-II</b>	<b>Simple Comparative Experiments.:</b> Introduction, Basic Stastical Concepts, Sampling and Sampling distributions, difference in means, hypothesis testing, choice of sample size, confidence intervals, comparing single mean to Specified value, difference in means, paired comparison designs.	<b>( 06 Hrs)</b>
<b>UNIT-III</b>	<b>Design of Experiments:</b> Introduction to Factorial Designs. The $2^k$ Factorial Design, The $2^2$ Factorial Design, The $2^3$ Factorial Design, General $2^k$ design, Single replicate of the $2^k$ design, Taguchi Method and addition of center points to the $2^k$ design.	<b>( 06 Hrs)</b>
<b>UNIT-IV</b>	<b>Analysis of Variance :(ANOVA)</b>	<b>( 06 Hrs)</b>

	Analysis of the fixed effects Model, decomposition of the Total Sum of Squares, Stastical Analysis, Estimation of the Model Parameters, Unbalanced Data.	
<b>UNIT-V</b>	<b>Regression Analysis:</b> Regression Model, Comparison among Means, Regression Approach to the Analysis of Variance Least Squares, Estimation of the Model Parameters, General Regression Significant Test,	<b>( 06 Hrs)</b>
<b>UNIT-VI</b>	<b>Result Analysis:</b> Fitting Regression Models, Linear Regression Models, Estimation of the Model Parameters in Linear Regression Models, Hypothesis Testing in Multiple Regression, Test for Significance of Regression, Test on Individual Regression Coefficient and group of Coefficients, Confidence intervals on the individual Regression Coefficient, Confidence intervals on the Mean Response, Prediction the new response observation F-Test, Matching the Calculated value with standard value, Use of Software's, Statease, Systat, Minitab ,Predict analysis	<b>( 06 Hrs)</b>
<b>Term work: Students have to write the assignments as well as perform the experiment and prepare the journal for the same.</b>		
<b>Assignments: (Any Six)</b> <ul style="list-style-type: none"> <li>• Assignment on Introduction to design of experiments</li> <li>• Assignment on Simple Comparative Experiments</li> <li>• Assignment on Design of Experiments.</li> <li>• Assignment on Analysis of Variance (ANOVA)</li> <li>• Assignment on Regression Analysis</li> <li>• Assignment on Result Analysis.</li> <li>• Case Study (Perform the experiments by selecting at least 2 levels and 3 parameters.)</li> </ul>		
<b>Oral/Practical</b> Term work and oral will be based on above syllabus		
<b>Text Books</b> <ol style="list-style-type: none"> <li>1) George E. P. Box, William G. Hunter, J. Stuart Hunter, Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building, Second Edition, John Wiley &amp; Sons, New York, 2005</li> <li>2) Douglas C. Montgomery, Design and Analysis of Experiments, Sixth Edition, John Wiley &amp; Sons, New York, 2004.</li> </ol>		
<b>Syllabus for Unit Test</b>		
Unit Test 1	<b>Units I , II , III</b>	
Unit Test 2	<b>Units IV, V ,VI</b>	



<b>Computer Aided Engineering</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: --	End Semester Examination: --	
Practical: -- 02 Hrs/Week	Internal evaluation: -- Assignments : -- Unit Test : --	01 Credit
Tutorial : --	TW/OR – 50 marks	01 Credit
<b>Course Pre-requisites:</b>		
<b>The Students should have</b>		
1.	Basic knowledge of computer aided design and analysis	
2.	Basic knowledge of manufacturing	
3.	Basic knowledge of numerical methods	
<b>Course Objectives:</b>		
The students should understand the scope, objectives and applications of Computer Aided Engineering.		
<b>Course Outcomes:</b>		
Students will be able to		
1.	Solve ordinary and partial differential equations using Galerkin method.	
2.	Analyse the 2D problems by using software.	
3.	Solve the problems related to heat transfer by using software.	
4.	Design and analyse the connecting rod.	
5.	Design and analyse the burnished components.	
6.	Analyse the screw jack.	
<b>Term work:</b>		
1.	Structural analysis of a corner bracket.	
2.	Structural analysis of Truss structure.	
3.	Modal analysis of Simple Pendulum.	
4.	Steady state heat transfer through a plate with hole.	
5.	Analysis of a connecting rod.	
6.	Analysis of Leaf spring	
7.	Analysis of burnished components	
8.	Analysis of piston	
9.	Analysis of camshaft	
10.	Analysis of Screw jack.	
<b>Assignments: NA</b>		
<b>Text Books / References</b>		
<ol style="list-style-type: none"> <li>1. S. S. Rao, " Finite Element methods in Engineering", Pergomon press Oxford, 2<sup>nd</sup> edition 1989</li> <li>2. Sagarlind L J, Applied Finite Element Analysis, John Willey, 1984</li> <li>3. Chandrupatla &amp; Belegundu, Introduction to Finite Element Engineering, Prentice Hall, 1999.</li> <li>4. David Hutton, "Fundamentals of Finite Element Analysis", Mcgraw-Hill</li> <li>5. Saeed Moaveni, "Finite Element Analysis Theory And Application With ANSYS", Prentice Hall.</li> <li>6. Sham Tickoo," Ansys Workbench 14.0 for Engineers and Designers (MISL-DT), Dreamtech Press.</li> </ol>		
Syllabus for Unit Test		
NA		

<b>PROJECT STAGE-II</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Practical: 04 Hours / Week	TW/OR :150 Marks	08 Credits
<b>Course Pre-requisites:</b>		
The Students should have		
<b>1.</b>	Basic knowledge of Machines.	
<b>2.</b>	Knowledge of material science.	
<b>3.</b>	Knowledge of Strength of Material.	
<b>Course Objectives:</b>		
To prepare the students to carry out a comprehensive study of any design or process or phenomenon, to encourage the process of independent / creative thinking and working in groups and to expose them to industrial atmosphere of accountability.		
<b>Course Outcomes:</b>		
Students will be able to		
<b>1.</b>	Work in Team	
<b>2.</b>	Allocate work among students according to expertise in specific field	
<b>3.</b>	Break the Project into Tasks.	
<b>4.</b>	Develop Leadership quality	
<b>5.</b>	Carry out Purchasing activity	

6.	Carry out fabrication and assembly of components.

### **Term Work**

The students will complete their project work started in B.Tech. (Production Engineering) – Semester VII and will submit the report in a prescribed format as given below at the end of Semester VIII. The report will be assessed by the Project Guide and External faculty member appointed by the Head of the Department / concerned responsible official of the sponsoring industry (Co-guide). A publication of work in national conference or journal is compulsory. The report shall be submitted, typed on A4 size sheets and hard bound.( One copy for the department and one copy for each student). The contents of the report shall include the following in a broad sense.

#### **Detailing may be done according to the problem undertaken.**

- a) Problem identification and statement
  - b) Review of relevant literature / present practices regarding the problem
  - c) Methodology followed to carry out the work
  - d) Inputs for the project design
  - e) Processing / conversion of these inputs
  - f) Outputs testing / validation
  - g) Results, conclusion, future scope, references, acknowledgement
  - h) **Review of initial plan and deviations in it.**
- 1) Term work will be assessed by the project guide along with Co-guide from sponsoring industry **or** one more faculty member appointed by the Head of Department for in-house projects; based on the work done and the report submitted.
  - 2) The students will be examined orally by the examiner appointed by the university and the project guide as the internal examiner.

**Marks will be awarded on the basis of the work done and performance in the oral examination.**

Format of the project report should be as follows:

1. Paper: The Project report should be typed/printed on white paper of A-4 size.
2. Typing: The typing shall be with one and half spacing and on one side of the paper.
3. Binding: The Industrial Implant Report should be submitted with front and back cover in black  
Hard bound, with golden embossing.
4. Margins: Left - 1.25", Right - 1". Top and Bottom 1"
  
5. Sequence of Pages:
  1. Title page
  2. Certificate form Institute
  3. Completion Certificate form Industry, if sponsored.
  4. Acknowledgement
  5. Abstract
  6. Index
  7. Nomenclature and Symbols
  8. Actual Content
  9. Conclusion
  10. References.
  
6. Front cover: The front cover shall have the following details in block capitals
  - i. Title at the top.
  - ii. Name of the candidate in the centre, and
  - iii. Name of the Institute, Name of Industry, if sponsored and the year of submission on separate

lines, at the bottom.

### CERTIFICATE

This is to certify that Mr. /Ms .....

(Seat No.)..... has carried out a Project entitled ,.....for partial fulfillment of the requirement of the B.Tech. Production Engineering Course during the academic Year .....

Date:

Place:

(Guide)

(Project Co-Ordinator)

(Examiner)

(Head of Department)

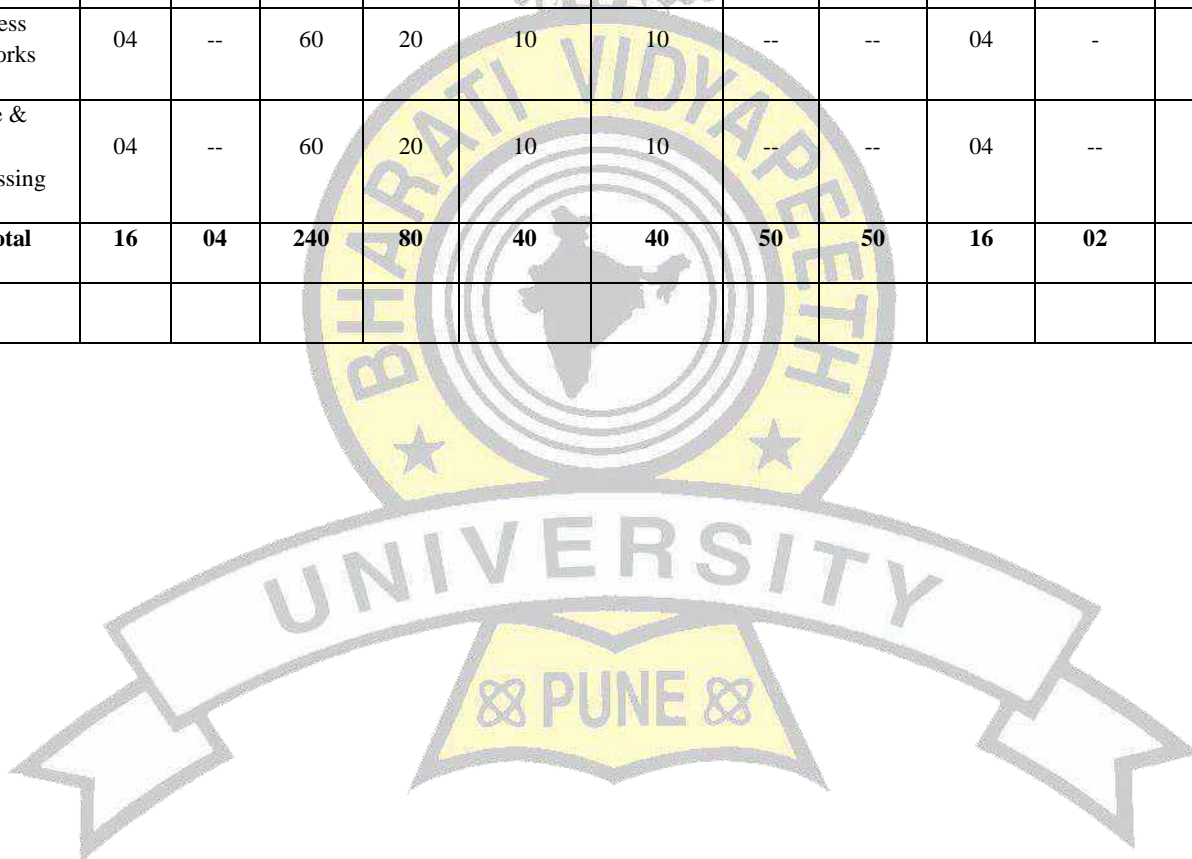
## Structure of M.Tech Electronics Engineering (VLSI)

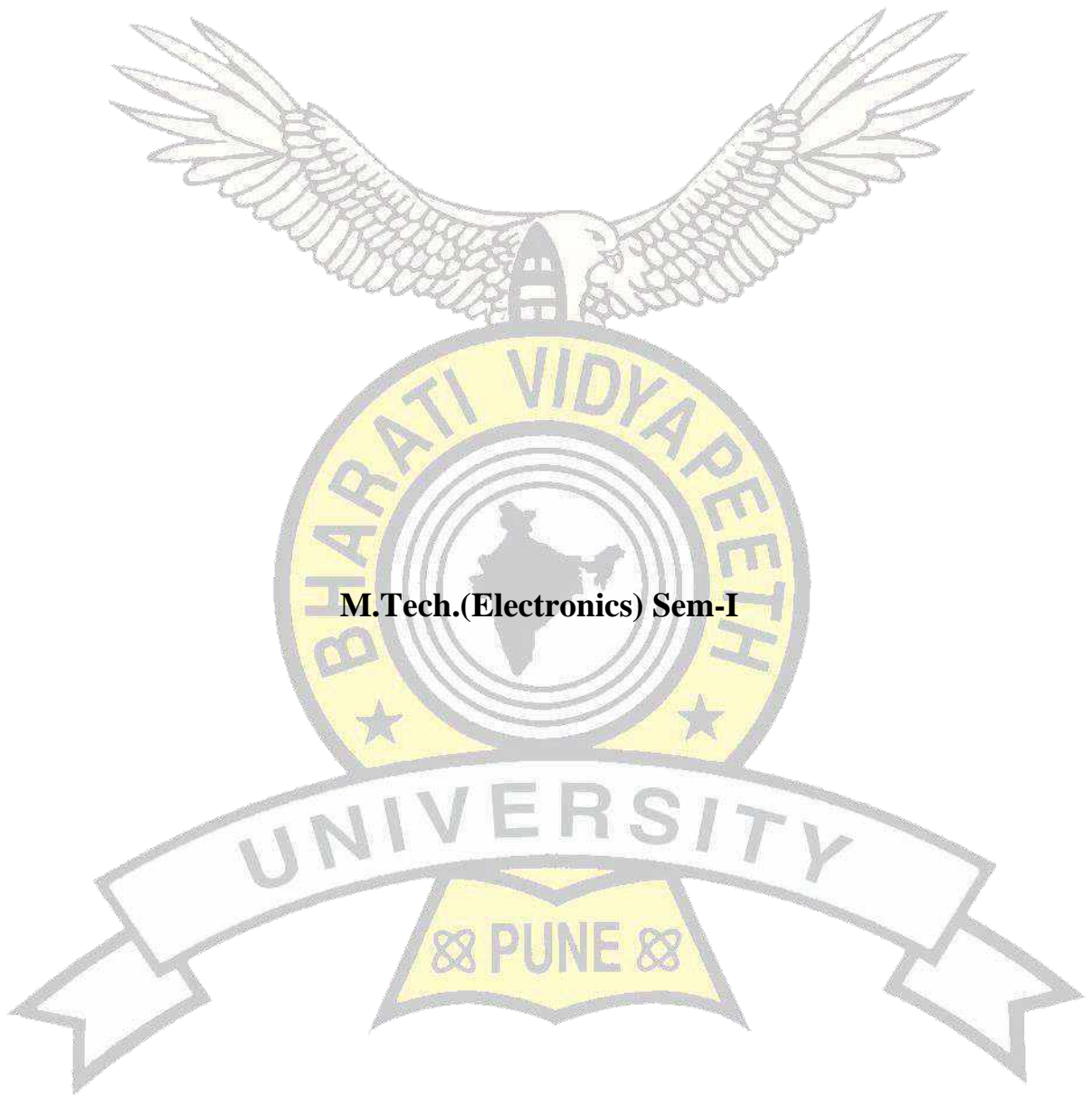
Based on Credit Pattern

### STRUCTURE & EXAMINATION PATTERN

<b>Semester I</b>											<b>Total Duration: 20 hrs/week</b>	
											<b>Total Marks :500</b>	
											<b>Total Credits: 18</b>	
<b>Subject</b>	<b>Teaching Scheme (Hrs)</b>		<b>Examination Scheme (Marks)</b>						<b>Examination Scheme (Credits)</b>		<b>Total Credits</b>	
	<b>Hrs./Week</b>											
	<b>L</b>	<b>P</b>	<b>Theory</b>	<b>Unit Test</b>	<b>Attendance</b>	<b>Tutorial/assignments</b>	<b>TW</b>	<b>Pract/Oral</b>	<b>TH</b>	<b>TW/PR/OR</b>		
Digital VLSI design	04	02	60	20	10	10	25	25	04	01	05	
Embedded System & processors	04	02	60	20	10	10	25	25	04	01	05	
Advanced Digital communication system	04	--	60	20	10	10	--	--	04	--	04	
Linear algebra & random processes	04	--	60	20	10	10	--	--	04	--	04	
<b>Total</b>	<b>16</b>	<b>06</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	

Semester II											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR/OR		
Analog VLSI Design	04	02	60	20	10	10	25	25	04	01	05	
Advanced digital signal processing	04	02	60	20	10	10	25	25	04	01	05	
Wireless Networks	04	--	60	20	10	10	--	--	04	-	04	
Image & video processing	04	--	60	20	10	10	--	--	04	--	04	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	





**M.Tech.(Electronics) Sem-I**





## **ADVANCED DIGITAL COMMUNICATION SYSTEM**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### **Course prerequisites:**

Knowledge of random processes and linear system theory (Transforms, convolution, sampling)

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### **Course objective:**

To provide students with the knowledge & understanding of modern communication systems.

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**Course Outcomes:** Upon Completion of the course, the students will be able to

1. To identify and describe different techniques in modern communication systems.
2. To understand the basic theory of modulation & demodulation techniques.
3. To possess knowledge of different codes.
4. To apply fundamentals of communication systems to solve the Engineering Problems.

### **Contents:**

#### **UNIT I**

(08 Hours)

#### **Basic digital pass band modulation**

Introduction, Binary amplitude shift keying(BASK), Binary Phase shift keying(BPSK), Binary frequency shift keying(BFSK),Performance comparison of BASK, BFSK,BPSK, Digital modulation techniques for spectral efficiency, Quadrature Phase shift keying(QPSK),

Offset Quadrature Phase shift keying(OQPSK), Minimum shift keying(MSK), Comparison of M-ary signaling techniques.

## UNIT II

(08 Hours)

### **Demodulation:**

The matched filter, The correlator, envelop detector, output signal to noise ratio, Binary demodulation, coherent PSK,DPSK,FSK, non-coherent FSK,DPSK ,MSK .

## UNIT III

(08 Hours)

### **Channel coding**

Reed soloman codes, Interleaving & concatenated codes, coding and Interleaving applied to the compact disc digital audio system, Linear block codes, Cyclic Redundancy check (CRC), Turbo codes, Automatic repeat request (ARQ).

## UNIT IV

(08 Hours)

### **Fading Channels**

Multipath propagation, Flat & frequency selective fading, Fast and slow fading Random channel models, Signal design for radio channels, Diversity, Modulation, Coding.

## UNIT-V

(08 Hours)

### **Advanced Modulation techniques**

Trellis –coded modulation, Direct sequence modulation, IS-95 forward link, Code division multiple Access (CDMA), IS-95 reverse link, Frequency hop Spread Spectrum (FH-SS) ,CDMA, Pseudorandom sequences: generation & properties, Rake receiver

## UNIT VI

(08 Hours)

### **OFDM**

Introduction to OFDM, Low mobility, High mobility, Time diversity, Frequency diversity, Receiver antenna diversity (SIMO), Transmit antenna diversity (MISO), Transmit receive antenna diversity.

### **Text Books/ References:**

1. Digital communications- Simon Haykin, John Wiley and sons, 1998
2. Digital Communications- Bernard Sklar, Second edition, Pearson Education, 2001.
3. Nguyen Ha, Shwedyk Ed, “ A First Course in Digital Communications, Cambridge University Press.
4. Digital communication, 4th ed. - J. G. Proakis, MGH International edition.
5. Principle of Communication Systems – Taub, Schilling, TMH
6. Communication Systems, 4th ed. – A. Bruce Carlson, Paul B. Crilly, Janet C. Rutledge, MGH International edition.
7. Advanced Digital Communication Sytems-NIIT,PHI learning.





## DIGITAL VLSI DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40

Marks

TW&OR: 50 Marks

Total Credits: 05

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### Course Prerequisite:

Knowledge of Digital Electronics

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### Course Objective:

To understand theory and to learn design of digital system. The course will involve design and simulation of digital circuits using VHDL

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**Course Outcomes:** On successful completion of this course, students will be able to

- Ability to apply various modeling styles for digital circuits.
  - Ability to design sequential and combinational circuits using VHDL.
  - Ability to conceptualize FSM.
  - Ability to simulate digital circuits.
  - Ability to apply concepts of PLD designs.
- 

### Contents:

#### UNIT I

(08 Hours)

#### VHDL Basics

Objectives of VHDL, Entity-Architecture Concepts, Introduction to various modeling styles of VHDL (Behavioral, Dataflow, Structural and Mixed), VHDL Basic Elements (Data types, Data objects and Operator), Configuration, Package declaration.

**UNIT II**  
**VHDL Modeling-1**

(08 Hours)

Dataflow Modeling: Example based on dataflow modeling, When-Else and With Select Statement, Concept of Delta delay and multiple drivers, Generate and Block Statements  
Structural modeling: Concept of Component

**UNIT III**

(08 Hours)

**VHDL Modeling-2**

Behavioral and mixed modeling for digital design, If-else, Loop, Case, Assert and Report statements, State Machine Design, Moore and Mealy FSM Design using VHDL

**UNIT IV**

(08 Hours)

**EDA tools**

Digital Design Flow, RTL Synthesis, Synthesis Flow, Functional and Timing simulation, Physical Verification, Floor planning, Place and route, IP Design

**UNIT V**

(08 Hours)

**Programmable Logic Devices**

Overview of PLDs, SPLD, CPLD, FPGA, Case study of Xilinx family XC 4000 and XC9500, Modes of configuration.

**UNIT VI**

(08 Hours)

**Designing with PLDs**

Designing with ROM, PLA, PAL, GAL, CPLD and FPGA, Implementing functions in PLDs.

**Text Books/ References:**

1. VHDL: Programming by Example-Douglas Perry, McGraw Hill, Fourth Edition, 2002.
2. Fundamentals of Logic Design-Charles Roth, Larry Kinney, Cengage Learning, Seventh edition, 2014.
3. A VHDL Primer-J. Bhaskar, PHI Learning, Third Edition, 1998.
4. CMOS VLSI Design: A Circuits and system perspectives- Neil H.E. Weste, Davir Harris, Pearson Education 3rd Edition, 2004.

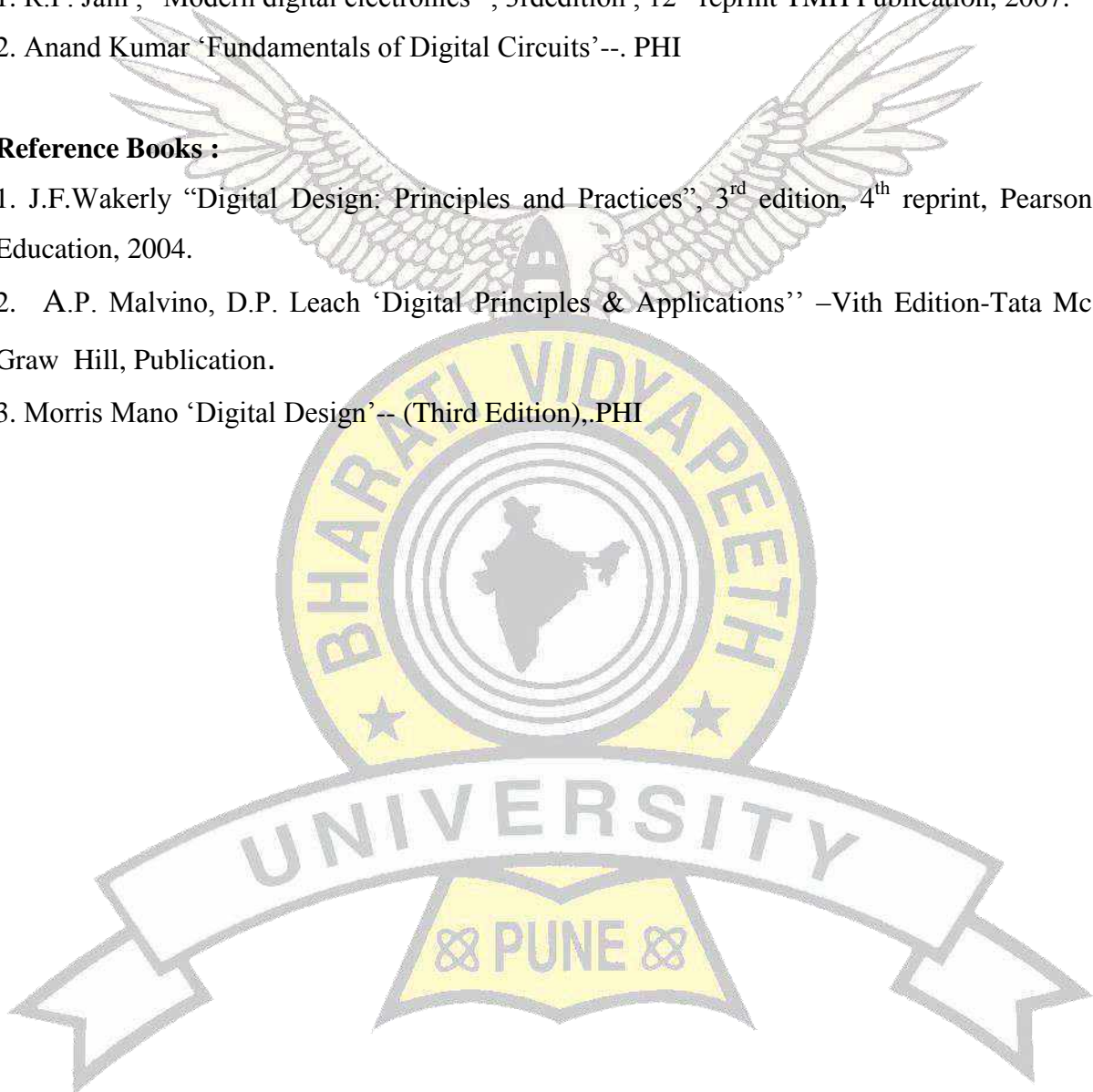
5. Circuit Design and Simulation with VHDL- V. Pedroni, MIT Press, Second Edition, 2010

**Text Books:**

1. R.P. Jain , “Modern digital electronics” , 3rd edition , 12<sup>th</sup> reprint TMH Publication, 2007.
2. Anand Kumar ‘Fundamentals of Digital Circuits’--. PHI

**Reference Books :**

1. J.F.Wakerly “Digital Design: Principles and Practices”, 3<sup>rd</sup> edition, 4<sup>th</sup> reprint, Pearson Education, 2004.
2. A.P. Malvino, D.P. Leach ‘Digital Principles & Applications’ –Vith Edition-Tata Mc Graw Hill, Publication.
3. Morris Mano ‘Digital Design’-- (Third Edition),.PHI





**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune**



## **EMBEDDED SYSTEMS AND PROCESSORS**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 04

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### **Course Prerequisites:**

Knowledge of microcontrollers like 8051, PIC and ARM

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### **Course objective:**

- To understand need and application of ARM Microprocessors in embedded system.
  - To understand architecture and features of typical PSoC.
  - To learn the importance of interprocess communication.
  - To learn Real time operating system and its application.
- 

### **Course Outcomes:** After successfully completing the course students will be able to

- Describe the PSoC architectures and its feature.
- Interface the advanced peripherals to ARM based microcontroller.
- Design embedded system with available resources.

**Contents:**

**UNIT I** (08hours)

**ARM7 & ARM 9 Based Microcontroller**

Review of ARM7, ARM9, &ARM11 processors .  
Interfacing of ARM7 & ARM 9 processors with real world: LED, LCD, KEYPAD,SDI card,UART.

**UNIT II** (08hours)

**Interprocess Communication**

Multiple processes in an application, problem of shared data, interprocess communication, RTOS task scheduling, interrupt latency and response time, interrupt service mechanism Context and context switching.

**UNIT III** (08hours)

**Real Time systems**

Kernel, Scheduler, Non-Preemptive Kernel , Preemptive Kernel, Reentrancy, Round robin scheduling, Task Priorities, Static & Dynamic Priority, Priority Inversion, Assigning task priorities, Mutual Exclusion, Deadlock, Clock Tick, Memory requirements, Advantages & disadvantages of real time kernels

**UNIT IV** (08hours)

**Introduction to PSoC**

PSoC technology, programmable routing and interconnect, configurable analog and digital blocks, cpu sub system, families of PSoC .

PSoC 3/5, architecture – block diagram, system wide resources, I/O interfaces, CPU sub system, memory organization, digital sub systems, analog sub systems

**UNIT V** (08hours)

**PSoC components:**

Universal digital blocks (UDB), UDB arrays and counter and PWM, digital filter gain amplifiers, switched capacitor / continuous time, analog routing, flash temperature sensors,DTMF dialers, sleep timers, UART, I2 C, SPI,USB,CAN buses.



## UNIT VI

(08hours)

### μCOS II

Features of. Kernel structure. μCOS II RTOS services:Task management, Time management, Intertask Communication and Synchronization.

#### Text Books:

1. Andrew Sloss, Dominic Symes. Chris Wright, 'ARM System Developer s Guide- Designing and Optimizing System Software', ELSEVIER
2. Joseph Yiu, 'The Definitive Guide to the ARM Cortex –M', ELSEVIER
3. Rajkamal , 'Embedded System –Architecture, Programmng and design,' TMH Publication, edition 2003
4. PSoC 3, PSoC 5 Architecture technical reference manual, Cypress website
5. Robert Ashby, My First Five PSoC 3 design (e-book), , Cypress website

#### Reference Books:

1. LPC 214x User manual (UM10139);-[www.nxp.com](http://www.nxp.com)
2. LPC17xx User manual (UM10360);-[www.nxp.com](http://www.nxp.com)
3. ARM architecture reference manual:-[www.arm.com](http://www.arm.com)
4. Trevor Martin, ' An Engineer's Introduction to the LPC2100 Series', Hitex (UK) Ltd.
5. Designer Guide to the Cypress PSoC, Robert Ashby, Elsevier Publications
6. Introduction to Mixed Signal Embedded Design, Alex Dobioli, Springer
7. The Beginners Guide to Using PSoC Express: Mixed-Signal Microcontroller Development without Code, Oliver H. Bailey, Timelines Industries Incorporated, 2007
8. PSoC Mikrocontroller by Fredi Kruger Franzis, 2006

#### • Web References:

1. [www.cypress.com/go/psoc](http://www.cypress.com/go/psoc)
2. [www.cypress.com/go/training](http://www.cypress.com/go/training)
3. [www.cypress.com/go/support](http://www.cypress.com/go/support)
4. [www.psocdeveloper.com](http://www.psocdeveloper.com)



## LINEAR ALGEBRA AND RANDOM PROCESS

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

Knowledge of Group theory, ring theory, Field theory

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### Course objective:

- To develop the ability to use the concepts of linear algebra and special functions for solving problems to related networks
  - To formulate and construct a mathematical model for linear programming problem in real life situations
- 

**Course Outcomes:** On successful completion of this course, students will be able to

- To achieve an understanding of the basic concepts of algebraic equations and methods of solving them
- To familiarize the students with special functions and solve problems associated with engineering applications

## Contents:

### UNIT I

(08 Hours)

#### LINEAR Algebra:

Vector spaces-norms-inner products-Eigen values using QR transformations-QR factorization-generalized eigenvectors-canonical forms-singular value decomposition and applications-pseudo inverse-least square approximation-Toeplitz matrices and some applications

### UNIT II

(08 Hours)

#### LINEAR PROGRAMMING:

Formulation-graphical solution-simplex method-Two phase method-Transportation and assignment models, Efficient computational algorithms, Duality, Parametric Linear programming, integer Linear Programming.

### UNIT III

(08 Hours)

#### ORDINARY DIFFERENTIAL EQUATIONS:

Runge-kutta methods for system of IVP's, numerical stability, Adams-Bashforth multistep method, solution of stiff ODE's shooting method, BVP: Finite difference method, orthogonal collocation method, orthogonal collocation with finite element method, Galerkin finite element method

### UNIT IV

(08 Hours)

#### TWO DIMENSIONAL RANDOM VARIABLES:

Joint distributions- marginal and conditional distributions- functions of two dimensional random variables- regression curve- correlation.

### UNIT V

(08 Hours)

#### QUEUEING MODELS:

Poisson's process- Markovian queues- single and multi server models- little's formula – machine interference model- steady state analysis- self service queue. Pure Birth and Death Models (Relationship between the Exponential And Poisson Distribution.)

### UNIT VI

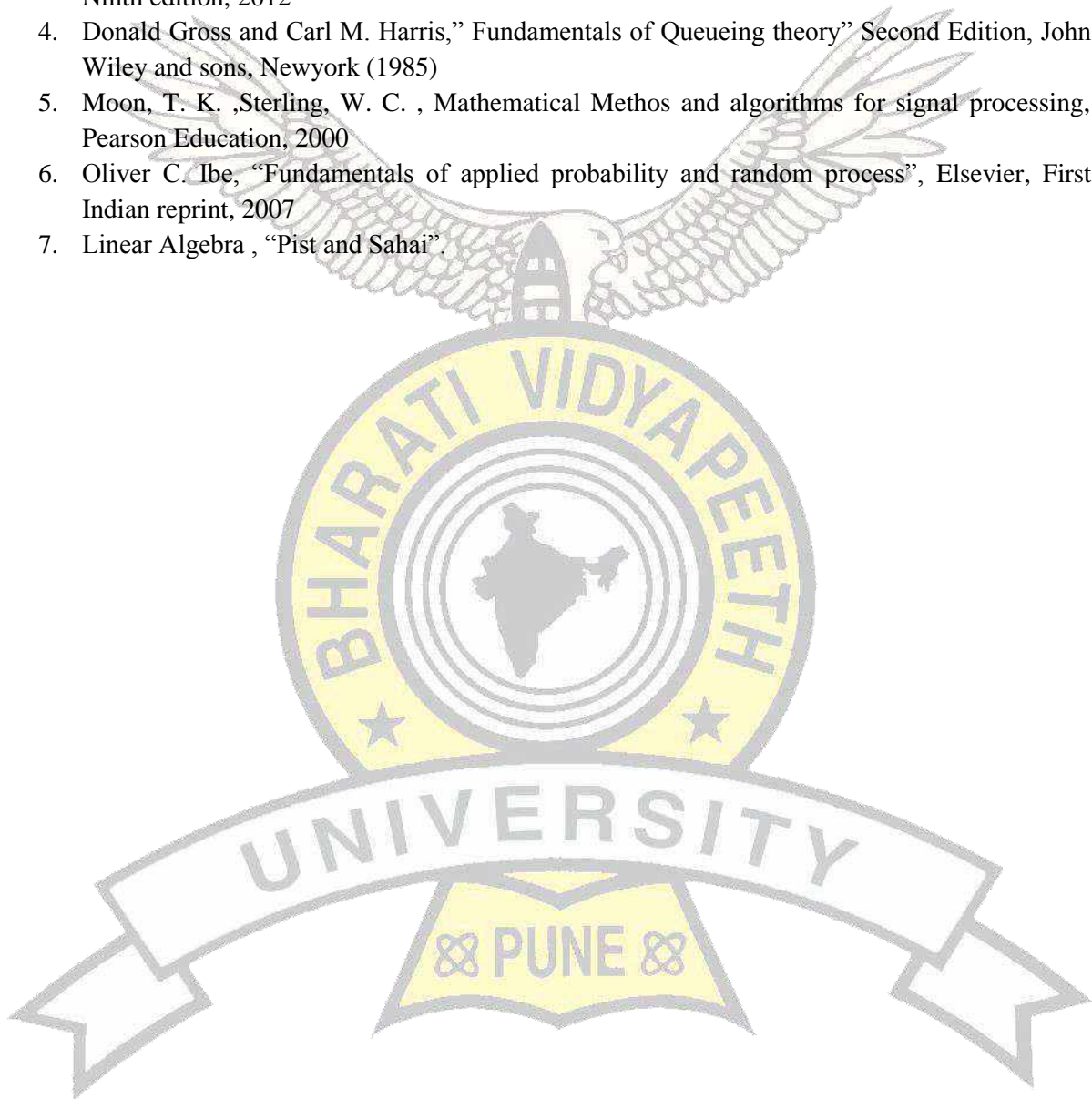
(08 Hours)

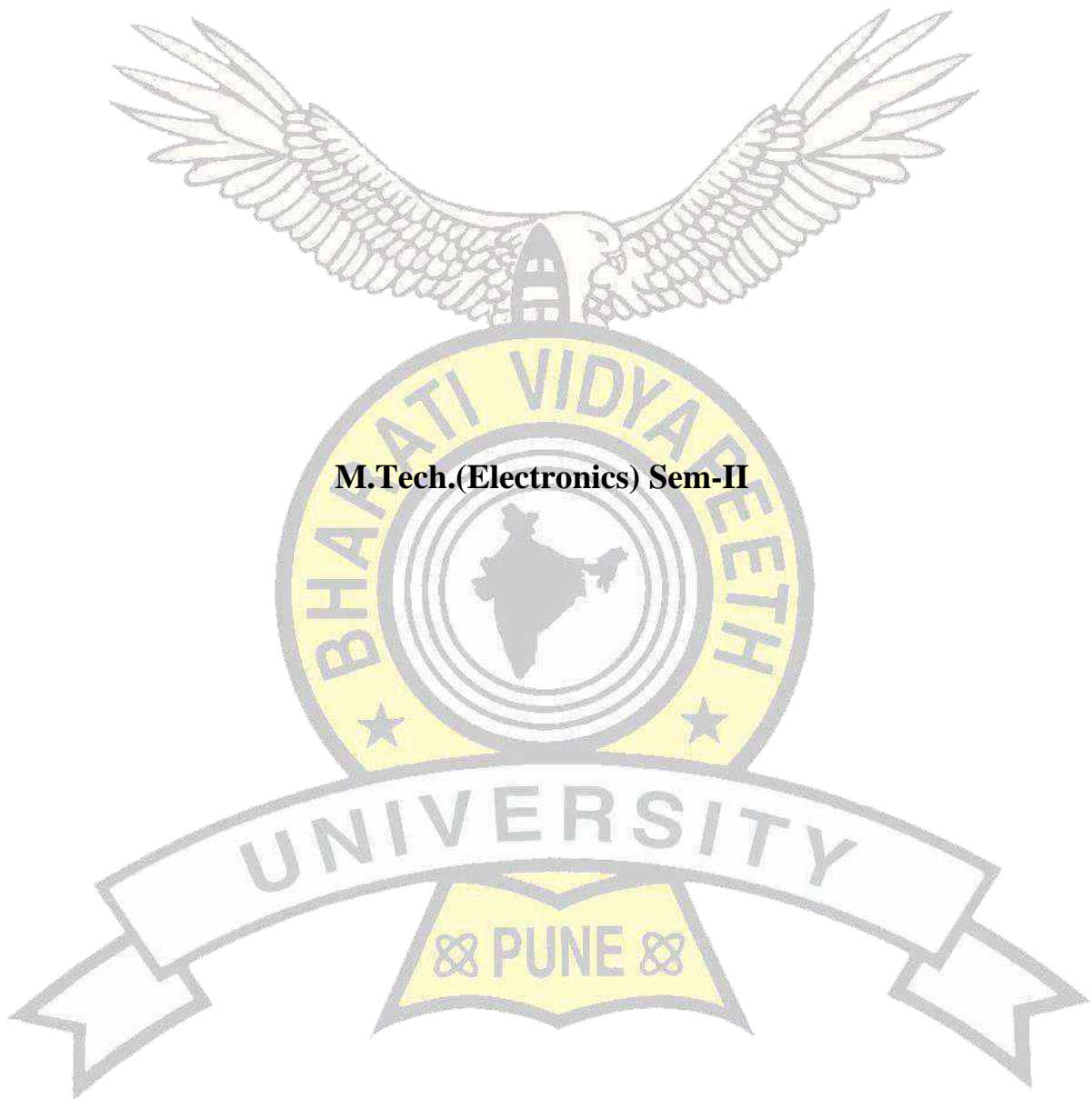
#### RANDOM PROCESS:

Averages of a random process, stationary random process, ergodic random process, random process-mean and covariance function, linear filtering of random process, power spectral density, spectral analysis of random process, Gaussian Poisson random process.

**Text Books/ References:**

1. Richard Bronson, Gabriel B. Costa, “ Linear Algebra”, Academic press, Second edition, 2007
2. Richard Johnson, Miller and Freund, “Probability and Statics for Engineers”, Seventh edition, Prentice-Hall of India, private limited, New Delhi (2007)
3. Taha H. A. “ Operations research, and Introduction”, Pearson Eductaion Asia, New Delhi, Ninth edition, 2012
4. Donald Gross and Carl M. Harris,” Fundamentals of Queueing theory” Second Edition, John Wiley and sons, Newyork (1985)
5. Moon, T. K. ,Sterling, W. C. , Mathematical Methos and algorithms for signal processing, Pearson Education, 2000
6. Oliver C. Ibe, “Fundamentals of applied probability and random process”, Elsevier, First Indian reprint, 2007
7. Linear Algebra , “Pist and Sahai”.





**M.Tech.(Electronics) Sem-II**



**Bharati Vidyapeeth Deemed University,  
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## **ADVANCED DIGITAL SIGNAL PROCESSING**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week  
Practicals: 2Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs  
Theory: 60 Marks  
Internal Assessment: 40 Marks  
TW&OR: 50 Marks  
Total Credits: 05

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### **Course objective:**

- This course covers the fundamental aspects of digital signal processing.
- To introduce the various techniques that is fundamental to a variety of application areas.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. To apply fundamental mathematical tools, in the analysis and design of signal processing systems.
2. To identify estimation problems and design, implement algorithms for solving them.
3. To understand the basic theory of wavelet transform and the concepts of using Simple wavelets for simple applications.

### **Contents:**

#### **UNIT I**

(08 Hours)

#### **Linear Prediction:**

Forward and Backward Linear prediction, optimum reflection coefficient for lattice backward and forward prediction, solution of normal equations (Levinson-Durbin algorithm and Schur algorithm), properties of linear prediction filters.

## **UNIT II**

(08 Hours)

### **Adaptive Filters:**

Applications of adaptive filters: System identification, adaptive channel equalization echo cancellation in data transmission over telephone channels, linear predictive coding of speech signals, adaptive direct form filters-LMS algorithm, RLS algorithm.

## **UNIT III**

(08 Hours)

### **Power Spectrum Estimation:**

Estimation of power spectrum and correlation, Non-parametric and parametric methods, Minimum Variation Estimation methods, Eigen Analysis algorithm, Power Spectrum analysis using DFT.

## **UNIT IV**

(08 Hours)

### **Programmable Digital Signal Processors:**

Multiplier accumulator unit (MAC), modified bus structures, Multiple Access memory, VLIW architecture, pipelining, special addressing modes in P-DSP's.

## **UNIT V**

(08 Hours)

### **An Overview of TMS320C6X DSPs:**

Introduction, features of TMS320C6X processors, Internal Architecture, CPU & data paths, Addressing modes, memory architecture, pipeline, peripherals, program development.

## **UNIT VI**

(08 Hours)

### **Wavelet Transforms:**

Fourier Transform and its limitations, Short Time Fourier Transform, Continuous Wavelet Transform, Discretization of the Continuous wavelet Transform, Multiresolution Approximations; wavelet and Scaling Function Coefficients, Orthonormality of Compactly Supported Wavelets, Bi-orthogonal Decomposition, Harr wavelets, The Daubechies Wavelets Construction, Fast Wavelet Transform and Image Compression, Denoising using wavelets, Perfect Reconstruction Filter bank design using Wavelets.

### **Text Books/References:**

1. Digital Signal Processing Using MATLAB by V.K.Ingle and J.G.Prokakis (Books/Colle,2000)
2. Digital Signal Processing:Principles,Algorithms and Applications by J.G.Prokakis and D.G.Manolakis



**Bharati Vidyapeeth Deemed University,  
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## **ANALOG VLSI DESIGN**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

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### **Course prerequisites:**

Basic Electronics and Physics

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### **Course objective:**

To understand theory and to learn design of analog systems at transistor level. The course will involve design, layout and simulation of analog VLSI circuits using various CAD tools.

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**Course Outcomes:** On successful completion of this course, students will be able to

- Ability to apply modeling for MOS circuits.
- Ability to design Analog CMOS sub-circuits.
- Ability to conceptualize CMOS amplifiers.
- Ability to characterize CMOS Op-amps.
- Ability to apply concepts of Switched Capacitor Circuits.

### **Contents:**

#### **UNIT I**

(08 Hours)

#### **MOS Devices and Modeling**



The MOS Transistor, CMOS Device Modeling -Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

**UNIT II** (08 Hours)

**Analog CMOS Sub-Circuits**

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors, Current and Voltage References, Band gap Reference.

**UNIT III** (08 Hours)

**CMOS Amplifiers**

Inverters, Differential Amplifiers, Cascode Amplifiers

**UNIT IV** (08 Hours)

**CMOS Operational Amplifiers**

Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power-Supply Rejection Ratio of Two -Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

**UNIT V** (08 Hours)

**High Performance CMOS OP AMP**

High Speed/Frequency OP AMP, Micro Power OP AMP, Low Noise OP AMP, Low Voltage OP AMP.

**UNIT VI** (08 Hours)

**Switched Capacitor Circuits**

Switched Capacitor Circuits Switched Capacitor Amplifiers, Switched Capacitor Integrators.

**Text Books/ References:**

1. CMOS Analog Circuit Design -Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2. Analysis and Design of Analog Integrated Circuits -Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
3. Analog Integrated Circuit Design-David A. Johns, Ken Martin, Wiley Student Edn, 2013
4. Design of Analog CMOS Integrated Circuits-Behzad Razavi, TMH Edition, 2002.
5. CMOS: Circuit Design, Layout and Simulation-Baker, Li and Boyce, PHI, 2010.



Bharati Vidyapeeth Deemed University,  
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## DIGITAL IMAGE AND VIDEO PROCESSING

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

### Course objective:

- This course provides an introduction to basic concepts, algorithms of digital image and video processing.
- To provide different analytical tools and methods applied in Digital Image processing

**Course Outcomes:** On successful completion of this course, students will be able to

- To apply principles and techniques of digital image processing in applications related to digital imaging system.
- To use and implement basic algorithms for image & video compression

### Contents:

#### UNIT I

(08 Hours)

#### Fundamentals of Image processing

Introduction to Digital Image Processing : Digital image fundamentals:, Applications of Image Processing, Simple image formation model, Image sampling and quantization - Basic relationships between pixels, connectivity, adjacency. Distance between the pixels . Elements of human visual perception, MTF, Image statistics.

#### UNIT II

(08 Hours)

#### Image Enhancement

Image Enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Image zooming, Spatial filtering - smoothing filter, sharpening filter. 2D-DFT, FFT, Frequency domain filtering: low pass filtering, high pass filtering, and Homomorphic filtering.

**UNIT III** (08 Hours)

**Image Compression**

Image Compression: Fundamentals, Lossless Compression schemes like Huffman, Arithmetic, LZW and lossless Prediction. 2D-DCT, KL, Hadamard Image compression using DCT, zig-zag scanning, still image compression standard - baseline JPEG. Vector Quantization

**UNIT IV** (08 Hours)

**Image Segmentation**

Image Segmentation: Fundamentals, point, line and edge and combined detection, Thresholding Edge linking Hough transform, Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging, Segmentation using watersheds

**UNIT V** (08 Hours)

**Image Restoration**

Morphological Operations: Erosion and Dilation, Opening and Closing, Hit and Miss transform, Boundary extraction, region filling, Extraction of connected components. Image Restoration: Image degradation/restoration model, Noise models, Linear Position invariant degradation, Estimation of degradation function, inverse filtering, Wiener filter.

**UNIT VI** (08 Hours)

**An overview of Video processing**

Analog Video, Digital Video, Motion estimation and detection, video enhancement, Video compression fundamentals.

**Text Books/References:**

1. Gonzalez and Woods, "Digital Image Processing", 3<sup>rd</sup> Edition, Pearson Education.
2. Pratt William K. "Digital Image Processing", John Wiley & sons .
3. S. Jayaraman, S. Esakkiraian "Digital Image Processing", Tata McGraw-Hill Education .
4. Al.Bovik," Handbook of Image and Video Processing " Academic Press.
5. B,Chanda and D.Datta Mujumdar " Digital Image Processing and Analysis", Prentice Hall of India.
6. Madhuri Joshi," Digital Image Processing" Prentice Hall of India.
7. Joshi, Madhuri A., Mehul S. Raval, Yogesh H. Dandawate, Kalyani R. Joshi, and Shilpa P. Metkar. *Image and Video Compression: Fundamentals, Techniques, and Applications*. CRC Press, 2014.



**Bharati Vidyapeeth Deemed University,  
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## **WIRELESS NETWORKS**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

Practical: --Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### **Course objective:**

- To introduce the concepts and techniques associated with Wireless Cellular Communication systems.
- To familiarize with state of art standards used in wireless cellular systems.

To understand the concept of new technologies in wireless systems

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Explain the Classification of mobile communication systems
2. Analyze the radio channel characteristics and the cellular principle
3. Ability to analyze improved data services in cellular communication

### **Contents:**

#### **UNIT I**

(08 Hours)

#### **Introduction**

Systems and Design Fundamentals, Propagation Models Description of cellular system, Frequency Reuse, Co channel and Adjacent channel interference, Propagation Models for Wireless Networks, Multipath Effects in Mobile Communication, Models for Multipath Reception.

**UNIT II**

(08 Hours)

**Cellular Communications**

Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes-Call Setup, Handover etc, Teletraffic Theory, Capacity Building, Blocking Probability

**UNIT III**

(08 Hours)

**CDMA**

Introduction to CDMA, Walsh codes, Variable tree OVVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization

**UNIT IV**

(08 Hours)

**GSM**

Architecture and Protocols - Air Interface, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multiframe, Control (Signaling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames, GSM Call Set up Procedure, GSM Protocols and Signaling, Location Update Procedure, Routing of a call to a Mobile Subscriber.

**UNIT V**

(08 Hours)

**MIMO**

Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the MIMO Channel, MIMO Spatial Multiplexing – BLAST, MIMO Diversity – Alamouti, MIMO Diversity-OSTBC, MIMO Beam Forming-MRT, MIMO - OFDM

**UNIT VI**

(08 Hours)

**3G and 4G Wireless Standards/UWB**

GPRS, WCDMA, LTE, WiMAX, UWB Definition and Features, UWB Wireless Channels, Bit-Error Rate Performance of UWB

**Text Books/ References:**

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed.2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.

3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.
4. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002
5. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
6. Wireless Communication and Networking – William Stallings, 2003, PHI.
7. Wireless Communication – Upen Dalal, Oxford Univ. Press
8. Wireless Communications and Networking – Vijay K. Gary, Elsevier.



**Bharati Vidyapeeth Deemed University,  
College of Engineering, Pune  
Structure of M.Tech (Electronics -VLSI)  
Based on Credit Pattern**

Semester III											Total Duration: 28 hrs/week Total Marks : 475 Total Credits: 40	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR		
Elective –I	04	02	60	20	10	10	25	25	04	01	05	
Elective –II	04	02	60	20	10	10	25	25	04	01	05	
**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –I	-	07	-	-	---	---	25	--	-	21	21	
Seminar	-	05	-	-	--	--	25	25	-	05	05	
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>12</b>	<b>28</b>	<b>40</b>	

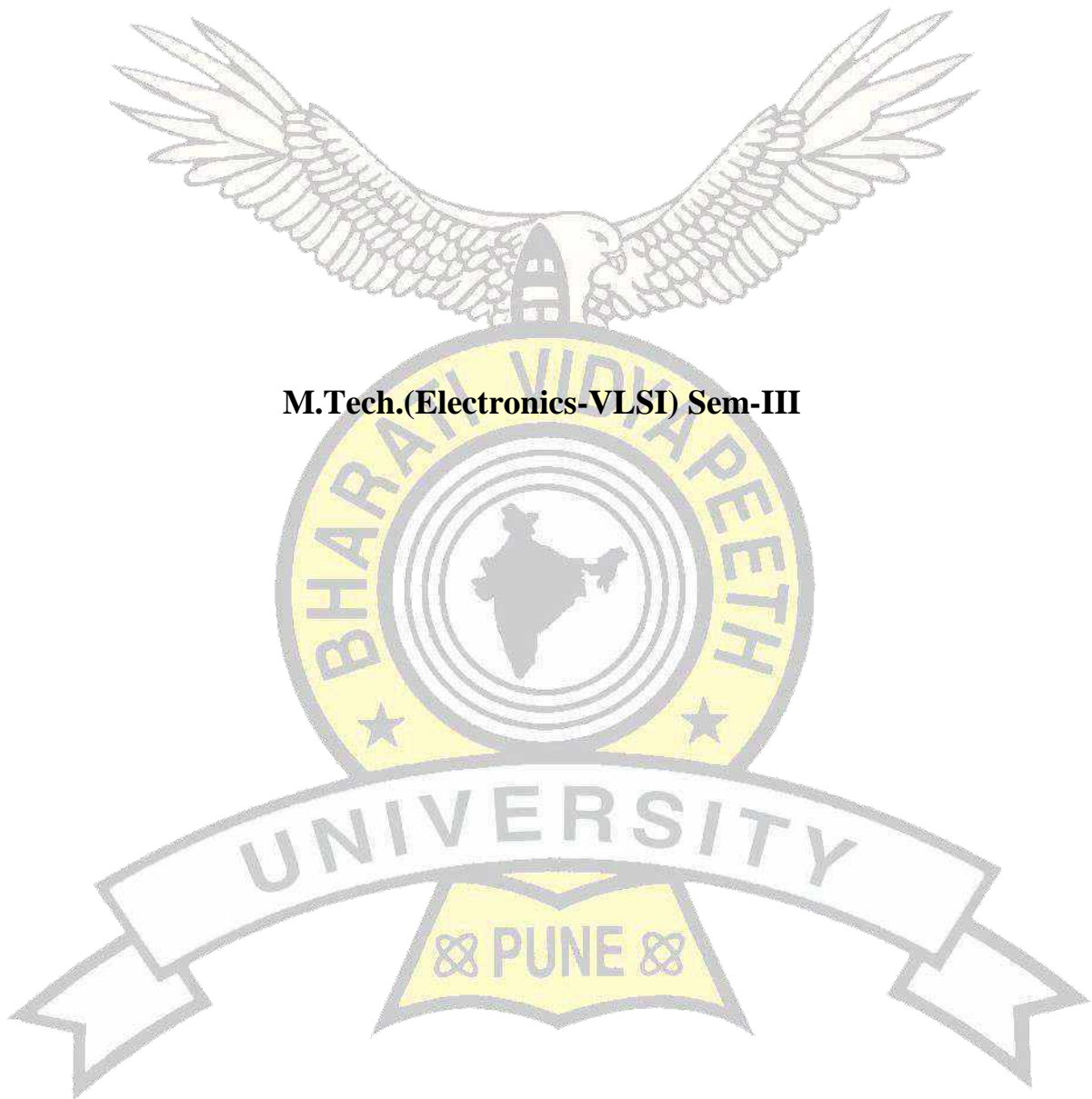
Elective – I	Elective - II
<ul style="list-style-type: none"> <li>• Programmable System on chip</li> <li>• Nano electronics</li> <li>• Algorithms for VLSI Design Automation</li> </ul>	<ul style="list-style-type: none"> <li>• ASIC Design</li> <li>• Testing &amp; Verification of VLSI Design</li> <li>• Artificial neural networks</li> </ul>

Semester IV		Total Duration: 14 hrs/week Total Marks : 325 Total Credits: 34									
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR	
**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>

#### List of Self Study Subjects

Sr. No.	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
1	Low power VLSI Design	Genetic algorithms & optimization techniques
2	IC Fabrication Technology	Fuzzy logic systems
3	In-Vehicle Networking	Biomedical Instrumentation
4	Research methodology	Computer aided VLSI Design
5	Intellectual property rights	Human values & professional ethics





**M.Tech.(Electronics-VLSI) Sem-III**



## Elective I- PROGRAMMABLE SYSTEM ON CHIP

### TEACHING SCHEME

Lectures: 04 Hrs/Week  
Practicals: 02 Hrs/week

### EXAMINATION SCHEME

Duration: 03 Hrs  
Theory : 60 Marks  
Internal Assessment: 40 Marks  
TW&OR: 50 Marks  
Total Credits: 05

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### Course prerequisites:

Knowledge of microprocessors and microcontrollers

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### Course objective:

1. To introduce the students to the Cypress PSoC technology
  2. To study the architecture of PSoC
  3. To learn interfacing of real world with PSoC
- 

**Course Outcomes:** Upon Completion of the course, the students will be able to

1. Describe and identify the features of PSoC
  2. Design the system for interfacing to the real world.
- 

### Contents:

#### UNIT I

(08 hours)

#### Introduction to PSoC

PSoC Technology, Programmable Routing and Interconnect Configurable Analog and Digital Blocks, CPU Sub System, Families of PSoC (PSoC1, PSoC2, PSoC3,) Difference between PSoC and Conventional MCU.

**UNIT II** (08 hours)

**Introduction to PSoC 3/5**

PSoC3/5 architecture-block diagram system wide resources, I/O interfaces, CPU Subsystem, memory organization digital subsystems, analog subsystems

**UNIT III** (08 hours)

**PSoC Design Modules**

Cypress PSoC Structure, PSoC Designer Suit, limitations of PSoC improvements of the PSoC, PSoC Subsystem design, PSoC memory management.

**UNIT IV** (08 hours)

**Mixed –Signal Embedded design**

Overview of mixed-signal embedded system designs, hardware and software subsystems of mixed-signal architectures, PSoC Hardware components, PSoC software components, PSoC interrupt subsystem, Introduction to PSoC Express, System design using PSoC express.(8hrs)

**UNIT V** (08 hours)

**PSoC Components**

Universal Digital Blocks (UDB), UDB arrays and digital System Interconnect (DSI),Timer, Counter and PWM,Digital Filter Blocks (DFB),ADC topologies and Circuits Programmable gain amplifiers, Switched capacitor / continuous time, analog routing, flash temperature sensors,DTMF Dialers, Sleep times,UART,12C,SPI,USB,CAN buses.

**UNIT VI** (08 hours)

**System design using PSoC**

Interfacing of temperature Sensors and Tachometers, SPI and UART based task communications, Lower Noise Continuous Time Signal Processing with PSoC Data Acquisition and Control System with PSoC, Ultra wide-band RADAR, Serial Bit Receiver with Hardware Manchester Decoder, DTMF Detector, and Ultrasonic Vehicle Parking Assistant, Universal wide-Range Signal Generator.

**Text Books:**

1. PSoC3, PSoC5 Architecture Technical Reference Manual-Cypress website
2. My First Five PSoC3 Designs (e-book)by Robert Ashby-Cypress website

### Reference Books:

1. Designers Guide to the Cypress PSoC by Robert Ashby –Elsevier Publications
2. Introduction to Mixed Signal Embedded Design, Alex Boboli-Springer
3. The Beginners Guide to Using PSoC Express: Mixed –Signal Microcontroller Development Without code by Oliver H.Bailey-Timelines Industries Incorporated,2007
4. PSoC Microcontroller by Fredi Kruger Franzis,2006

### Web references

[www.cypress.com/go/psoc](http://www.cypress.com/go/psoc)

[www.cypress.com/go/training](http://www.cypress.com/go/training)

[www.cypress.com/go/support](http://www.cypress.com/go/support)

[www.psocdeveloper.com](http://www.psocdeveloper.com)





## **Elective I-NANO ELECTRONICS**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### **EXAMINATION SCHEME**

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW&OR: 50 Marks

Total Credits: 05

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### **Course Prerequisite:**

Physics, Basic electronics

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### **Course Objective:**

To learn and understand basic and advance concepts of nanoelectronics.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Understand basic and advanced concepts of nanoelectronic devices
  2. Gain knowledge about Nanostructure devices and logic devices.
  3. Know the techniques of fabrication and measurement.
- 

### **Contents:**

#### **UNIT I**

#### **Basics of nanoelectronics**

Capabilities of nanoelectronics – physical fundamentals of nanoelectronics – basics of information theory – the tools for micro and nano fabrication – basics of lithographic techniques for Nanoelectronics

**(08 hours)**

## **UNIT II**

**(08 hours)**

### **Quantum electron devices**

classical to quantum physics: upcoming electronic devices – electrons in mesoscopic structure – short channel MOS transistor – split gate transistor – electron wave transistor – electron spin transistor – quantum cellular automate – quantum dot array – Principles of Single Electron Transistor (SET) – SET circuit design – comparison between FET and SET circuit design

## **UNIT III**

**(08 hours)**

### **Fabrication and Measurement Techniques**

Growth, fabrication, and measurement techniques for nanostructures- Bulk crystal and heterostructure growth- Nanolithography, etching, and other means for fabrication of nanostructures and nanodevices- Techniques for characterization of nanostructures- Spontaneous formation and ordering of nanostructures- Clusters and nanocrystals- Methods of nanotube growth- Chemical and biological methods for nanoscale fabrication- Fabrication of nano-electromechanical systems

## **UNIT IV**

**(08 hours)**

### **Nanostructure Devices -I**

Electron transport in semiconductors and nanostructures- Time and length scales of the electrons in solids- Statistics of the electrons in solids and nanostructures- Density of states of electrons in nanostructures- Electron transport in nanostructures-Electrons in traditional low-dimensional structures- Electrons in quantum wells- Electrons in quantum wires- Electrons in quantum dots

## **UNIT V**

**(08 hours)**

### **Nanostructure devices- II**

Resonant-tunneling diodes- Potential-effect transistors- Light-emitting diodes and lasers- Nano-electromechanical system devices- Molecular electronics – elementary circuits – flux quantum devices – application of superconducting devices –Strain –oxide nanowire, Nano designs and Nanocontacts – metallic nanostructures

## **UNIT VI**

**(08 hours)**

### **Logic Devices and Applications**

Logic Devices-Silicon MOSFETs-Ferroelectric Field Effect Transistors-Quantum Transport Devices Based on Resonant Tunneling-Single-Electron Devices for Logic Applications-Superconductor Digital Electronics-Quantum Computing Using Superconductors-Carbon Nanotubes for Data Processing- Molecular Electronics

### **Text Books :**

1. Karl Goser, Peter Glösekötter, Jan Dienstuhl, "Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices", Springer 2004
2. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, "Nanotechnology: basic science and emerging technologies", Overseas Press (2005)

### **Reference Books:**

1. Rainer Waser (edition, 2005) , "Nanoelectronics and Information Technology" ,John Wiley & Sons, Germany.
2. Vladimir V. Mitin, Viatcheslav A. Kochelap, Michael A. Stroscio, "Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications", Cambridge University Press 2011
3. Supriyo Datta, "Lessons from Nanoelectronics: A New Perspective on Transport", World Scientific 2012
6. George W. Hanson, "Fundamentals of Nanoelectronics", Pearson 2009
4. Korokin, Anatoli; Rosei, Federico (Eds.), "Nanoelectronics and Photonics", Springer 2008
5. Mircea Dragoman, Daniela Dragoman, "Nanoelectronics: principles and devices", CRC Press 2006
6. W. R. Fahrner, Nanotechnology and Nan electronics: Materials, Devices, Measurement Techniques (SpringerVerlag Berlin Heidelberg 2005)
7. Mark A. Reed, Takhee Lee, "Molecular nanoelectronics", American Scientific Publishers 2003
- 8.. Jaap Hoekstra, "Introduction to Nanoelectronic Single-Electron Circuit Design", Pan Stanford Publishing 2010





## Elective I-ALGORITHMS FOR VLSI DESIGN AUTOMATION

### TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

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### Course Prerequisites:

Analog and Digital VLSI Design, Engineering Mathematics

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### Course objective:

To introduce the student to the algorithms used for VLSI Design Automation

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**Course Outcomes:** After successfully completing the course students will be able to

1. Apply various algorithms for VLSI design.
  2. Conceptualize placement, floorplanning and pin assignment.
  3. Plan global and detailed routing.
  4. Apply concepts of via minimization and compaction
- 

### Contents:

#### UNIT I

(08 Hours)

#### Basic Algorithms

Basic Terminology, Complexity issues, NP- hardness, Graph algorithms, Computational geometry algorithms.

#### UNIT II

(08 Hours)

#### Partitioning

Problem formulation, Classification of partitioning algorithms, Group migration algorithms, Simulated annealing & evolution, Other partitioning algorithms.



### UNIT III

(08 Hours)

#### **Placement, Floor Planning and Pin Assignment**

Problem formulation, Classification of Placement algorithms, Overview of placement algorithms, Constrain based floor planning, Floor planning algorithms for mixed block and cell design, General and channel pin assignment.

### UNIT IV

(08 Hours)

#### **Global Routing**

Problem formulation, classification of global routing algorithms, Maze routing algorithms, Line probe algorithm, Steiner tree based algorithms, ILP based approaches.

### UNIT V

(08 Hours)

#### **Detailed Routing**

Problem formulation, classification of routing algorithms, single layer routing algorithms, Two layer channel routing algorithm, Three layer channel routing algorithm & switch box routing algorithms.

### UNIT VI

(08 Hours)

#### **Over The Cell Routing & Via Minimization:**

Two layers over the cell routers, Constrained & unconstrained via minimization.

#### **Compaction:**

Problem formulation, one-dimensional compaction, Two dimension based compaction, hierarchical compaction.

#### **Text Books/ References:**

1. Naveed Shervani, "Algorithms for VLSI physical design Automation", Kluwer Academic Publisher, Third edition, 1999.
2. Christophn Meinel & Thorsten Theobold, "Algorithm and Data Structures for VLSI Design", Springer, 1998.
3. Rolf Drechsheler, "Evolutionary Algorithm for VLSI", Second edition KAP, 1998
4. Trimburger, "Introduction to CAD for VLSI", Kluwer Academic publisher, 2002



## Elective II -ASIC DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 05

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### Course prerequisites:

Digital VLSI Design

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### Course objective:

The course focuses on the semi custom IC Design and introduces the principles of design logic cells, I/O cells and interconnects architecture, with equal importance given to FPGA and ASIC styles.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Apply fundamentals of ASIC and its design methods
  2. Understand block level abstractions of FPGA and ASIC design
  3. Gain knowledge on programmable architectures for ASICs
  4. Conceptualize the physical design of ASIC.
- 

### Contents:

#### UNIT-I

(08 Hours)

#### Introduction to ASICS, CMOS Logic and ASIC Library Design

Types of ASICS, Design flow, Combinational Logic Cell, Sequential logic cell, Data path logic cell, Transistors as Resistors, Transistor Parasitic Capacitance, Logical effort.

#### UNIT-II

(08 Hours)

#### Programmable ASICS, Programmable ASICS Logic Cells and Programmable ASICS I/O Cells

Anti fuse, static RAM , EPROM and EEPROM technology, Actel ACT , Xilinx LCA, Altera FLEX , Altera MAX DC & AC inputs and outputs , Clock & Power inputs, Xilinx I/O blocks.

### **UNIT-III**

(08 Hours)

#### **Programmable ASIC Logic Cells**

Actel ACT, Xilinx LCA , Xilinx EPLD, Altera MAX 50 00 and 7000 , Altera MAX 9000 , Altera FLEX, Design systems, Logic Synthesis , Half gate ASIC, Schematic entry, Low level design language.

### **UNIT-IV**

(08 Hours)

#### **Logic Synthesis, Simulation and Testing**

VHDL and logic synthesis, Types of simulation, Boundary scan test, Fault simulation, Automatic test pattern generation.

### **UNIT-V**

(08 Hours)

#### **ASIC Floor Planning, Placement and Routing**

System partition, FPGA partitioning, Partitioning methods, Floor planning, Placement, Physical design flow, Global routing, Detailed routing

### **UNIT-VI**

(08 Hours)

#### **Optimization Algorithms**

Planar subset problem(PSP), single layer global routing single layer detailed routing wire length and bend minimization technique, over the cell(OTC) Routing, multichip modules(MCM), Programmable logic arrays, Transistor chaining, Weinberger Arrays, Gate Matrix Layout.

#### **Reference Books:**

1. M.J.S.Smith, " Application Specific Integrated Circuits", Pearson,2003
2. Steve Kilts, "Advanced FPGA Design," Wiley Inter-Science.
3. Roger Woods, John McAllister, Dr. Ying Yi, Gaye Lightbod , "FPGA based Implementation of Signal Processing Systems", Wiley, 2008
4. Mohammed Ismail and Terri Fiez, "Analog VLSI Signal and Information Processing ", Mc Graw Hill, 1994.
5. Douglas J. Smith, HDL Chip Design , Madison, AL, USA: Doone Publications, 1996.
6. Jose E. France, Yannis Tsividis, "Design of Analog Digital VLSI Circuits for Telecommunication and Signal Processing", Prentice Hall, 1994
7. Farzad Nekoogar and Faranak Nekoogar, "From ASICs to SOCs: A Practical Approach", Prentice Hall PTR, 2003.



## Elective II -TESTING AND VERIFICATION OF VLSI DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

Practicals: 02 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW&OR:50 Marks

Total Credits: 05

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### Course prerequisites:

Analog and Digital VLSI Design

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### Course objective:

To introduce the student to the mathematical and scientific principles based on which systematic test and validation can be carried out on multimillion transistor VLSI design.

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Apply various fault modeling for digital circuits.
  2. Test VLSI circuits.
  3. Conceptualize Verification process.
  4. Plan verification using verification tools.
  5. Apply concepts of DFT and BIST.
- 

### Contents:

#### UNIT I

(08 Hours)

#### Introduction to Verification

Importance of verification, Testbench, Human factor, What is being verified, Functional verification approaches, Testing v/s Verification, Verification and design reuse, Cost of verification.

**UNIT II** (08 Hours)

**Verification Tools**

Linting Tools, Simulators, Third party models, Waveform viewers, Code coverage.

**UNIT III** (08 Hours)

**Verification Plan**

Role of verification plan, Levels of verification, Verification strategies, From specification to features, From features to testcases, From testcases to testbenches.

**UNIT IV** (08 Hours)

**Basics of Testing and Fault Modeling**

Introduction to Testing, Faults in digital circuits, Modeling of faults, Logical Fault Models, Fault Detection, Fault dominance, Delay fault models.

**UNIT V** (08 Hours)

**Test Generation for Combinational and Sequential Circuits**

Test generation for combinational logic circuits, Testable combinational logic circuit design, Test generation for sequential circuits, Design of testable sequential circuits.

**UNIT VI** (08 Hours)

**DFT and BIST**

Design for Testability, Ad-hoc design, Scan based design, Built-In-Self-Test.

**Text Books/ References:**

1. Janick Bergeron ,”Writing Testbenches: Functional Verification of HDL Models”, Springer, Second Edition, 2003
2. M.L. Bushnell and V.D. Agrawa,”Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits- 1, “Kluwer Academic Publishers, 2002
3. A.L.Crouch ,”Design Test for Digital IC’s and Embedded Core Systems”, Prentice Hall International, 2002.
4. M.Abramovici, M.A.Breuer and A.D. Friedman ,”Digital systems and Testable Design”, Jaico Publishing House, 2002.



## Elective II-ARTIFICIAL NEURAL NETWORK

### TEACHING SCHEME

Lectures: 04 Hrs/Week  
Practicals: 02 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs  
Theory : 60 Marks  
Internal Assessment: 40 Marks  
TW&OR:50 Marks  
Total Credits: 05

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### Course prerequisites:

- Basic knowledge of human nervous systems.
- Basic knowledge of mathematical concepts like state-space, Matrix fundamentals.

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### Course objective:

This course provides in depth knowledge of Artificial Neural Network and role of ANN in different application areas.

---

**Course Outcomes:** On successful completion of this course, students will be able to

- 1 Identify potential use of learning approaches of ANN.
2. Analyze role of perceptron, Adaline & Madeline networks
3. Evaluate different application scenarios of ANN

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### Contents:

#### UNIT I

(08 Hours)

#### Introduction and ANN Structure.

Biological neurons and artificial neurons, Model of an ANN, ANN Terminologies, Activation functions used in ANNs, Typical classes of network architectures, Mc-Culloch-Pitts Neuron Model, Learning rules.

#### UNIT II

(08 Hours)

#### Mathematical Foundations and Learning mechanisms.

Re-visiting vector and matrix algebra, State-space concepts, Concepts of optimization, Error-correction learning, Memory-based learning, Hebbian learning, Competitive learning.

### UNIT III

(08 Hours)

#### **Single layer perceptrons. Adaline & Madeline Networks**

Structure and learning of perceptrons, Pattern classifier - introduction and Bayes' Classifiers, Perceptron as a pattern classifier, Perceptron convergence, Limitations of a perceptrons, Adaline architecture, algorithm, MR-I, MR-II algorithms.

### UNIT IV

(08 Hours)

#### **Feedforward ANN.**

Structures of Multi-layer feedforward networks, Back propagation algorithm, Back propagation - training and convergence, Functional approximation with back propagation, Practical and design issues of back propagation learning. Radial Basis Function Networks, Pattern separability and interpolation, Regularization Theory, Regularization and RBF networks, RBF network design and training, Approximation properties of RBF.

### UNIT V

(08 Hours)

#### **Competitive Learning and Self organizing ANN**

General clustering procedures, Learning Vector Quantization (LVQ), Competitive learning algorithms and architectures, Self organizing feature map, Properties of feature maps, Mexican Net, Hamming Net.

### UNIT VI

(08 Hours)

#### **Special Networks & Applications of Neural Networks**

Support Vector machines, Design of an SVM, Examples of SVM, Probabilistic Neural Network, Boltzmann Machine with learning, cognitron, simulated annealing, applications of Neural Networks in bioinformatics, forecasting, healthcare, robotics, pattern recognition.

#### **Text Books/ References:**

- Simon Haykin, "Neural Networks: A comprehensive foundation", Second Edition, Pearson Education Asia.
- Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
- Robert J. Schalkoff, "Artificial Neural Networks", McGraw-Hill International Editions, 1997.
- S.N. Sivananadam, "Introduction to Neural Networks using MATLAB", The McGraw-Hill, 2006.



## Self Study Paper I -LOW POWER VLSI DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

Analog and Digital VLSI Design

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### Course objective:

To introduce the student to the concept of low power VLSI design, power estimation and power optimization

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### Course Outcomes:

1. Ability to apply various low power techniques at device and circuit level.
1. Ability to design low power VLSI circuits.
2. Ability to conceptualize low power VLSI basics.
3. Ability to plan low power architectures.
4. Ability to apply concepts of low power design at system level.

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### Contents:

#### UNIT I

(08 Hours)

#### Low Power Basics

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits, Emerging Low power approaches, Physics of power dissipation in CMOS devices.

#### UNIT II

(08 Hours)

#### Impact of Device & Technology on Low Power

Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.



### **UNIT III**

(08 Hours)

#### **Low Power Design**

##### **Circuit level:**

Power consumption in circuits, Flip Flops & Latches design, High capacitance nodes, Low power digital cells library

##### **Logic level:**

Gate Reorganization, Signal Gating, Logic Encoding, State Machine Encoding, Pre-Computation Logic

### **UNIT IV**

(08 Hours)

#### **Low power Architecture & Systems**

Power & performance management, Switching activity reduction, Parallel and Pipeline architecture for low power memory design.

### **UNIT V**

(08 Hours)

#### **Low power Clock Distribution**

Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co-design of clock network

### **UNIT VI**

(08 Hours)

#### **Algorithm & architectural level methodologies**

Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

##### **Text Books/ References:**

1. Gary K. Yeap ,”Practical Low Power Digital VLSI Design”, KAP, 2002
2. Rabaey, Pedram ,”Low power design methodologies”, Kluwer Academic, 1997
3. Kaushik Roy, Sharat Prasad ,”Low-Power CMOS VLSI Circuit Design”,Wiley,2000



## Self Study Paper I -IC FABRICATION TECHNOLOGY

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

Physics, Chemistry

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### Course objective:

To understand theory and to learn IC Fabrication Technology..

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Conceptualize steps required for IC fabrication.
2. Apply concepts of Oxidation, Lithography , Chemical Vapour Deposition and Metal Film Deposition.

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### Contents:

**UNIT-I** (08 Hours)

**Environment for VLSI Technology**

Basic Fabrication Steps, Concepts of Clean room and safety requirements, Wafer cleaning processes and Wet chemical etching techniques.

**UNIT-II** (08 Hours)

**Oxidation**

Kinetics of Silicon dioxide growth for thick, thin and ultrathin films. Oxidation technologies in VLSI and ULSI, High k and Low k dielectrics

**UNIT-III** (08 Hours)

**Lithography**

Photolithography, E-beam lithography and newer lithography techniques for VLSI/ULSI.

## UNIT-IV

(08 Hours)

### Chemical Vapour Deposition Techniques

CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal film

## UNIT-V

(08 Hours)

### Metal Film Deposition

Evaporation and sputtering techniques, Failure mechanisms in metal interconnects Multi-level metallization schemes

## UNIT-VI

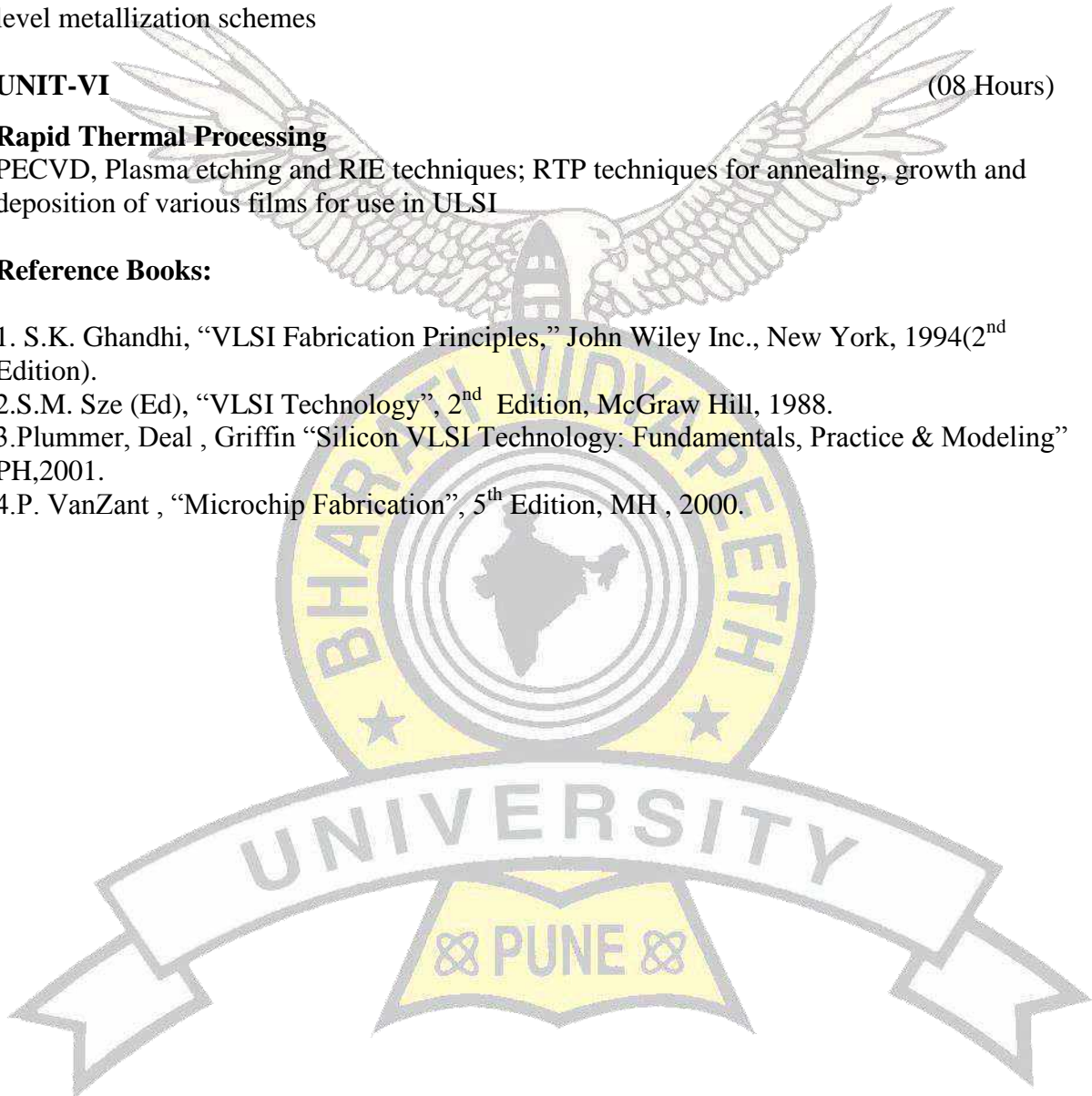
(08 Hours)

### Rapid Thermal Processing

PECVD, Plasma etching and RIE techniques; RTP techniques for annealing, growth and deposition of various films for use in ULSI

### Reference Books:

1. S.K. Gandhi, "VLSI Fabrication Principles," John Wiley Inc., New York, 1994(2<sup>nd</sup> Edition).
- 2.S.M. Sze (Ed), "VLSI Technology", 2<sup>nd</sup> Edition, McGraw Hill, 1988.
- 3.Plummer, Deal , Griffin "Silicon VLSI Technology: Fundamentals, Practice & Modeling" PH,2001.
- 4.P. VanZant , "Microchip Fabrication", 5<sup>th</sup> Edition, MH , 2000.





## Self Study Paper I -IN-VEHICLE NETWORKING

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

Knowledge of Basic Electronics and Physics

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### Course objective:

1. To Provide Students with a working of in-vehicle network systems and exposure to aspects of design, development, application issues associated with those systems.
2. To Provide Knowledge in concepts of capture of Sensor data, Storage and exchange of data to obtain remote services.

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**Course Outcomes:** On successful completion of this course, students will be able to

1. Get knowledge in Information –intensive applications that are being enabled for vehicles by a combination of telecommunication computing technology.
2. Develop communications, and navigation/in automotive telemetries.

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### Contents:

#### UNIT I

#### Basics of In-vehicle Networking

(08 hours)

Over view of Data communication and networking –need for In-Vehicle networking-layers of OSI reference model –multiplexing and de-multiplexing concepts-vehicles

#### UNIT II

#### Networks and Protocols

(08 hours)

Over view of general purpose networks and protocols –Ethernet, TCP, UDP, IP, ICMP, ARM, RARP, Over view CAN-Fundamentals-selecting CAN controller-CAN development tools-CAN application areas.

CAN protocol: principles of Data exchange –real time transmission –message frame formats, bit encoding bit physical layer standards

**UNIT III** (08 hours)

**CAN Higher Layer Protocol**

Introduction to CAN open-Device net –TTCAN-SAE J1939-overview of CAN open and application in transportation electronics –CAN open standards

**UNIT IV** (08 hours)

**LIN Protocol**

LIN standard over view – applications- LIN communication concept message frame-development flow

**UNIT V** (08 hours)

**MOST and Flex Ray**

MOST over view –Data rates –data types-topology –application areas –Flex Ray Introduction-network topology –ECUs and bus interfaces –controller host interface and protocol operation controls-media Access Control and frame and Symbol processing – Coding/decoding unit-Flex Ray Scheduling –message processing –wakeup/Startup-applications

**UNIT VI** (08 hours)

**Wireless Systems**

Introduction to wireless system –GPS –Setting receivers-Positioning-activating the navigation function –Concept of latitude and grid System-mapping and location technologies-Application.

**Reference Books:**

1. B.Hoffman-Wellenhof,H.Lichtenegger and J.Collins,"GPS Theory and practice ".4<sup>th</sup> revised edition, Spriger, Wein New York,1997
2. A.Leick,"GPS satellite Surveying",2edition,John Wiley and Sons, New York, 1995
3. Wireless Systems,W.C.Y.lee,prentice hall Publ. (LBS) -mobile and Wireless design
4. Konrad Etschberger, Controller Area Network, IXXAT Automation August 22, 2001.
5. Olaf Pfeiffer, Andrew Ayre,Christian Keydel,Embedded Networking with CAN and CAN open ,Anna books/Rtc Books,November 1,2003
6. Ronald K Jurgen, Automotive Electronics Handbook, McGraw-Hill Lnc.1999.
7. Dennis Foy,Automotive Telemetric ,Red Hat,2002.



## Self Study Paper I -RESEARCH METHODOLOGY

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW & OR : 50 Marks

Total Credits: 04

### Course prerequisites:

- Basic knowledge of modeling and simulation.
- Basic knowledge of probability and statistics

### Course objective:

This course provides basic knowledge of Research Methodology in different areas.

**Course Outcomes:** On successful completion of this course, students will be able to

1. Learn research fundamentals like objectives, literature review process.
2. Apply the various methods of modeling and simulation.
3. Apply the probability statistics in the simulation.
4. Write the technical research paper with required presentation.
5. Know about of Information communication technology: e-research, indices, patents, virtual lab etc

### Contents:

#### UNIT I

(08 Hours)

#### Research fundamentals

Definition, objectives, motivation, types of research and approaches, research- descriptive, conceptual, theoretical, applied and experimental

## **UNIT II**

(08 Hours)

### **The initial research process**

Literature review, research design, assortment of the problem, identification of problem, defining a problem, objective, sub objective and scope, assumptions, validation criteria, research proposal(synopsis)

## **UNIT III**

(08 Hours)

### **Mathematical modeling and simulation**

Mathematical modeling – need, techniques and classification, system models –types, static, dynamic, system simulation – why to simulate, technique of simulation, Monte Carlo simulation, types, continuous modeling, discrete model

## **UNIT IV**

(08 Hours)

### **Probability and statistics in simulation**

Role of probability and statistics in simulation, statistical distributions, inference about the difference in means, statistical output analysis

## **UNIT V**

(08 Hours)

### **Design of experiment**

Strategy of experimentation, types, basic principle, guidelines, need of precision, types of errors

## **UNIT VI**

(08Hours)

### **Report writing and presentation of results**

Need, report structure, formulation, sections, protocols, graphs, tables, IEEE format, evaluation of report, writing abstract, writing technical paper, Introduction of Information communication technology: e-research, indices, patents, virtual lab, digital lab, ethical issues in research

### **Reference books:**

1. Yogesh Kumar Sing ,”Fundamental of Research Methodology and Statistics” , New Age International Publishers
2. C.R. Kothari, “Research Methodology: Methods and Techniques,” New Age International Publishers, 2<sup>nd</sup> revised Edition
3. Deepak Chawla, Neena Sondhi ,”Research Methodology, Concepts and Cases” , Vikas Publishing House Pvt. Ltd
4. Hamdy A. Taha ,”Simulation Modeling and Simnet” , Prentice Hall International Edition
5. Geoffrey Gorden ,”System Simulation” , Prentice Hall of India Pvt. Ltd.
6. J N Kapur ,”Mathematical Modeling” , Wiley Eastern Ltd

7. Douglas C. Montgomery ,”Design and analysis of Experiments” , Wiley Student Edition, 7<sup>th</sup> Edition
8. Capt. Dr.Nitin P. Soaje ,”Role of ICT in Doctoral Research “







## Self Study Paper I -INTELLECTUAL PROPERTY RIGHTS

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory : 60 Marks

Internal Assessment: 40 Marks

TW & OR: 50 Marks

Total Credits: 04

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### Course objective:

- To introduce fundamental aspects of intellectual property rights to students.
- To provide case studies to demonstrate the application of legal concepts in engineering.

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**Course Outcomes:** On successful completion of this course, students will be able to

- Understand the international intellectual property rights system.
- Use the necessary analytical tools to understand intellectual property in its broader environment

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### Contents:

#### UNIT I

#### Overview of Intellectual Property

(08 Hours)

Introduction and need for Intellectual Property Rights (IPR), Different categories of IP in instruments, Rational behind Intellectual Property, Rights of the owner of the IP. IPR in India-Genesis & development, International Background of Intellectual Property, some important examples of IPR.

**UNIT II** (08 Hours)

**Patents**

Introduction to patents, Concept: Novelty, Utility, Patent document, Granting of patent, Rights of a patent, Drafting of a patent, Filing of a patent, The Indian Patent law, Infringement

**UNIT III** (08 Hours)

**Copyright**

Introduction to Copyright, Originality, Works protected under Copyright Law, Authorship and Ownership

**UNIT IV** (08 Hours)

**Trademarks**

Introduction, Rights of trademark, Need for protection of trademarks, Types of trademarks, Registration of trademarks, Rights of Registered Trademark Owners, Infringement of trademarks

**UNIT V** (08 Hours)

**Acquisition & maintenance of Intellectual Property Rights**

Introduction to Acquisition & maintenance of Intellectual Property Rights, Intellectual property offices (IPOs), Costs-Patents, costs-Trademark, Costs-Copyright

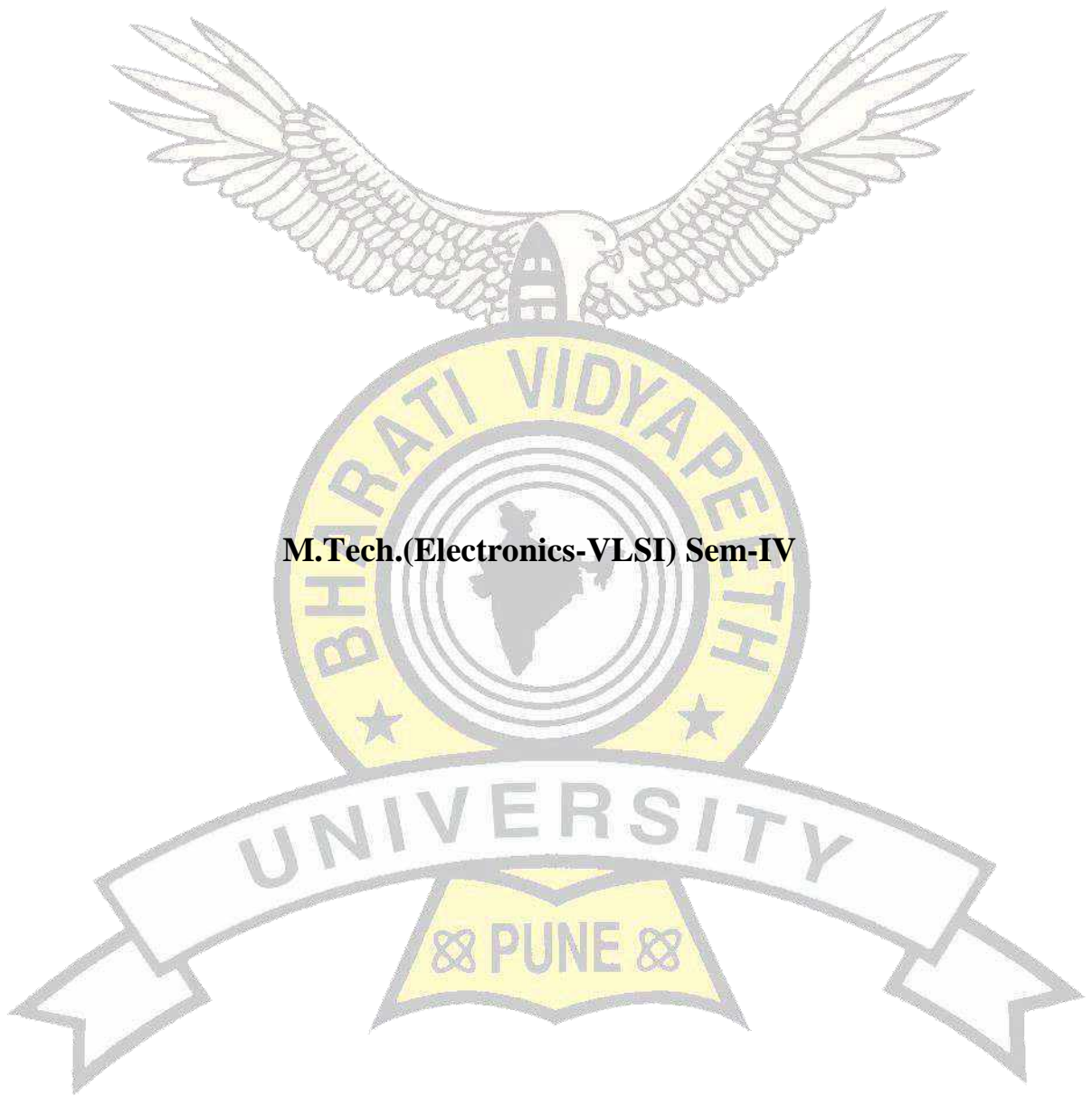
**UNIT VI** (08 Hours)

**Enforcement of Intellectual Property Rights**

Introduction to Enforcement of Intellectual Property and Global economy. The knowledge of economy & IP, valuation & accounting of Intangible assets, Management of IP in knowledge economy.

**Text books/Reference**

- 1) W.R. Cornish, 'Intellectual Property', Sweet & Maxwell, London (2000)
- 2) N.S. Gopalakrishnan & T.G. Agitha, 'Principles of Intellectual Property' Eastern Book Company, Lucknow.
- 3) P. Narayana, 'Patent Law', Wadhwa Publication.
- 4) V. V. Sopale, 'Managing Intellectual Property: The Strategic Importance', Second edition, PHI.



**M.Tech.(Electronics-VLSI) Sem-IV**



## Self Study Paper II- GENETIC ALGORITHMS FOR VLSI DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

TW & OR: 50 Marks

Total Credits: 04

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### Course prerequisites:

Analog and Digital VLSI Design

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### Course objective:

To introduce the student to the concept of Genetic Algorithm for VLSI

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### Course Outcomes:

1. Ability to apply Genetic Algorithm for VLSI Design.
  2. Ability to optimize VLSI Design through algorithm.
  3. Ability to conceptualize VLSI design flow through Genetic Algorithm .
- 

### Contents:

#### UNIT I (8 hours)

##### VLSI Design

Design Methodology and Hardware Implementation Methodologies, Digital ASIC Implementation

#### UNIT II (8 hours)

##### Genetic Algorithms

Components of a GA Based Optimization Engine, Individual Encoding, Fitness of an Individual, Selection Mechanism Genetic Operators, Crossover Operators, Uniform Crossover, Elitism in Genetic Algorithms, Multi-Objective Genetic Algorithms

**UNIT III**

(8 hours)

**Multi-Objective Genetic Floorplanning For Vlsi Asics**

Multi-objective Optimization, Floor planning and Floor planning Using Sequence Pair Representation, Conversion from a Floor plan to a Sequence Pair, Conversion from a Sequence Pair to a Floor plan

**UNIT IV**

(8 hours)

**FPGA Based Genetic Algorithm**

Pseudo-Random Number Generation and GA Performance, Basics of Evolvable Hardware, FPGA Based Genetic Algorithm, Implementation and Interfacing, Design Considerations for ASIC Implementation, RT-Level Simulations, Runtime Comparison of Implemented design.

**UNIT V**

(8 hours)

**Power Estimation**

Application of GA-Standard cell placement-GA for ATG-problem encoding- fitness function-GA vs Conventional algorithm

**UNIT VI**

(8 hours)

**Hybrid Genetic**

Genetic encoding-local improvement-WDFR-Comparison of Cas-Standard cell placement-GASP algorithm-unified algorithm.

**Text Books**

1. Pinaki Mazumder, E. M. Rudnick, "Genetic Algorithm for VLSI Design, Layout and test Automation", Prentice Hall, 1998.

**References :**

1. Randy L. Haupt, Sue Ellen Haupt, "Practical Genetic Algorithms" Wiley – Interscience, 1977.

2. Ricardo Sal Zebulum, Macro Aurelio Pacheco, Marley Maria B.R. Vellasco, Marley

Maria Bernard Vellasco "Evolution Electronics: Automatic Design of electronic

Circuits and Systems Genetic Algorithms”, CRC press, 1st Edition Dec 2001.

3. John R.Koza, Forrest H.Bennett III, David Andre , Morgan Kufmann, “Genetic Programming Automatic programming and Automatic Circuit Synthesis”, 1st Edition , May 1999.





## Self-Study Paper II: FUZZY LOGIC SYSTEMS

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

---

### Course prerequisites:

- Basic knowledge of set & probability theory.
- Basic knowledge of propositional logic & control systems

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### Course objective:

This course provides in depth knowledge of Fuzzy Logic and role of Fuzzy Logic systems in different application areas.

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Analyze basic concepts of fuzzy sets, fuzzy relation and fuzzy arithmetic.
2. Identify potential use of fuzzy logic controller in different applications.
3. Evaluate fuzzy logic systems with fuzzy classification, fuzzy pattern recognition and hybrid systems.

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### Contents:

#### UNIT I

(08 Hours)

#### Classical Sets and Fuzzy Sets

Crisp Sets: An Overview, Fuzzy Sets: Basic Types, Fuzzy Sets: Basic Concepts, Characteristics and Significance of the Paradigm Shift, Additional Properties of alpha Cuts, representations of Fuzzy Sets, Extension Principle for Fuzzy Sets, Types of Operations, Fuzzy complements, Fuzzy Intersections: t-Norms, Fuzzy Unions: t-Conorms, Multivalued Logic, Fuzzy Propositions, Fuzzy Quantifiers.

## UNIT II

(08 Hours)

### **Classical Relations and Fuzzy Relations**

Cartesian Product ,crisp relations, operations on crisp Relations, properties of crisp relations, composition, Fuzzy Relations, operations on fuzzy relations, properties of fuzzy relations, Fuzzy Tolerance and Equivalence Relations, Fuzzy Compatibility Relations, Fuzzy Ordering Relations.

## UNIT III

(08 Hours)

### **Fuzzy Arithmetic, Fuzzification and Defuzzification**

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on intervals, Arithmetic Operations on Fuzzy Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations, Fuzzification, Defuzzification to Crisp Sets,  $\lambda$ -Cuts for Fuzzy Relations, Defuzzification to Scalars.

## UNIT IV

(08 Hours)

### **Fuzzy Systems**

Conventional Control Systems, Analysis, Design, PID Control, Fuzzy Logic Controller (FLC), Design, Defuzzification, Analysis, Simplified Examples of Applications- Washing machine, Vacuum cleaner. Fuzzy Control System Design, Aircraft Landing Control Problem, Fuzzy Engineering Process Control, Fuzzy Statistical Process Control. Fuzzy Neural Networks, Fuzzy Automata.

## UNIT V

(08 Hours)

### **Fuzzy Classification & Fuzzy Pattern Recognition**

Classification by Equivalence Relations, Cluster Analysis, Cluster Validity,  $c$ -Means Clustering, Hard  $c$ -Means (HCM), Fuzzy  $c$ -Means (FCM), Fuzzy  $c$ -Means Algorithm, Classification Metric, Hardening the Fuzzy  $c$ -Partition, Similarity Relations from Clustering, Feature Analysis, Partitions of the Feature Space, Single-Sample Identification, Multifeature Pattern Recognition.

## UNIT VI

(08 Hours)

### **Hybrid Systems & Applications of Fuzzy Logic**

Hybrid Systems, Fuzzy Neuron, Multilayer FNN Architectures, Fuzzy ART, Fuzzy ARTMAP Neural Fuzzy Systems, economics application, civil & industrial applications, Fuzzy Systems and Genetic Algorithms, Fuzzy Regression, Interpersonal Communication.

### **Text Books/ References:**

1. Timothy Ross, "Fuzzy Logic with Engineering Applications", Third Edition, Wiley publication.
2. George J. Klir & Bo Yuan, "Fuzzy Sets & Fuzzy Logic Theory & Applications", Prentice Hall India, 2007.
3. Ahmad M. Ibrahim "Fuzzy Logic for Embedded Systems Applications" 2003, Elsevier Science.





## Self-Study Paper II: BIOMEDICAL INSTRUMENTATION

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

- Knowledge of basic cell structure, organs and systems in the human body

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### Course objective:

1. To make student understand different body systems.
2. To introduce amplifiers in order to design ECG Preamplifier system to pick up ECG waveform from the body.
3. To introduce various types of blood pressure monitoring and pulse oxymetry techniques.
4. To make student understand the importance of respiratory organs and parameters.
5. To make student understand various types of clinical lab equipments and its applications.
6. To introduce importance of electrosurgical equipment and electrodes used for electrosurgical

---

**Course Outcomes:** On successful completion of this course, students will be able to

1. Classify different body systems with their functions.
  2. Design ECG preamplifier system to pick up ECG waveform from the body.
  3. Categorize various pressure transducers as well as measurement techniques used for blood pressure monitoring.
  4. Describe respiratory system organs, parameters and respiratory transducers.
  5. Describe clinical equipments used in the pathology lab for blood test and analysis.
  6. Classify various electrodes and techniques used for surgery.
-

## Contents

### UNIT I (08 hours)

#### Human Body System

Human body as a uniquely adaptable organism , Overview of Different systems

### UNIT II (08 hours)

#### Amplifier Systems for ECG

Introduction to amplifiers in biomedical electronics,ECG wave form,Standard lead system,ECG Preamplifier.

### UNIT III (08 hours)

#### Blood Pressure and Blood Flow Measurements

Physiological pressures, Blood pressure measurements, Pressure transducers, pulse oximetry

### UNIT IV (08 hours)

#### Respiratory System Measurements

Introduction to human respiratory system,organs of Respiration,Parameters of respiration,Respiratory transducers, plethysmography.

### UNIT V (08 hours)

#### Clinical Laboratory Equipments

Blood components, overview of Laboratory measurements,Blood gas Analyzer,Blood cell counters,Spectrophotometer,Blood Tests and analyzers.

### UNIT VI (08 hours)

#### Electrosurgical Equipments

Introduction to Electrosurgical Unit ,electro surgery circuits, Electro surgery safety, Patients safety

#### Text Books:

1. Joseph.J.Carr and John.M.Brown, "Introduction to Biomedical Equipment Technology", Pearson Education.

#### References:

1.Arthur C Guyton, "Medical Physiology", Prism Book.

2.Leslie Cromwell,Fred.J.Weibel,"Biomedical Instrumentation and Measurements", PHI.



## Self-Study Paper II: COMPUTER AIDED VLSI DESIGN

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

VLSI Design

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### Course objective:

The course will introduce CAD tools required for VLSI.

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### Course Outcomes:

On successful completion of this course, students will effectively utilize various CAD tools for VLSI design.

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### Contents

#### UNIT I

**Digital Design and Design Environments: (08 hours)**

Design, Hierarchy, Views, Connectivity, Spatial Dimensionality, Introduction of Design Environments, System Level, Algorithm Level, Component Level, Layout Level

#### UNIT II

**Representation: (08 hours)**

Introduction, General Issues of Representation, Hierarchy Representation, View Representation, Connectivity Representation, Geometry Representation.

#### UNIT III

**Synthesis Tools: (08 hours)**

Introduction, Cell Contents Generation and Manipulation, Generators of Layout outside the Cells, Cells and Their Environment, Silicon Compilers, Post layout Generators,

#### **UNIT IV**

##### **Static Analysis Tools, Dynamic Analysis Tools:**

**(08 hours)**

Node Extraction, Geometrical Rule Checker, Electrical Rule Checker, Verification, Circuit–Level Simulators, Logic-Level Simulators, Functional and Behavioral Simulation Issues, Event Driven and Hardware Simulation

#### **UNIT V**

##### **Output of Design Aids and Programmability:**

**(08 hours)**

Introduction, Circuit Boards, Integrated Circuits, Implementation Issues, Imperative Programming, Declarative Programming, Hierarchy.

#### **UNIT VI**

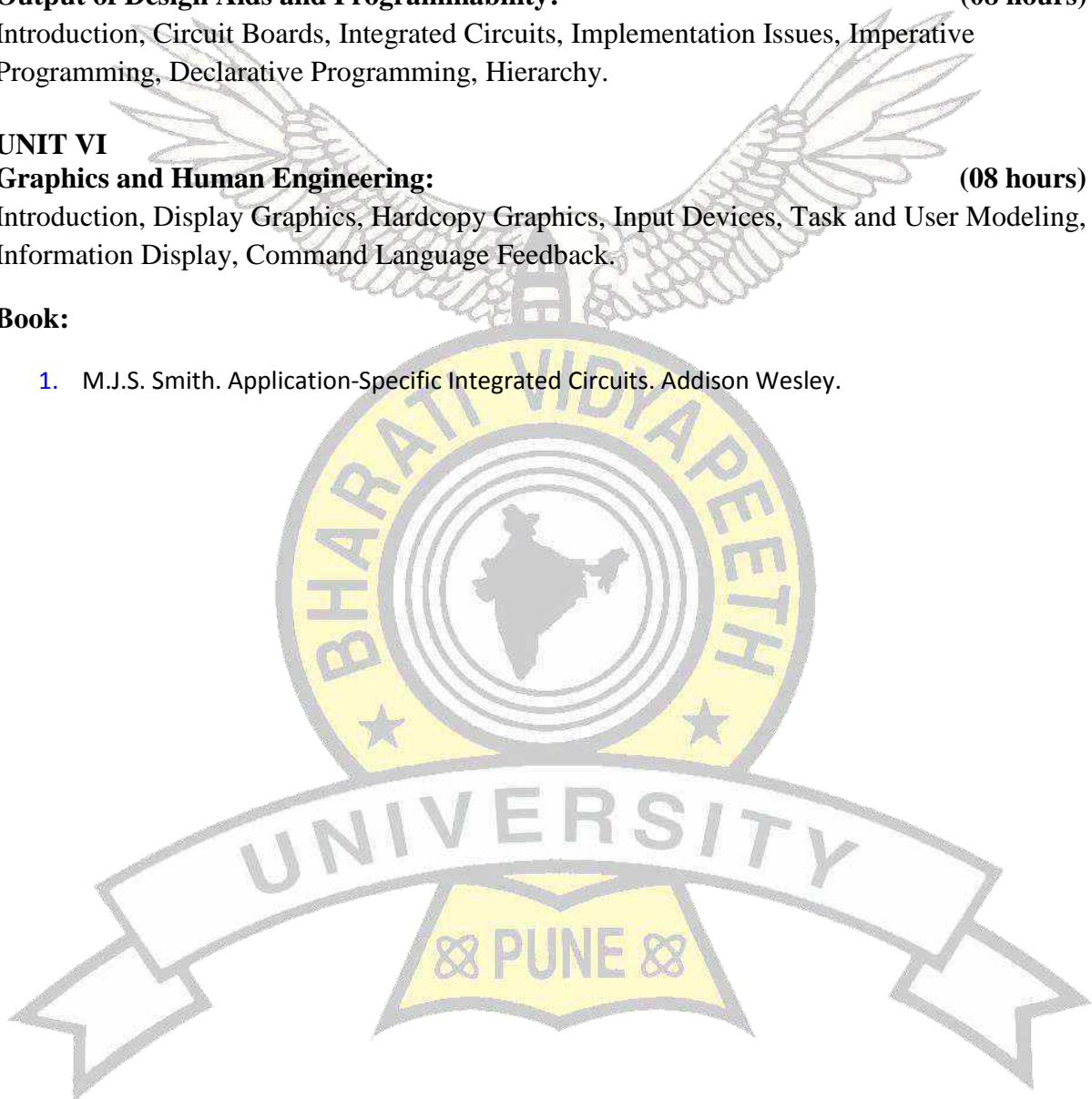
##### **Graphics and Human Engineering:**

**(08 hours)**

Introduction, Display Graphics, Hardcopy Graphics, Input Devices, Task and User Modeling, Information Display, Command Language Feedback.

##### **Book:**

1. M.J.S. Smith. Application-Specific Integrated Circuits. Addison Wesley.





## Self-Study Paper II: HUMAN VALUES & PROFESSIONAL ETHICS

### TEACHING SCHEME

Lectures: 04 Hrs/Week

### EXAMINATION SCHEME

Duration: 03 Hrs

Theory: 60 Marks

Internal Assessment: 40 Marks

Total Credits: 04

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### Course prerequisites:

- Listening skills for academic and professional purposes.
- Ability to speak effectively in English in real-life situations.

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### Course objective:

1. To create awareness on engineering ethics and human values
2. To understand social responsibility of an engineer
3. To appreciate ethical dilemma while discharging duties in professional life

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### Course Outcomes: On successful completion of this course, students will be able to

1. Familiar with the ethical issue and professional issue in the engineering profession.
2. Familiar with social impact of decision and the action of participants in the engineering profession

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### Contents

#### UNIT I

#### Human Values

(08 Hours)

Morals, Values and Ethics - Integrity, - Work Ethics - Service Learning - Civic Virtue - Respect for others - Living Peacefully - Caring - sharing - Honesty - Courage - Valuing Time- Cooperation - Commitment - Empathy – Self-Confidence - Character - spirituality

#### UNIT II

#### Engineering Ethics

(08 Hours)

Senses of engineering ethics - Variety of Moral Issues - Types of inquiry - Moral Dilemmas Moral Autonomy - Kohlberg's Theory - Gilligan's Theory - Consensus and Controversy -

Models of Professional Roles - Theories about Right Action - Self-Interest - Customs and Religion .

**UNIT III**

(08 Hours)

**Safety, Responsibilities and Rights**

Safety and Risk - Assessment of safety and Risk - Risk Benefit Analysis and Reducing Risk - The Three Mile Island. And Chernobyl Case Studies. Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Whistle Blowing - Professional Rights – Employee Rights - Intellectual Property Rights (IPR) – Discrimination

**UNIT IV**

(08 Hours)

**Global Issues**

Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers - Consulting Engineers - Engineers as Expert Witnesses and Advisors - Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

**UNIT V**

(08 Hours)

**Engineer's responsibility for safety**

Collegiality and loyalty-respect of authority-collective bargaining-confidentiality-conflicts of interest-occupational crime- professional rights-employee rights-Intellectual property rights(IPR).

**UNIT VI**

(08 Hours)

**Engineering as social Experimentation**

Engineering as social experimentation-engineers as responsible experimenters-codes of ethics-a balanced outlook on law- the challenger case study

**Text Books/ References:**

- Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
- Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
- R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age
- International, 2006 . Mike Martin and Ronald Schinzinger, Ethics in Engineering”, McGraw-Hill, New YORK 1996
- Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
- Wuest, D.E. : Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994.

**Proposed Structure of M.Tech Electrical Engineering (Power Systems)  
CBCS Pattern (2015-16)**

**STRUCTURE & EXAMINATION PATTERN**

<b>Semester I</b>											<b>Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18</b>	
<b>Subjects</b>	<b>Teaching Scheme (Hrs) Hrs./Week</b>		<b>Examination Scheme (Marks)</b>						<b>Examination Scheme (Credits)</b>		<b>Total Credits</b>	
	<b>L</b>	<b>P</b>	<b>Theory</b>	<b>Unit Test</b>	<b>Attendance</b>	<b>Tutorial/assignments</b>	<b>TW</b>	<b>Pract/Oral</b>	<b>TH</b>	<b>TW/PR/OR</b>		
Research Methodology	04	--	60	20	10	10	-	--	04	-	04	
FACTS and HVDC	04	--	60	20	10	10	-	--	04	-	04	
Advanced Microcontroller & Its Applications	04	02	60	20	10	10	25	25	04	01	05	
Power System Modeling	04	02	60	20	10	10	25	25	04	01	05	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	

<b>Semester II</b>											<b>Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18</b>	
<b>Subjects</b>	<b>Teaching Scheme (Hrs) Hrs./Week</b>		<b>Examination Scheme (Marks)</b>						<b>Examination Scheme (Credits)</b>		<b>Total Credits</b>	
	<b>L</b>	<b>P</b>	<b>Theory</b>	<b>Unit Test</b>	<b>Attendance</b>	<b>Tutorial/assignments</b>	<b>TW</b>	<b>Pract/Oral</b>	<b>TH</b>	<b>TW/PR/OR</b>		
Power Systems Dynamics	04	--	60	20	10	10	--	--	04	-	04	
Digital Protection of Power System	04	02	60	20	10	10	25	25	04	01	05	
PLC & SCADA	04	02	60	20	10	10	25	25	04	01	05	
Elective - I	04	--	60	20	10	10	--	--	04	--	04	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	

Semester III										Total Duration: 28 hrs/week Total Marks : 500 Total Credits: 40	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Power Quality Issues	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –I	-	07	-	-	---	--	25	25		21	21
Seminar	-	05	-	-	--	--	25	25	-	05	05
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>100</b>	<b>12</b>	<b>28</b>	<b>40</b>

Elective – I	Elective - II
a) Power Sector Restructuring & Deregulation b) Power system planning & reliability	a) Advanced Control system b) Advanced Power Electronics & Drives

Semester IV										Total Duration: 14 hrs/week Total Marks : 325 Total Credits: 34	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR	
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>

**List of Self Study paper I & II**

Self Study Paper I	Self Study Paper II
Condition Monitoring of Electrical Equipments	Electrical Power Capacitors
Energy Storage Devices	Nano technology & its applications in Electrical Engineering
Digital Measurement Techniques	High voltage insulation system & design
Energy Conservation & Audit	Use of synchronized measurement techniques in power system
Solar PV & Wind energy systems	Distributed Generation
Demand response & demand side management	Smart Grid - Automation System for State Transmission Utility
Digital Signal Processing Applications in Power Systems	Substation design



<b>RESEARCH METHODOLOGY</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>Fundamentals</b>	<b>(08 Hours)</b>
	Definition, Research Characteristics, Research Need, Objectives and types of research, Motivation and objectives – Research methods vs Methodology, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical	
<b>UNIT - II</b>	<b>Formulation of research problem</b>	<b>(08 Hours)</b>
	Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Summarizing a Technical Paper -summary template , Online tools - Google, CiteSeer, ACM Digital Library, IEEE, The on-line Computer Science bibliography, Searching patents	
<b>UNIT - III</b>	<b>Research design methods</b>	<b>(08Hours)</b>
	Research design, sampling design and scaling techniques – Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design, basic principles of experimental designs, implications of sample design, steps in sample design, criteria of selecting sampling procedure, characteristics of good sampling design, different types of sample design. Scaling techniques: measurement scales, sources of error, technique of developing measurement tool, important scaling techniques, scale construction techniques.	
<b>UNIT - IV</b>	<b>Statistical analysis</b>	<b>(08 Hours)</b>
	Data Collection and analysis:- Observation and Collection of primary and secondary data - Methods of data collection, processing operations, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationships, simple regression analysis, multiple correlation and regression, partial correlation.	
<b>UNIT - V</b>	<b>Research Paper &amp; Thesis writing</b>	<b>(08 Hours)</b>
	Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation –Practice – Making presentation –	

	Use of visual aids - Importance of effective communication - Documentation and presentation tools: LATEX. Types of technical papers - Journal papers, Conference papers, Survey papers, Poster papers, Review papers Comparison, Structure of a survey, conference and journal paper, Organization and flow of thesis/ Project report, Research proposal: preparation, budgeting, presentation, funding agencies for engineering research,	
<b>UNIT - VI</b>	<b>Research ethics, IPR and publishing</b>	<b>(08 Hours)</b>
	Ethics: ethical issues. IPR: intellectual property rights and patent law, techniques of writing a Patent, filing procedure, technology transfer, copy right, royalty, trade related aspects of intellectual property rights Publishing: design of research paper, citation and acknowledgement, plagiarism tools, reproducibility and accountability.	
<b>Text Books:</b>		
1. Kothari, C.R., Research Methodology: Methods and Techniques. New Age International		
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., An introduction to Research Methodology, RBSA Publishers		
3. Suresh Sinha, Anil K Dhiman, Research Methodology, ESS Publications, Volumes 2		
4. Day R.A., How to Write and Publish a Scientific Paper, Cambridge University Press		
5. Wadehra, B.L. Law relating to patents, Trade Marks, copyright designs and geographical indications. Universal Law Publishing		
<b>Reference Books:</b>		
1. Louis Cohen, Lawrence Manion and Keith Morrison, Research Methods in Education, 7th Edition, Cambridge University Press, ISBN – 978-0415-58336-7		
2. Anthony, M., Graziano, A.M. and Raulin, M.L., Research Methods: A Process of Inquiry, Allyn and Bacon		
3. Ranjit Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd Edition, APH Publishing Corporation		
4. Leedy, P.D. and Ormrod, J.E., Practical Research: Planning and Design, Prentice Hall		
5. Fink, A., Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications		
6. Leslie Lamport, 'Latex: A document preparation system' Addison Wesley, Reading, Massachusetts, second		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

## FACTS & HVDC

<b>FACTS &amp; HVDC</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>FACTS:</b>	<b>(08 Hours)</b>
	Conventional methods to increase transmission capacity, Series, Shunt reactors, Phase shifting transformers, Synchronous condensers, Flexible AC transmission controllers Basics, Challenges and needs, Static Power converter structures, AC controller based structures, DC link converter topologies, Converter output and harmonic control, Power converter control issues	
<b>UNIT - II</b>	<b>Shunt and Series Compensation:</b>	<b>(08 Hours)</b>
	Operation and control of thyristor controlled reactor, Thyristor switched Capacitor, SVC, STATCOM configuration and control, Applications of SVC, Power oscillation damping, Mitigation of sub-synchronous resonance, TCSC operation, Layout and protection, Applications of TCSC, Static Synchronous Series Compensator (SSSC)	
<b>UNIT - III</b>	<b>Unified Power Flow Controller:</b>	<b>[08 Hrs ]</b>
	UPFC configuration, Independent real and reactive power flow control, Control scheme for UPFC, Basic control system for P and Q control, Dynamic performance, Operational constraints of UPFC, Power flow studies in UPFC embedded systems	
<b>UNIT - IV</b>	<b>General Background of HVDC Transmission:</b>	<b>(08 Hours)</b>
	EHV AC versus HVDC Transmission, Different configurations of HVDC link - Monopolar, Bipolar, Back to Back, Power flow through HVDC link, Equation for HVDC power flow, Connections of three phase six pulse and twelve pulse converter bridges, Voltage and current waveforms. Effect of delay angle, Extinction angle, Overlap angle, Control of DC voltage	
<b>UNIT - V</b>	<b>Multi Terminal HVDC:</b>	<b>(08 Hours)</b>
	Bipolar HVDC terminal, Converter transformer connections, Switching arrangements in DC yard for earth return to metallic return, HVDC switching system, Switching arrangements in a bipolar HVDC terminal, Sequence of switching operations, HVDC circuit breakers, DC current interruption, Commutation principle, Probable types and applications of HVDC circuit breakers, Multi-terminal HVDC systems, Parallel tapping, Reversal of power, Configurations and types of multi-terminal HVDC systems, Commercial multi terminal systems	
<b>UNIT - VI</b>	<b>Protection and Control:</b>	<b>(08 Hours)</b>
	Faults and abnormal condition in bipolar, Two terminal HVDC system, Pole-wise segregation, Protective zones, Clearing of DC line faults and reenergizing, Protection of converters, Transformer, Converter valves, DC yards, Integration of protection and controls, Hierarchical levels of control, Block diagram, Schematic diagram, Current control, Power	

	control, DC voltage control, Commutation channel, Master control, Station control, Lead station, Trail station, Pole control, Equidistant firing control, Synchronous HVDC link, Asynchronous HVDC Link	
<b>Text Books:</b>		
1. E.Acha, V.A.Agelidis, O.Anaya-lara and TJE MillerNewnes, Power Electronic control in Electrical Systems Oxford.		
2. N.G. Hingorani and L.Gyugi, Understanding FACTS- IEEE Press, New York.		
3. J. Arrilaga, Y.H.Liu and N.R.Watson, Flexible Power Transmission- The HVDC Options, John Wiley and sons Ltd., New York.		
<b>Reference Books:</b>		
1. T J E Miller, “Reactive Power Control in Electric Systems”, John Wiley		
2. Padiyar K R “FACTS Controllers in Power Transmission & Distribution”, New Age.		
3. R. Mohan and R.K.Varma, “Thyristor-Based FACTS Controllersfor Electrical Transmission Systems”, IEEE Press.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

## Advance Micro controllers and applications

<b><u>TEACHING SCHEME:</u></b>		<b><u>EXAMINATION SCHEME:</u></b>		<b><u>CREDITS ALLOTTED:</u></b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
		TW&OR : 50 Marks		01 Credits	
<b>UNIT - I</b>					
<b>UNIT - I</b>		Introduction to PIC 16F8XX family and development tools. CPU architecture and instruction set. Harvard architecture and pipelining, program memory considerations, register file structure and addressing modes, CPU registers.			(08 Hours)
<b>UNIT - II</b>					
<b>UNIT - II</b>		PIC peripherals I/O ports, external interrupts and timers, timer operation, ADC, short overview of synchronous serial port, serial peripheral interface I2C bus.			(08 Hours)
<b>UNIT - III</b>					
<b>UNIT - III</b>		Learning MPLAB (V 5.0 or above) Integrated development environment from Microchip (Assembler and simulator), Study of applications like motor control, temperature control, lamp dimmer, 4X4 matrix keyboard and LCD interfacing etc.			(08 Hours)
<b>UNIT - IV</b>					
<b>UNIT - IV</b>		ARM & AVR Processors : RISC, ARM design philosophy, ARM fundamentals, instruction set, thumb instruction set, exception & interrupt handling, efficient C programming, optimizing ARM assembly code, AVR architecture, instruction set, hardware interfacing, communication links and design issues.			(08 Hours)
<b>UNIT - V</b>					
<b>UNIT - V</b>		Interfacing considerations: Intel process communication, synchronization of processes, tasks, threads, devices & buses for networks, hardware-software co-design embedded programming in C/RT Linux			(08 Hours)
<b>UNIT - VI</b>					
<b>UNIT - VI</b>		Real time operating systems: Survey of software architectures- round robin, with interrupts, function queue scheduling, RTOS architecture, selecting an architecture, task states, task and data semaphores and shared data, message queues, mailboxes ,pipes, timer functions, events, memory management, interrupt routines in an RTOS environment, basic design using RTOS, embedded software development tools, Micro C/OS- II, VX works.			(08 Hours)
<b>Reference Books:</b>					
<ol style="list-style-type: none"> <li>1. Microchip PIC family Microcontroller handbook</li> <li>2. Design with PIC microcontrollers –John Peatman, Pearson Education Asia ,LPE</li> <li>3. Rajkamal, ”Embedded system –architecture, programming and design”,TMH Publication, edition 2003</li> <li>4. David Simon, ” An embedded software Primer”, Pearson education , Asia</li> <li>5. Jonathan W. Valvano, Brooks, Cole” Embedded Microcomputer systems-Real time interfacing” Thomson Learning</li> </ol>					
<b>Syllabus for Unit Test:</b>					
Unit Test -1		UNIT – I, UNIT – II, UNIT – III			
Unit Test -2		UNIT – IV, UNIT – V, UNIT – VI			

## Power System Modeling

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04Hours / Week		End Semester Examination: 60 Marks		04Credits	
		Continuous Assessment: 40 Marks			
		PR & OR : 50 Marks		01 Credits	
<b>UNIT – I</b>	<b>Modeling of Non-Electrical Parameters:</b>				<b>(08 Hours)</b>
	Different areas of power system analysis, Need for mathematical modeling of power system, Simplified models of non-electrical components such as boiler, steam & hydro turbine, governor system				
<b>UNIT – II</b>	<b>Modeling of Transformers:</b>				<b>(08 Hours)</b>
	Transformer modeling for two winding transformer, tap-changer, phase shifting transformer, three winding transformer and auto-transformer				
<b>UNIT – III</b>	<b>Modeling of Transmission Line:</b>				<b>(08 Hours)</b>
	Modeling of transmission network, Transformation to Alpha-Beta components using D-Q components, Steady state equations				
<b>UNIT – IV</b>	<b>Synchronous Machine Modeling:</b>				<b>(08 Hours)</b>
	Introduction, Park's Transformation, Flux Linkage Equation, Voltage Equations, Formulation of State-Space Equation, Current Formulation, Per Unit Conversion, Normalizing Voltage equations, Normalizing Torque Equations, Torque & Power Equivalent Circuit of Synchronous Machine				
<b>UNIT – V</b>	<b>Excitation System Modeling :</b>				
	Types of excitation systems, Control and protective systems, Modeling of excitation systems (excitation system components and entire excitation system, Voltage Response Ratio, Exciter voltage ratings				<b>(08 Hours)</b>
<b>UNIT – VI</b>	<b>Load Modeling:</b>				
	Basic Load Modeling concepts, Static load representation, Dynamic load representation, Induction motor (as load) modeling, synchronous motor (as load) modeling, acquisition of load model parameters				<b>(08 Hours)</b>
<b>Text Books:</b>					
1. K. R. Padiyar", Power System Dynamics", B.S. Publications					
2. John J. Granier & W.D. Stevenson Jr., "Power System Analysis ", 4 <sup>th</sup> Edition, McGraw Hill International Student Edition					
3. Olle Elegard, "Electrical Energy System Theory - An Introduction", TMH Publishing Company, 2 <sup>nd</sup> Edition					
4. Kundur, "Power System Dynamics & Control", IEEE Press, New York					
<b>Reference Books:</b>					
1. Anderson & Foud, "Power System Control & Stability", Vol-I, IEEE Press, New York					
2. P.S.R Murthy, " Power System Operation & Control"					
<b>Syllabus for Unit Test:</b>					
Unit Test -1	UNIT – I, UNIT – II				
Unit Test -2	UNIT – III, UNIT – IV				
Unit Test-3	UNIT –V, UNIT-VI				

<b>Power System Dynamics</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>Classical Methods of Power System Dynamic Studies</b>	<b>(08 Hours)</b>
	Equality and inequality constraints in power system operation, state transition diagram, concept of system security and stability, classical model of system of one machine connected to infinite bus, Clark diagram for two machines series reactance system, extension of Clark diagram to cover any reactance network, elementary model of overall power system	
<b>UNIT - II</b>	<b>Small Signal Stability:</b>	<b>(08 Hours)</b>
	Small signal analysis, analysis of synchronizing & damping torque, state equation for small signal model, Simplified synchronous machine model, calculation of initial conditions, system simulation, improved model of synchronous machine, small signal stability of multi machine system	
<b>UNIT - III</b>	<b>Large Signal Analysis:</b>	<b>(08 Hours)</b>
	Elementary view of transient stability, Large signal analysis, Analysis using numerical integration methods (Modified Euler's, Runge-Kutta), Simulation of power system dynamic response, Analysis of unbalanced faults, Case study of a large system	
<b>UNIT - IV</b>	<b>Power System Stabilizers:</b>	<b>(08 Hours)</b>
	Basic concepts of control signals in power system stabilizers (PSS), Structure and tuning, Field implementation, PSS design and application, Future trends	
<b>UNIT - V</b>	<b>Multi-machine system:</b>	<b>(08 Hours)</b>
	Simplified model, Improved model of the system for linear load, Inclusion of load and SVC, Introduction to analysis of large power system	
<b>UNIT - VI</b>	<b>Voltage stability:</b>	<b>(08 Hours)</b>
	Definition, Factors affecting voltage stability & collapse, Analysis & comparison of angle & voltage stability and voltage instability & collapse, Control of voltage instability, islanding - necessity, methods, advantages and disadvantages, implication on power system dynamic performance	
<b>Text Books:</b>		
1. Anderson & Foud, "Power system Control & Stability", IEEE press, New York		
2. OlleElgerd, "Electrical Energy System Theory - An Introduction", TMH		
<b>Reference Books:</b>		
1. K R Padiyar, "Power System Dynamics", B S Publications		
2. PrabhaKundur, "Power system Stability & control", TMH		
3. C.W.Taylor, "Power System Voltage Stability", TMH		
4. R. A. Walling, "Distributed Generation Islanding", N.W. Miller		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

## Digital Protection of Power System

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04Hours / Week		End Semester Examination: 60 Marks	04 Credits
		Continuous Assessment: 40 Marks	
		TW & OR : 50 Marks	01 Credit
<b>UNIT – I</b>	<b>Introduction:</b>		<b>(08 Hours)</b>
	Need for Power system protection, Digital Protection: State of Art, Merits of Microprocessor relaying scheme, Power System Components, Basic Philosophy of Protection Scheme, Section of Protection Scheme, Circuit Breakers and Relays, Types and Applications. Architecture of Modern Digital Relay		
<b>UNIT - II</b>	<b>Static Relays:</b>		<b>(08 Hours)</b>
	Introduction to Static Relay, Overcurrent Relay, Distance Relay, Protection Schemes of transmission lines, Switched distance relay, Poly-phase relay, Relay as Comparator - Dual input Comparator, Relay characteristics by comparison of constants, Multi-input comparator, Pilot Relaying Scheme		
<b>UNIT - III</b>	<b>Elements of Digital Protection:</b>		<b>(08 Hours)</b>
	Basic components of a digital relay, Signal conditioning subsystem: Transducers, Surge protection circuits, Analog filtering and analog multiplexers, Conversion subsystems, Sampling Theorem, Digital filter signal aliasing error, Sample and hold circuit, Digital multiplexing, Digital to analog conversion, Analog to digital conversion, Digital relay subsystem, Digital relay as unit		
<b>UNIT – IV</b>	<b>Digital Protection of Transmission Line:</b>		<b>(08 Hours)</b>
	Protection scheme of transmission line, Distance Relay, Travelling wave relays. Digital protection scheme based on fundamental signal: hardware design, software design, Digital protection of EHV/UHV transmission line based on travelling wave phenomena, New relaying scheme using amplitude comparison		
<b>UNIT – V</b>	<b>Digital Protection of Transformer and Synchronous Generator:</b>		<b>(08 Hours)</b>
	Faults in Transformer, Schemes used for Transformer Protection, Digital Protection of Transformer Faults in Synchronous generator, Protection schemes for Synchronous generator, Digital Protection of Synchronous Generator		
<b>UNIT – VI</b>	<b>Artificial Intelligence in Power System Protection:</b>		<b>(08 Hours)</b>
	Introduction, An Expert System (ES) for Protective Relay Settings: Introduction, Problem Description, ES Approach, Typical Application, Fuzzy Logic (FL) for Power system Protection: Introduction, Problem Description, FL Approach, Artificial Neural Network (ANN) in Phase Selection: Introduction, Problem Description, Measurement of fault generated in high frequency components, ANN Approach		

### Text Books:

1. "Digital Protection – Protective Relaying from Electro-Mechanical to Microprocessor" By L.P. Singh. 2<sup>nd</sup> Edition, Reprint-2004, New Age International Publisher, New-Dehli.
2. "Digital Power System Protection" By S.R. Bhide. PHI Learning Private Limited, New Delhi.
3. "Artificial Intelligence Techniques in Power Systems", By Kevin Warwick, Auther Ekwue & Raj Aggarwal, Publication : Institution of Electrical Engineers, London, UK.
4. "Digital Protection for Power system" by A.T Johns and S.K. Salman. Peter Peregrinus Ltd. Of The Institute of Electrical Engineers, London, United Kindom.
5. "Soft Computing Techniques and its Applications in Electrical Engineering" By Dr. Devendra Chaturvadi,



Publication: Springer – Verlag Berlin Heidelberg.

**Reference Books:**

1. “Power System Protection 4: Digital Protection and Signalling” edited by ETA Electricity Training Association. Published by Institute of Engineers, London, UK.

2. “Digital Signal Processing in Power System Protection and Control” By Waldemar Rebizant, Janusz Szafran, Andrzej Wiszniewski.

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

## PLC and SCADA

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
	Term Work: 50 Marks	01 Credits

<b>UNIT – I</b>	<b>Introduction to PLC</b>	<b>(08 Hours)</b>
	Definition & History of PLC, Overall PLC system, PLC Input and Output modules, CPU, Interfaces, Power supplies, PLC advantages and disadvantages, Selection criteria for PLC, Architecture of Industrial Automation Systems, Process Control, PID Control, Predictive Control, Introduction to Sequence Control, PLCs and Relay Ladder Logic, Hardware environment	
<b>UNIT – II</b>	<b>PLC Programming</b>	<b>(08 Hours)</b>
	Programming equipments, Construction of PLC ladder diagram, Basic components and symbols in ladder diagram, Ladder logic, Functional block, Structural text, Instruction, trouble shooting, features, programming ON/OFF Inputs to produce ON/OFF outputs, Networking of Sensors, Actuators and Controllers: The Fieldbus, The Fieldbus Communication Protocol	
<b>UNIT – III</b>	<b>PLC Applications</b>	<b>(08 Hours)</b>
	Analog PLC operation, PID control of continuous processes, simple closed loop systems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface, Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive	
<b>UNIT – IV</b>	<b>SCADA</b>	<b>(08 Hours)</b>
	Need of SCADA system, Features, SCADA architecture – First generation, Second generation, Third generation, HMI, MTU, RTU, IED's, 7 Layers of OSI, Communication requirements for SCADA (communication protocols – DNP, IEC, Ethernet, TCP/IP, Modbus, UDP), Client – Server based communication concept, SCADA Benefits	
<b>UNIT – V</b>	<b>SCADA in Power System</b>	<b>(08 Hours)</b>
	Operation and control of interconnected power system, Automatic substation control, SCADA configuration, Energy Management System (EMS), system security, State estimation, SCADA system security issues overview	
<b>UNIT – VI</b>	<b>Supervisory Management</b>	<b>(08 Hours)</b>
	Networked SCADA environment with implementation examples, Substation Automation and Equipment condition monitoring using SCADA, Distribution system design mapping, trouble call management, Customer level intelligent automation system, computer level monitoring and control of equipments	

### **Text Books:**

1. Terson, "Power System Control Technology", Prentice Hall
2. Green, J. N, Wilson, R, "Control and Automation of Electric Power Distribution Systems", Taylor and Francis, 2007
3. Turner, W. C, " Energy Management Handbook", 5<sup>th</sup> Edition, 2004
4. Gary Dunning, "Introduction to Programmable Logic Controllers", Thomson, 2<sup>nd</sup> Edition
5. John W. Webb, Ronald A. Reis, "Programmable Logic Controllers: Principles and Application", 5<sup>th</sup> Edition
6. Stuart A Boyer, "SCADA supervisory control and data acquisition"

**Reference Books:**

1. Handschin, E. "Energy Management Systems", Springer Verlag, 1990
2. Gordan Clark, Deem Reynders, "Practical Modem SCADA Protocols"

**Syllabus for Unit Test:**

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

<b>(Elective – I) Power Sector Restructuring &amp; Deregulation</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>Power Sector in India</b> Introduction to various institutions in an Indian Power sector such as CEA, Planning Commissions, PGCIL, PFC, Ministry of Power, State and Central governments, REC, Load Dispatch Centers, Utilities and their roles. Critical issues / challenges before the Indian power sector, Electricity act 2003-Provision in the Generation, Transmission & Distribution Sector, Various national policies and guidelines under this act.	<b>(08 Hours)</b>
<b>UNIT - II</b>	<b>Fundamentals of Economics &amp; Power Sector Regulation</b> Fundamentals of economics applicable to Power Sector, Consumer behavior, Supplier behavior, Market Equilibrium, Short-run & Long-run costs, Various costs of production- Total cost (TC), Average fixed cost (AFC), Average variable cost (AVC), Average cost (AC) and Marginal cost (MC), Relationship between short-run and long-run average costs, Perfectly competitive market, Concept of life cycle cost, Annual rate of return, methods of calculations of Internal Rate of Return (IRR) and Net Present Value (NPV) of project, Role of regulation and evolution of regulatory commission in India, Types and methods of economic regulation, Regulatory process in India.	<b>(08 Hours)</b>
<b>UNIT - III</b>	<b>Power Tariff</b> Different tariff principles (marginal cost, cost to serve, average cost), Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff, and different tariff based penalties and incentives etc., Subsidy and cross subsidy, life line tariff, Comparison of different tariff structures for different load patterns. Government policies in force from time to time. Effect of renewable energy and captive power generation on tariff, Availability based tariff, Latest reforms and amendments	<b>(08 Hours)</b>
<b>UNIT - IV</b>	<b>Power sector restructuring and market reform</b> Introduction to power sector restructuring, Reasons for restructuring / deregulation of power industry, Understanding the restructuring process-Entities involved, The levels of competition, The market place mechanisms and Sector-wise major changes required, Different industry structures and ownership models, Market models based on contractual arrangements-Monopoly Model, Single buyer Model, Wholesale competition model and Retail competition model, Market architecture, Timeline for various energy markets, Bilateral / forward contracts, The spot market, Models for trading arrangements, ISO or TSO model, Reasons and objectives of deregulation of various power systems across the world-The US, The UK, The Nordic Pool and The developing countries. Congestion Management, Ancillary Services	<b>(08 Hours)</b>
<b>UNIT - V</b>	<b>Electricity Markets Pricing and Non-price issues</b> Electricity price basics, Market Clearing price (MCP), Zonal and locational MCPs, Dynamic, spot pricing and real time pricing, Dispatch based pricing, Power flows and prices. Optimal power flow Spot prices for real and reactive power. Unconstrained real spot prices, constraints and real spot prices. Non price issues in electricity restructuring (quality of supply and service, environmental and social considerations), Global experience with	<b>(08 Hours)</b>

	electricity reforms in different countries.	
<b>UNIT - VI</b>	<b>Transmission Planning and Pricing</b> Transmission planning & operation in open access power systems, Introduction & Principles of transmission pricing, Different transmission pricing methods, Transmission cost allocation methods, Marginal & Composite pricing Paradigms & their comparison, Introduction to transmission loss allocation & various methods of loss allocation, Debated issues in transmission pricing, Congestion issues and management, Ancillary Service Management, Forward ancillary service auction. Power purchase agreements.	<b>(08 Hours)</b>
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>Loi Lei Lai, 'Power System Restructuring &amp; Deregulation, John Wiley &amp; Sons Ltd.</li> <li>"Know Your Power", A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune</li> <li>Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc</li> <li>Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy</li> <li>D. S. Kirschen &amp; G. Strbac, 'Fundamentals of Power System Economics', John Wiley &amp; Sons Ltd.</li> <li>Steven Stoft, 'Power System Economic Designing markets for Electricity, Wiley-Inter Science.</li> <li>M Shahidepour, Hatim Yamin, Zuyi Li, 'Market Operations in Electrical Power Systems, Forecasting, Scheduling and Risk Management', Wiley Inter Science.</li> </ol>		
<b>References:</b>		
<ol style="list-style-type: none"> <li>Regulation in infrastructure Services: Progress and the way forward - TERI, 2001</li> <li>Maharashtra Electricity Regulatory Commission Regulations and Orders - <a href="http://www.mercindia.com">www.mercindia.com</a></li> <li>Various publications, reports and presentations by Prayas, Energy Group, Pune <a href="http://www.prayaspune.org">www.prayaspune.org</a></li> <li>Central Electricity Regulatory Commission, Regulations and Orders - <a href="http://www.cercind.org">www.cercind.org</a></li> <li>Electricity Act 2003 and National Policies – <a href="http://www.powermin.nic.in">www.powermin.nic.in</a></li> <li>Market Operations in Electric Power Systems Forecasting, Scheduling and Risk Management – Mohammad Shadepur, Hatim Yatim, Zuyi Li.</li> <li>Bhanu Bhushan, "ABC of ABT - A primer on Availability Tariff" - <a href="http://www.cercind.org">www.cercind.org</a></li> </ol>		
<b>Website: NPTEL-Phase II-</b>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

<b>(Elective – I) POWER SYSTEM PLANNING AND RELIABILITY</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	Term Work: 25 Marks	01 Credit
<b>UNIT - I</b>	<b>Unit 1: Load Forecasting :</b>	<b>(06 Hours)</b>
	Introduction, Factors affecting Load Forecasting, Load Research, Load Growth Characteristics, Classification of Load and Its Characteristics, Load Forecasting Methods -(i) Extrapolation (ii) Co-Relation Techniques, Energy Forecasting, Peak Load Forecasting, Reactive Load Forecasting, Non-Weather sensitive load Forecasting, Weather sensitive load Forecasting, Annual Forecasting, Monthly Forecasting, Total Forecasting, Objectives & Factors affecting to System Planning , Short Term Planning, Medium Term Planning, Long Term Planning. [10 hrs]	
<b>UNIT - II</b>	<b>Unit 2: Probability theory</b>	<b>(06 Hours)</b>
	Introduction to probability, Probability distributions : Random variables, density and distribution functions. Mathematical expectation. Binominal distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution. Normal Gaussian, Gamma and Beta distribution. Correlation and regression	
<b>UNIT - III</b>	<b>Unit 3: Reliability</b>	<b>(06 Hours)</b>
	Reliability, Failure, Concepts of Probability, Evaluation Techniques (i) Markov Process (ii) Recursive Technique, Stochastic Prediction of Frequency and Duration of Long & Short Interruption, Adequacy of Reliability, Reliability Cost.	
<b>UNIT - IV</b>	<b>Unit 4: Generation Planning and Reliability :</b>	
	Objectives & Factors affecting Generation Planning, Generation Sources, Integrated Resource Planning, Generation System Model, Loss of Load (Calculation and Approaches), Outage Rate, Capacity Expansion, Scheduled Outage, Loss of Energy, Evaluation Methods. Interconnected System, Factors affecting interconnection under Emergency Assistance.	
<b>UNIT - V</b>	<b>Unit 5: Transmission Planning and Reliability</b>	<b>(06 Hours)</b>
	Transmission Planning and Reliability: Introduction, Objectives of Transmission Planning, Network Reconfiguration, System and Load Point Indices, Data required for Composite System Reliability.	
<b>UNIT - VI</b>	<b>Unit 6: Distribution Planning and Reliability</b>	<b>(06 Hours)</b>
	Radial Networks – Introduction, Network Reconfiguration, Evaluation Techniques, Interruption Indices, Effects of Lateral Distribution Protection, Effects of Disconnects, Effects of Protection Failure, Effects of Transferring Loads, Distribution Reliability Indices. Parallel & Meshed Networks -Introduction, Basic Evaluation Techniques, Bus Bar Failure, Scheduled Maintenance, Temporary and Transient Failure, Weather Effects, Breaker Failure.	

<b>Text Books:</b>	
1. Roy Billinton & Ronald N. Allan, Reliability Evaluation of Power System - Springer Publication.	
2. R.L. Sullivan Power System Planning -, Tata McGraw Hill Publishing Company Ltd.	
3. Miler & Freund's, Probability and Statistic for Engineers, Pearson Education, Richard Johnson.	
<b>Reference Books:</b>	
1. X. Wang & J.R. McDonald, Modern Power System Planning -, McGraw Hill Book Company	
2. T. Gönen, Electrical Power Distribution Engineering - McGraw Hill Book Company	
3. B.R. Gupta Generation of Electrical Energy -, S. Chand Publications	
4. A.S. Pabla, Electrical Power Distribution Tata McGraw Hill Publishing Company Ltd.	
5. T.W. Berrie, Electricity Economics & Planning -, Peter Peregrinus Ltd., London	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Power Quality Issues

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits
		Continuous Assessment: 40 Marks		
<b>UNIT - I</b>	<b>Voltage sag; swells and interruptions</b> Introduction; importance of power quality; terms and definitions of power quality as per IEEE std. 1159. Sources & Effects of Power Quality Problems; Sources of sag; swell and interruptions; Estimation of voltage sag performance; Fundamental principles of protection; solutions at end user level; utility systems and fault clearing issues; motor starting sags; evaluation of the economics of different alternatives.			<b>[8Hrs]</b>
<b>UNIT - II</b>	<b>Transient Over- Voltages</b> Sources of transient over voltages; capacitor switching; lightening; Ferro resonances and other switching transients; Principles of over voltage protections; devices of over voltage protections; Utility capacitor switching transients; Utility system lightening protection; managing Ferro resonance; switching transients problems with loads; computer tools for transient analysis.			<b>[8Hrs]</b>
<b>UNIT - III</b>	<b>Fundamentals of Harmonics and its Analysis</b> Introduction; the Mechanism of Harmonic Generation; Definitions and Standards: Factors Influencing the Development of Standards, Existing Harmonic Standards, General Harmonic Indices. Introduction to Harmonic Analysis; Fourier Series and Coefficients; Simplifications Resulting from Waveform Symmetry; Complex Form of the Fourier Series; Convolution of Harmonic Phasors; The Fourier Transform; Sampled Time Functions; Discrete Fourier Transform (DFT); The Nyquist Frequency and Aliasing; Fast Fourier Transform (FFT); Window Functions; Efficiency of FFT Algorithms; Alternative Transforms.			<b>[8Hrs]</b>
<b>UNIT - IV</b>	<b>Harmonic Sources and Distortions</b> Harmonic Sources : Introduction; Transformer Magnetization Nonlinearities; Rotating Machine Harmonics; Distortion Caused by Arcing Devices; Single-Phase Rectification; Three-Phase Current-Source Conversion; Three-Phase Voltage-Source Conversion; Thyristors-Controlled Reactors. Harmonic Distortion : Introduction; Resonances; Effects of Harmonics on Rotating Machines; Effect of Harmonics on Static Power Plant; Harmonic Interference with Power System Protection; Effect of Harmonics on Consumer Equipment; Interference with Communications.			<b>[8Hrs]</b>
<b>UNIT - V</b>	<b>Computation, Assessment and Harmonic Elimination</b> Harmonic Computation : Introduction; Direct Harmonic Analysis; Derivation of Network Harmonic Impedances from Field Tests; Transmission Line Models; Underground and Submarine Cables; Load Models; Computer Implementation; Examples of Application of the Models; Harmonic Elimination : Introduction; Filter Design Criteria; Network Impedance for Performance Calculations; Tuned Filters; Damped Filters; Conventional Filter			<b>[8Hrs]</b>



	Configurations; Band-Pass Filtering for Twelve-Pulse Converters; Distribution System Filter Planning; Filter Component Properties; D.C. Side Filters; Active Filter	
<b>UNIT - VI</b>	<p><b>Power quality monitoring; Assessment &amp; Mitigation</b></p> <p>Need and approaches followed in power quality monitoring; objectives and requirements; Initial site survey; Power quality Instrumentation; Selection of power quality monitors; monitoring location and period; Selection of transducers; Harmonic monitoring; Transient monitoring; event recording and flicker monitoring.</p> <p>Power Quality assessment; Power quality indices and standards for assessment; waveform distortion; voltage and current unbalances; Power assessment under waveform distortion conditions. Power quality state estimation; State variable model; observability analysis; capabilities of harmonic state estimation; Test systems; Mitigation techniques at different environments.</p>	<b>[8Hrs]</b>
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. Understanding power quality problems; voltage sag and interruptions - M. H. J. Bollen IEEE press; 2000; series on power engineering.</li> <li>2. "POWER SYSTEM HARMONICS", Second Edition By Jos Arrillaga and Neville R. Watson; John Wiley and Publication, 2003 ISBN: 0-470-85129-5.</li> <li>3. Electrical power system quality - Poge C. Dugan; Mark F. McGranghan; Surya santoso; H. Wayne Beaty; second edition; McGraw Hill Pub.</li> <li>4. Power system quality assessment - J. Arrillaga; M.R. Watson; S. Chan; John Wiley and sons.</li> <li>5. Electric power quality - G. J. Heydt.</li> <li>6. Power system harmonics: Computer modeling and analysis- Enriques Acha; Manuel Madrigal; John wiley and sons ltd.</li> <li>7. Power System Harmonics – J. Arrillaga &amp; N. Watson</li> <li>8. IEEE std 519-1992/ IEEE std 1159 IEEE recommended practices and requirements for harmonics control in electrical power system.</li> <li>9. ECBC Code 2007 (Edition 2008) published by Bureau of Energy Efficiency; New Delhi Bureau of Energy Efficiency Publications Rating System; TERI PUBLICATIONS GRIHA Rating System; LEEDS Publications</li> </ol>		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

**(Elective – II) Advanced Control System**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	03 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>PID Control:</b>	<b>(08 Hours)</b>
	Review of classical and modern control concepts: PID control and tuning approaches, Selection of Variables for Control, PID Controller Tuning for Dynamic Performance - Determining Tuning Constants for Good Control Performance, Ziegler-Nichols method, Correlations for Tuning Constants, Fine-Tuning the Controller Tuning Constants, Controller tuning based on stability – Dead beat and self tuning, Rate feedback	
<b>UNIT - II</b>	<b>State Variable Analysis:</b>	<b>(08 Hours)</b>
	Control System Analysis Using State Variable Methods, Conversion of transfer function to phase variable and canonical variable model, Eigen value and eigen vector, Kalman's test and Gilbert's Test for controllability and observability analysis and design of control system in state space, Pole placement, State observer, Design of control system with Luenberger observer	
<b>UNIT - III</b>	<b>Nonlinear and Robust Control:</b>	<b>(08 Hours)</b>
	Nonlinear Systems and Equilibrium Points, Concepts of Stability, Describing function analysis, Phase plane analysis, Linearization, Feedback Linearization, Input-output linearization, Input-State Linearization Concept of robust control, Description and categorization of system uncertainties, System and signal norms, Small gain theorem, Robust stability, Design of robust control, Introduction to H-∞ control.	
<b>UNIT - IV</b>	<b>Digital Control:</b>	<b>(08 Hours)</b>
	Structure of the Digital Control System, ADC, DAC, Effects of Sampling of continuous time signals, Quantization, Sample and hold, Reconstruction of signal, Sampling Theorem, Aliasing, Elementary discrete-time signals, Impulse response, Linear convolution and its properties, Z transform: Basics, Properties, Inverse Z transform using power series and partial fraction difference equation, Stability analysis in z- plane with Jury's stability criteria	
<b>UNIT - V</b>	<b>Frequency Analysis:</b>	<b>(08 Hours)</b>

	<p>Frequency response of first order and second order systems, Polar plot, Bode plot, Bode plot from Sweep Frequency Response Analysis (SFRA) of transformer and its conclusion, Phase and group delays, Ideal filters and their pole zero locations, Zero phase and linear phase transfer functions</p> <p>Exponential representation of Fourier series and Fourier transform of continuous time signals, The Fourier series for discrete-Time periodic signals (only concept), The Fourier transform of discrete-time a periodic signals (only concept), Discrete Fourier Transform, Properties: Periodicity, Linearity, Symmetry properties, Circular convolution, Linear convolution using circular convolution, Fast Fourier Transform: Radix 2 DIT and DIF algorithms</p>	
<b>UNIT - VI</b>	<b>Optimal Control:</b>	<b>(08 hours)</b>
	<p>Parameter optimization and optimal control problems, Hamiltonian formulation of optimal control problem, Hamilton-Jacoby equation, Linear regulator problem, Quadratic performance criterion, Numerical solution of Matrix Riccati equation, Pontryagin's minimum principle, Application to optimal control of discrete and continuous systems (quadratic performance index, analysis and design of finite and infinite time), Linear Quadratic Regulators, Introduction to Linear Quadratic Gaussian approach</p>	
<b>Text Books:</b>		
1. 'Modern Control Engineering' - Katsuhiko Ogata, Prentice Hall India, 5th edition 2010.		
2. 'Non-linear Systems', by Hassan Khalil, Prentice Hall.		
3. Digital Control – Ogata , Prentice Hall India		
<b>Reference Books:</b>		
1. Digital Control- B.C.Kuo		
2. 'Digital Control and State Variable Methods' by M. Gopal, Tata-McGraw-Hill Publishing Company Limited		
3. Optimal Control: Linear Quadratic Methods' Brian D. O. Anderson, John Barratt Moore, Dover Publications, 2007		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

**(Elective – II) ADVANCED POWER ELECTRONICS AND DRIVES**

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 25 Marks		01 Credit	
<b>UNIT - I</b>	<b>Converters:</b>				<b>(08 Hours)</b>
	<b>Voltage Source Converters</b> Review of 3-ph-full wave bridge converter, operation and harmonics, 3 level voltage source converters. PWM converter. Generalized technique of harmonic elimination and voltage control. Advanced modulation techniques (space vector modulation, 3 <sup>rd</sup> harmonic PWM) Comparison of PWM techniques. Converter rating <b>Current source converters</b> (i) Matrix Converter: 3×3 matrix converter, principle of working, mathematical treatment, comparison of matrix converter with multipulse converter (ii) Self and Line commutated current source converter: Basic concepts of CSC, converters with self commutating devices				
<b>UNIT - II</b>	<b>Multilevel Inverters:</b>				<b>(08 Hours)</b>
	Multilevel concept, Types of multilevel Inverters, diode clamped multilevel inverter, flying-capacitors multilevel inverters, cascaded multilevel inverter, switching device currents, D.C. link capacitor voltage balancing, features of multilevel inverters, comparison of multilevel inverters. Applications of multilevel Inverter: Reactive power compensation Back to back intertie system				
<b>UNIT - III</b>	<b>DC Drives:</b>				<b>(08 Hours)</b>
	Single phase and 3 phase converter drives. Four quadrant Chopper drives, closed loop control of DC motor, Permanent magnet DC motor drives, DC Servo drives, applications				
<b>UNIT - IV</b>	<b>Induction Motor Drives:</b>				<b>(08 Hours)</b>
	3 phase induction motor control, stator voltage control/rotor voltage control, voltage and frequency control, current control, closed loop control of 3-phase induction motor. Soft starters, comparison of variable frequency drives, Speed control by static slip power recovery, induction motor servo drives, applications.				
<b>UNIT - V</b>	<b>Synchronous Motor Drives:</b>				<b>(08 Hours)</b>
	Voltage and frequency control, closed loop control of synchronous motors. Synchronous motor servo drive with sinusoidal waveform, synchronous motor servodrive with trapezoidal waveform. Load commutated inverter drives, speed control of synchronous motors by cyclo-convertors, applications				
<b>UNIT - VI</b>	<b>Akagi's p-q theory</b>				<b>(08 Hours)</b>
	Conventional concepts of active and reactive power in single phase and three phase circuits-Equation of power with sinusoidal voltage source and non-linear loads - $\alpha\beta$ transformation of three phase four wire system-Akagi's instantaneous power (pq) theory-relationship between Akagi's components and conventional active and reactive power application of pq theory to reactive and harmonic power compensation in simple circuits.				

<b>Text Books:</b>	
1.	Bimal K Bose, Modern power electronics and AC drives, Pearson education asia
2.	G. K. Dubey, Fundamentals of Electrical Drives CRC press 2002
3.	VedamSubrahmanyam Electric Drives: Concepts &Appl Tata McGraw-Hill
4.	Power electronics convertors, applications and design, Ned Mohan, Tore M Undeland, William P Robbins, Wiley India Pvt. Ltd., 2009
5	E. Acha, Miller & Others, Power Electronic Control in Electrical Systems (Newnes, Oxford publication) – first Edition
6	M. H. Rashid Power Electronics, Prentice Hall of India Pvt. Ltd. New Delhi, (3rd Edition)
7.	R Krishnan, Electric motor drives, modeling, analysis and control, PHI learning Pvt. Ltd. 2001
8.	S.K. Pillai, A first course in electrical drives, Newage international publishers. 2010
<b>Reference Books and Papers:</b>	
1.	E. H. Watanube, R.M. Stephen and Maurico Ardes “New Concepts of instantaneous active and reactive powers in Electrical systems with Generic loads” (IEEE transaction on Power Delivery Vol.8, no.2 April 1993, PP-697-703
2.	L. Benchaïta, S. Sadaate and A. Salemnia – “A comparison of voltage source and current source shunt Active filter by simulation and Experimentation” ( IEEE Transaction on Power Systems, Vol 14, No.2, May 99, PP 642-647
3.	H. Akagi, E.H. Watanabe and M. Aredes “Instantaneous Power Theory and Applications to Power Conditioning, IEEE Press, New York
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**BharatiVidyapeeth University**  
**College of Engineering**  
**Department of Mechanical Engineering**  
**M.Tech. (CAD/CAM) CBCS 2015 Course**

<b>Semester I</b>										Total Duration: 24 Hrs/Week Total Marks: 500 Total Credits: 20	
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Computer Aided Design	4	4	60	20	10	10	-	50	4	2	6
Modeling and Simulation	4	4	60	20	10	10	-	50	4	2	6
Computer Integrated Manufacturing	4	-	60	20	10	10	-	-	4	-	4
Product Design and Development	4	-	60	20	10	10	-	-	4	-	4
<b>Total</b>	<b>16</b>	<b>8</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>100</b>	<b>16</b>	<b>4</b>	<b>20</b>

<b>Semester II</b>										Total Duration: 24 Hrs/Week Total Marks: 500 Total Credits: 20	
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Advanced Finite Element Methods	4	4	60	20	10	10	-	50	4	2	6
Control Systems	4	4	60	20	10	10	-	50	4	2	6
Precession Engineering	4	-	60	20	10	10	-	-	4	-	4
Optimization for Engineering Design	4	-	60	20	10	10	-	-	4	-	4
<b>Total</b>	<b>16</b>	<b>8</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>100</b>	<b>16</b>	<b>4</b>	<b>20</b>

Semester III									Total Duration:24 Hrs/Week Total Marks:375 Total Credits:34		
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Elective I	4	-	60	20	10	10	-	-	4	-	4
Elective II	4	-	60	20	10	10	-	-	4	-	4
Self-Study paper I	4	-	60	20	10	10	-	-	4	-	4
Dissertation Stage I	-	7	-	-	-	-	25	25	-	15	15
Seminar	-	5	-	-	-	-	25	-	-	7	7
<b>Total</b>	<b>12</b>	<b>12</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>50</b>	<b>25</b>	<b>12</b>	<b>22</b>	<b>34</b>

#### Elective I

1. Advanced Stress analysis
2. Manufacturing Information Systems
3. Computational Fluid Dynamics
4. Micro-electro Mechanical Systems

#### Elective II

1. Composite Materials
2. Analysis and Synthesis of Mechanisms
3. Artificial Intelligence
4. Design of Experiment

#### Self-Study Paper I

1. Advanced Manufacturing Processes
2. Machine Condition Monitoring and Diagnostics
3. Product Lifecycle Management
4. Robust Design of Product & Process
5. Computer Aided Process Planning
6. Flexible Manufacturing System
7. Product Design & Process Planning
8. Experimental Technique and Data analysis
9. Tribology in Design
10. Manufacturing System and Simulation

Semester IV									Total Duration: 14 Hrs/Week Total Marks: 325 Total Credits:36		
Subjects	Teaching Scheme (Hrs) Hrs/Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial /Assignments	TW	Pract/Orals	TH	TH/PR/OR	
Self-Study paper II	4	-	60	20	10	10	-	-	4	-	4
Dissertation Stage II	-	10	-	-	-	-	150	75	-	32	32
<b>Total</b>	<b>4</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>4</b>	<b>32</b>	<b>36</b>

#### Self-Study Paper II

1. CAD/CAM Practices in Metal Forming
2. Optimization Techniques
3. Robotics and Sensors
4. Rapid Prototyping
5. Design for Manufacture
6. Theory of Elasticity & Plasticity
7. Design of Dies
8. Integrated Product Design & Development
9. Design for Manufacturing & Assembly
10. Concurrent Engineering

# Computer Aided Design

## TEACHING SCHEME

Lectures : 04 Hrs/week  
Practicals : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Pract/Oral : 50 Marks  
Total Credits : 06

### Unit I

(08 Hours)

#### **CAD TOOLS**

Definition of CAD Tools, Types of system, CAD/CAM system evaluation Criteria, Graphics standards, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.

Wire frame modeling -Types of mathematical representation of curves, wire frame models, wire frame entities, parametric representation of synthetic curves - Hermite cubic splines, Bezier curves, B-Splines, rational curves - NURBS.

### Unit II

(08 Hours)

#### **SURFACE MODELING**

Mathematical representation of surfaces, Surface model, Surface entities, surface representation, Parametric representation of surfaces, plane surface, ruled surface, surface of revolution, Tabulated surface.

### Unit III

(08 Hours)

#### **SURFACE MODELING**

Hermite Bicubic surface, Bezier surface, B-Spline surface, COONs surface, Blending surface, Sculptured surface, Surface manipulation - Displaying, Segmentation, Trimming, Intersection, Transformations - 2D and 3D, Orthogonal and Perspective transformations.

### Unit IV

(08 Hours)

#### **SOLID MODELLING**

Solid Representation - Boundary Representation (B-rep), Constructive Solid Geometry (CSG) and other methods, Design Applications: Mechanical tolerances, Mass property calculations, CAD database structure.

CAD/CAM Data Exchange: Evaluation of data- exchange formats, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.

### Unit V

(08 Hours)

#### **ADVANCED MODELING CONCEPTS:**

Feature Based Modeling, Assembly Modeling, Behavioral Modeling, Conceptual Design & Top-down Design. Techniques for visual realism - hidden line - Surface removal - Algorithms for shading and Rendering. Parametric and variational modeling, Feature recognition, Design by features, Assembly and Tolerance Modeling, Tolerance representation - specification, analysis and synthesis, AI in Design.

### Unit VI

(08 Hours)

#### **COLLABORATIVE ENGINEERING:**

Collaborative Design, Principles, Approaches, Tools, Design Systems. Product Data Management (PDM).

## **Text Books/ References**

1. Ibrahim Zeid, CAD/CAM Theory and Practice, McGraw Hill international.
2. P. N. Rao, CAD/CAM Tata McGraw Hill.
3. Foley, Van Dam, Feiner and Hughes, Computer Graphics Principles and Practice,



second edition, Addison–Wesley, 2000.

4. Martenson, E. Micheal, Geometric Modelling, John Wiley & Sons, 1995.
5. Hill Jr, F.S., Computer Graphics using Open GL, Pearson Education, 2003.
6. Singeresu S. Rao, Engineering Optimization-Theory and Practice, New Age International Limited Publishers, 2000.
7. Johnson Ray, C. Optimum Design of Mechanical Elements, Wiley, John & Sons, 1981.
8. P. Radhakrishnan, S. Subramanyam, CAD/CAM/CIM, New Age International.
9. V. Ramamurti, Computer Aided Mechanical Design and Analysis, Tata McGraw Hill-1992.

**Termwork**

Eight Assignments using either of UG, SolidWorks, CATIA, ProE, Hyperwork

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Modeling and Simulation

## TEACHING SCHEME

Lectures : 04 Hrs/week  
Practicals : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Pract/Oral : 50 Marks  
Total Credits : 06

### Unit I

(08 Hours)

#### **System Concept and Modeling**

Physical model, Mathematical model, Types of mathematical model, Dynamic Versus Static Models, Continuous-Time Versus Discrete-Time, Dynamic Models, Quantitative Versus Qualitative Models, Mechanical system modeling examples.

Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study

### Unit II

(08 Hours)

#### **Simulation Concepts**

Simulation Basics, When Simulation Is the Appropriate Tool, when Simulation Is Not Appropriate, Advantages and Disadvantages of Simulation, Areas of Application, Steps in a Simulation Study

Simulation and analytical methods, Basic nature of simulation, The simulation process, Types of system simulation, Generation of random numbers .Monte Carlo Simulation.

### Unit III

(08 Hours)

#### **Probability as Used in Simulation**

Basic Probability Concepts, Discrete Random Variable, Expected Value and Variance of a Discrete Random Variable, Measure of Probability Function, Continuous Random Variable, Exponential Distribution, Mean and Variance of Continuous Distribution, Normal Distribution.

### Unit IV

(08 Hours)

#### **System Simulation**

Introduction, Simulation of Pure pursuit problem, exponential growth model, simulation of water reservoir system, Trajectory simulation, suspension system, simulation of pendulum.

### Unit V

(08 Hours)

#### **Simulation Models**

Discrete Simulation, Continuous System Simulation. Simulation of Queuing Systems, Inventory Control Models

### Unit VI

(08 Hours)

#### **Design and Evaluation of Simulation Experiments.**

Introduction, development of simulation experiments, principles of verification, validation and accreditation, Simulation experimentation, classical experimental design, validation of simulation experiments, evaluation of simulation experiments.

Simulation Languages

## **Text Books/ References**

1. Robert E. Shannon, "System Simulation The art and science", , Prentice Hall, New Jersey, 1995.
2. D.S. Hira, "System Simulation", S.Chand and company Ltd, New Delhi, 2001.
3. Geoffrey Gordon ,System Simulation; Prentice Hall.
4. Robert E. Shannon ; System Simulation: The Art and Science ;Prentice Hall
5. J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control

6. M Close and Dean K. Frederick; Modeling and Analysis of Dynamic Systems ;Houghton Mifflin

**Term Work**

1. Simulation of water reservoir system.
2. Trajectory simulation.
3. Suspension system.
4. Simulation of pendulum.
5. Discrete Simulation,
6. Continuous System Simulation.
7. Simulation of Queuing Systems,
8. Inventory Control Models

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Computer Integrated Manufacturing

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks

Total Credits : 04

### Unit I

(08 Hours)

#### **CONCEPT OF CIM**

Introduction to CIM, Types of Manufacturing, CIM hardware and software, Elements of CIM, Product development through CIM Design Activities in a networked environment, networking in a manufacturing company, hardware elements of networking.

### Unit II

(08 Hours)

#### **CIM DATABASE**

Introduction, Database requirements of CIM, Database, Database management, Database Models, EDM, Product Data Management (PDM), Advantage of PDM., Collaboration Engineering.

### Unit III

(08 Hours)

#### **WORK CELL & FLEXIBLE MANUFACTURING SYSTEM**

Manufacturing cell, Group Technology, Cellular Manufacturing. DNC system and transfer of program from PC to machine. Introduction to FMS, Manufacturing integration model, flexible manufacturing strategy, Components of Flexible Manufacturing- Pallets and fixtures, machining centers, inspection equipment, material handling stations, storage system, In-process storage, manually operated stations, allied operation centers

### Unit IV

(08 Hours)

#### **INTEGRATIVE MANUFACTURING PLANNING AND CONTROL**

Role of integrative manufacturing in CAD/CAM integration, Over view of production control - Forecasting, Master production schedule, Capacity planning, M.R.P., Order release, Shop-floor control, Quality assurance, Planning and control systems, Cellular manufacturing, JIT manufacturing philosophy.

### Unit V

(08 Hours)

#### **WEB BASED MANUFACTURING**

Integrating process with web, Process management and control through web, Applications of web based manufacturing, casting, machining, forming & forging.

### Unit VI

(08 Hours)

#### **FUTURE TRENDS IN MANUFACTURING SYSTEMS**

Lean Manufacturing: Definition, Principles of Lean Manufacturing, Characteristics of Lean Manufacturing, Value of Product, Continuous Improvement, Focus on Waste, Relationship of Waste to Profit, Four Functions of Lean Production, Performance Measures, The Supply Chain, Benefits of Lean Manufacturing. Introduction to Agile and Web Based Manufacturing systems.

## **Text Books/ References**

1. Paul G. Ranky, The Design and Operation of FMS, I.F.S. Publications 1983
2. Harrington J, Computer Integrated Manufacturing Krieger Publications 1979
3. Richard N. Shover, An Analysis of CAD/CAM Application with Introduction to C.I.M. Prentice hall
4. David Bedworth et.al Computer Integrated Design and Manufacturing McGraw hill 1991

5. Scolz B. Reiter C.I.M Interfaces Chapman & Hall 1992
6. David L. Goetsch, Fundamental of CIM Technology, Delmar Publication 1988
7. Groover, M.P., (2004), Automation, Production Systems & Computer Integrated Manufacturing second edition, Pearson Education ISBN: 81-7808-511-9
8. Groover, Weiss, Nagel, Audrey, Industrial Robotics-Technology, Programming and Applications, McGraw Hill.
9. Nanua Singh, Systems Approach to Computer Integrated Design and Manufacturing, John Wiley Publications.
10. Alavudeen, Venkateshwaran, Computer Integrated Manufacturing, Prentice- Hall India

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

<b>Product Design And Development</b>			
<b><u>TEACHING SCHEME</u></b>		<b><u>EXAMINATION SCHEME</u></b>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b><u>Unit I</u></b>			(08 Hours)
<b>Introduction</b>			
	<p>Characteristics of successful product development, Design and development of products, duration and cost of product development, the challenges of product development.</p> <p>Development Processes and Organizations: A generic development process, concept development: the front-end process, adopting the generic product development process, the AMF development process, product development organizations, the AMF organization.</p>		
<b><u>Unit II</u></b>			(08 Hours)
<b>Product Planning</b>			
	<p>The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process. Identifying Customer Needs: Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process.</p> <p>Product Specifications: What are specifications, when are specifications established, establishing target specifications, setting the final specifications.</p>		
<b><u>Unit III</u></b>			(08 Hours)
<b>Concept Generation</b>			
	<p>The activity of concept generation clarify the problem, search externally, search internally, explore systematically, reflect on the results and the process.</p> <p>Concept Selection: Overview of methodology, concept screening, and concept scoring, Concept Testing: Define the purpose of concept test, choose a survey population, choose a survey format, communicate the concept, measure customer response, interpret the result, reflect on the results and the process.</p>		
<b><u>Unit IV</u></b>			(08 Hours)
<b>Product Architecture</b>			
	<p>What is product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level design issues.</p>		
<b><u>Unit V</u></b>			(08 Hours)
<b>Industrial Design</b>			
	<p>Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, assessing the quality of</p>		

	<p>industrial design.  Design for Manufacturing: Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors.  Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes.</p>	
<b>Unit VI</b>	(08 Hours)	
<b>Product Development Economics</b>		
	<p>Elements of economic analysis, base case financial mode,. Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.  Managing Projects: Understanding and representing task, baseline project planning, accelerating projects, project execution, postmortem project evaluation.</p>	
<b>Text Books/ References</b>		
	<ol style="list-style-type: none"> <li>1. Product Design and Development - Karl.T.Ulrich, Steven D Eppinger - Irwin McGrawHill - 2000.</li> <li>2. Product Design and Manufacturing - A C Chitale and R C Gupta, PH1, - 3<sup>rd</sup> Edition, 2003.</li> <li>3. New Product Development - Timjones. Butterworth Heinmann -Oxford. UCI -1997</li> <li>4. Product Design for Manufacture and Assembly - Geoffery Boothroyd, Peter Dewhurst and Winston Knight - 2002</li> </ol>	
<b>Syllabus for Unit Test</b>		
	Unit Test I	Unit I,II,III
	Unit Test II	Unit IV,V,VI

## Semester II



**K60504: ADVANCE FINITE ELEMENT METHOD**

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
Practicals	: 02 Hrs/week	Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Term Work	: 25 Marks
		Pract/Oral	: 25 Marks
		Total Credits	: 05
<b>Unit I</b>			(08 Hours)
	Basic concepts of FEM, Weak formulation, Variational methods of approximation-Rayleigh Ritz Method, Stress strain relations, shape functions- linear and quadratic. Approximation errors in FEM, Accuracy of solution, p & h refinement		
<b>Unit II</b>			(08 Hours)
	One dimensional problems – Finite element modeling, Basic boundary condition, Multipoint constraints, Convergence of results , Potential energy approach, Global stiffness matrix, properties of stiffness matrix, load vector, Penalty approach, Elimination approach, Methods of Weighted Residuals-Least Square Method, Subdomain Method, Collocation Method, Garlekin's method.		
<b>Unit III</b>			(08 Hours)
	Finite Element Analysis of 2-D problems. Basic boundary value problems in 2-D, Triangular, Quadrilateral, Higher order elements. Constant strain triangle. Introduction to plate bending problems. Kirchhoff's theory, Mindlin plate element.		
<b>Unit IV</b>			(08 Hours)
	Isoparametric formulation – Natural Co-ordinate system, Lagrangian interpolation polynomials, Isoperimetric element, Numerical Integration Newton Cotes formula, Guass Quadrature formula in two and three dimensions, triangular elements, rectangular elements.		
<b>Unit V</b>			(08 Hours)
	Dynamic Analysis, Formulation of Dynamic problems, Consistent and Lumped Mass Matrices. Solution of Eigen Value Problems. Transformation Method, Jacobi Method, Vector Iteration Method, Subspace Iteration Method. Forced Vibration- Steady State and Transient vibration analysis, Analysis of damping, Mode of Super position Scheme, Direct Integration Method, Implicit and Explicit numerical methods.		
<b>Unit VI</b>			(08 Hours)
	Special Topics: - Linear Buckling Analysis, Adaptive Finite Element Technique .Sub modeling and substructuring.		

<b>Term Work</b>	
	Term work shall consists of three assignment based on above syllabus. Four computer program assignments to be developed for FEA. Using programming language. Two assignment of structural Analysis using FEA Software
<b>Oral/Practical</b>	
	Term work and Oral will be based on above syllabus.
<b>Text Books/ References</b>	
	<ol style="list-style-type: none"> <li>1. K. J. Bathe, "Finite Element Procedures", PHI</li> <li>2. R. D. Cook, D. S. Malus, M. E. Plesha, "Concepts and Applications of Finite Element Method Analysis", John Wiley</li> <li>3. J. N. Reddy, "An introduction to Finite Element Method Analysis", MGH</li> <li>4. Desai &amp; Abel, "Introduction to Finite Element Methods"</li> <li>5. S. Riaseleharan, "FEA in Engineering Design"</li> <li>6. D. L. Logan, "A course in the Finite Element Method", Third Edition, Thomson Learning</li> <li>7. T. R. Chandrupatia, A. D. Belegundu, "Introduction to Finite Elements in Engineering", Third Edition, PHI</li> <li>8. Seshu P, "Text Book of Finite Element Analysis", PHI Learning Pvt..Ltd. New Delhi.</li> </ol>
<b>Syllabus for Unit Test</b>	
Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Control Systems

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
Practicals	: 04 Hrs/week	Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Pract/Oral	: 50 Marks
		Total Credits	: 06
<b>Unit I</b>			(08 Hours)
<b>Introduction to Control System</b>			
	Introduction to control systems. Classification of control system, basic characteristic of feedback control systems. Mathematical modeling of control systems, concept of transfer function. Basic control actions:-On-Off Control, Proportional, Integral, Derivative and PID, Feedback and feed forward control system and their applications.		
<b>Unit II</b>			(08 Hours)
<b>Time Response Analysis of Control System</b>			
	Time response analysis: Time response of control system, standard test signal, Time Response Analysis of First and Second order system, Time Domain specifications. Step response of second order system. Steady-state errors, static error constants, steady state, analysis of different type of Systems using step. Ramp and parabolic inputs.		
<b>Unit III</b>			(08 Hours)
<b>Control System Stability Analysis</b>			
	Classification of control systems according to types of systems, Stability Analysis: Introduction to concepts of stability. The Routh-Hurwitz's Stability criteria. Stability in the sense of Lyapunov and absolute stability, autonomous systems, the invariance principle, linear systems and linearization, non autonomous systems, linear time varying systems and linearization.		
<b>Unit IV</b>			(08 Hours)
<b>Root Locus and Frequency Response Methods</b>			
	Frequency Response Analysis, Frequency domain specifications Correlation between time and frequency response. Polar Plots. Bode Plots, Nyquist Plots stability in frequency domain, frequency domain methods of design, compensation and their realization in time and frequency domain, improving system performance.		
<b>Unit V</b>			(08 Hours)
<b>State Space Modeling</b>			
	Concept of state, state variable, state model State space method. State space representation using physical and phase variables, decomposition of transfer function, diagonalisation. solutions of homogeneous and non homogenous equations, zero and pole placement using state space techniques. Transfer function from state model. Controllability and observability of linear system. State transition matrix, state controllability matrix, state observability matrix.		
<b>Unit VI</b>			(08 Hours)
<b>Non-Linear Control Systems</b>			
	Discrete time systems and Z-Transformation methods, State space analysis, Optimal and adaptive control systems, Non-Linear Systems Phase plane analysis: Phase portraits, Singular points characterization. Compensation (Introduction only): Types of compensator, selection of Compensator, Lead, Lag and Lag-Lead compensation. Control system Components : servomotor, stepper motors, Synchronos, Potentiometer, amplifiers		

<b>Text Books/ References</b>			
1. Control System Engineering: by Nagrath LT. and Gopal .M., Wiley Eastern Lid. 2. Modern Control engineering: by K.Ogata, Prentice Hall. 3. Benjamin C. Kuo, Automatic Control Systems, Pearson education, seventh edition. 4. Madan Gopal, Control Systems Principles and Design, Tata McGraw Hill, seventh edition, 1997 5. Nise, control system Engineering, John wiley& sons, 3rd edition 6. Norman Nise, Control System Engineering, Prentice Hall India, Fourth Edition 7. Anand Kumar, —Control System Theory, Prentice Hall India. 8. M.Vidyasagar, "Nonlinear systems analysis", Second Edition, Prentice Hall, 1993 9. H.Khalil, "Nonlinear Systems", Macmillan Publishing Company, NY, 1992. 10. A. Isidori, —Nonlinear Control Systems, 3rd edition, Springer Verlag, London, 1995. 11. Jack Golten, Andy Verwer, “Control System Design and Simulation”, McGraw Hill 12. F.H.Raven, ”Automatic Control Engineering”, Third edition, McGraw Hill, 1983. 13. Schaum Series, ” Theory and Problems of Feedback and Control Systems”. (MGH) 14. Dr.N.K.Jain, ”Automatic Control Systems Engineering”, Dhanpat Rai Publishing Company.			
<b>Term Work</b>			
Two Experiments on PID controller Four computer based assignments using MATLAB			
<b>Syllabus for Unit Test</b>			
Unit Test I	Unit I,II,III		
Unit Test II	Unit IV,V,VI		

## Precession Engineering

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b>Unit I</b>			(08 Hours)
<b>Concepts Of Accuracy</b>			
	Introduction - concept of accuracy of machine tools - spindle and displacement accuracies - Accuracy of numerical control systems - Errors due to numerical interpolation - Displacement measurement system and velocity lags.		
<b>Unit II</b>			(08 Hours)
<b>Geometric Dimensioning And Tolerancing</b>			
	Interpretation, measurement and application of form tolerances - datum system and targets – tolerance of position Tolerance zone conversions - Surfaces, features, features of size, datum features-Datum, oddly configured and curved surfaces as datum features, equalizing datum.		
<b>Unit III</b>			(08 Hours)
<b>Surface and form metrology</b>			
	Flatness, roughness, waviness cylindricity etc. Methods of improving accuracy & surface finish, Influence of forced vibration on accuracy, Dimensional wear of cutting tools and its influences on accuracy		
<b>Unit IV</b>			(08 Hours)
<b>Precision Measuring Systems</b>			
	Units of length - legal basis for length measurement – Traceability - Processing system of nanometer accuracies - LASER light source - LASER interferometer - LASER alignment telescope - LASER micrometer-on-line and in-process measurements of diameter and surface roughness using LASER - Micro holes and topography measurements -.- In processing or in-situ measurement of position of processing point-Post process and on-machine measurement of dimensional features and surface-mechanical and optical measuring systems. Straightness and flatness measurement – Optoelectronic Measurement Systems in Metrology, Opto electronic devices contact and non contact types Applications - Tool wear measurement - 3D Surface roughness - Pattern generation studies.		
<b>Unit V</b>			(08 Hours)
<b>Nano-Positioning Systems Of Nano Accuracy &amp; Repeatability</b>			
	Guide systems for moving elements - Servo control systems for tool positioning - Computer Aided digital and ultra precision position control.		
<b>Unit VI</b>			(08 Hours)
<b>Computer Integrated Quality Assurance</b>			
	Concept of Total quality control & quality assurance - Zero defects-POKA-YOKE Statistical evaluation of data using computer- CNC CMM applications - Computer Aided measurement, data integration of 3D-CMM		
<b>Text Books/ References</b>			
	1. MURTHY,R.L., - " Precision Engineering in Manufacturing ", New ageInternational(P) Limited, publishers, 1996.		

	<p>2. JAMESD. MEADOWS, - "Geometric Dimensioning and Tolerancing ", Marcel Dekker Inc.1995.</p> <p>3. "Dimensioning and tolerancing of mass production", Prentice Hall, 1983</p> <p>4. WATSON .J., " Optoelectronics " - Van Nostrand Rein hold(UK)Co ltd.,1988</p> <p>5. ROBERT.G. SEIPPEL, - "Optoelectronics for technology and engineering ", Prentice Hall NewJersey,1989</p> <p>6. ULRICH-REMBOLD, ARMBRUSTER AND ULZMANN-" Interface technology for computer controlled manufacturing processes ", Marcel Dekker Pub. New York, 1993</p> <p>7. Engg.Metrlogy by Shotbolt.</p> <p>8. THOMAS.G.G. - "Engineering metrology", Butterworth PUB.1974.</p> <p>9. NORIO TANIGUCHI, - " Nano Technology ", Oxford university,Press,1996.</p>
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<b>Syllabus for Unit Test</b>			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

# Optimization for Engineering Design

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	:04
<b>Unit I</b>			(08 Hours)
<b>Introduction</b>			
	Optimal problem formulation-Design variables, constraints, objective function, variable bound. Engineering optimization problems, Optimization algorithms		
<b>Unit II</b>			(08 Hours)
<b>Single Variable Optimization</b>			
	Optimality criteria, Bracketing methods, region elimination method, point estimate method, gradient based method, root finding using optimization techniques.		
<b>Unit III</b>			(08 Hours)
<b>Multivariable Optimization</b>			
	Optimality criteria, unidirectional search, direct search method- evolutionary optimization, simplex search, Hooke-Jeeves pattern search method, gradient based methods,-steepest descent method, Newton's method, Marquardt's method.		
<b>Unit IV</b>			(08 Hours)
<b>Constrained Optimization</b>			
	Kuhn-Tucker conditions, transformation methods, sensitivity analysis, direct search for constrained minimization, linearized search techniques, feasible direction method.		
<b>Unit V</b>			(08 Hours)
<b>Specialized Algorithms</b>			
	Integer programming, penalty function, branch-and-bound method Geometric programming		
<b>Unit VI</b>			(08 Hours)
<b>Nontraditional Optimization</b>			
	Genetic algorithm, simulated annealing, global optimization using steepest descent, genetic algorithm and simulated annealing.		
<b>Text Books/ References</b>			
	<ol style="list-style-type: none"> <li>1. Optimization for Engineering Design: Algorithms and Examples-Kalyanmoy Deb, PHI Learning Pvt. Ltd., 2004</li> <li>2. Optimization Concepts and Applications in Engineering-Ashok D. Belegundu, Tirupathi R. Chandrupatla, Cambridge University Press, 2011</li> <li>3. An Introduction to Numerical Methods and Optimization Techniques-Richard W. Daniels, North-Holland, 1978</li> <li>4. Optimization: theory and applications-S. S. Rao, Wiley Eastern, 1979</li> </ol>		
<b>Syllabus for Unit Test</b>			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

## Semester III



## Elective I : Advanced Stress analysis

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b>Unit I</b>			(08 Hours)
<b>Theory of Elasticity</b>			
	Elasticity problems in two dimensions - stress strain relationship for brittle materials, ductile materials. Compatibility equations in two and three dimensions, free body diagram of complicated structures and stress calculations, stress functions in rectangular and cylindrical coordinate systems, evaluation of stresses in flat rectangular plates with different clamp and load conditions evaluation of the stresses in the flat and circular plate with center hole/holes using stress function		
<b>Unit II</b>			(08 Hours)
<b>Theory of Plasticity</b>			
	Different criterions for three dimensional stress analysis using plasticity, evaluation of stress concentration factors in different geometries using plasticity theorem, practical problems on stress analysis for plasticity-stress in the sharp groove of the shaft, stress in the L shaped bracket under cantilever load, strain rate effects on highly deformable materials and stress calculations.		
<b>Unit III</b>			(08 Hours)
<b>Stress Analysis of Engineering Plastics and Composites</b>			
	Types of engineering plastics (Nylon, ABS, PP) failure modes, failure phenomenon in two and three dimensional stress analysis, wear and tear of plastics, impact properties of plastics, types of composites (fiber reinforced plastics), evaluation of elastic properties of composites, stress analysis of composite circular tubes (internal and external pressure), flat plate fixed at the edges and concentrated load, uniformly distributed load		
<b>Unit IV</b>			(08 Hours)
<b>Plate bending</b>			
	Bending of plate to cylindrical surface, bending of a long uniformly loaded rectangular plate, pure bending in two perpendicular directions, bending of circular plates loaded symmetrically w.r.t. center, bending of circular plates of variable thickness, circular plate with circular hole at center symmetrically loaded and load distributed along inner and outer edges		
<b>Unit V</b>			(08 Hours)
<b>Contact stresses</b>			
	Geometry of contact surfaces, method of computing contact stresses and deflection of bodies in point contact, stress for two bodies in line contact with load normal to contact area and load normal and tangent to contact area, gear contacts, contacts between cam and follower, ball bearing contacts		
<b>Unit VI</b>			(08 Hours)
<b>Experimental stress analysis</b>			
	Dimensional analysis, analysis techniques, strain gauges, types of strain gauges, materials, configuration, instrumentation, characteristics of strain gauge measurement, theory of photoelasticity, elements of polariscope, simple and circular polariscope, fringes in dark and white field, isoclinic and isochromatic fringe patterns, evaluation of stresses from these fringe patterns		

**Text Books/ References**

1. Advanced Mechanics of Materials – Cook and Young, Prentice Hall
2. Advanced Strength and Applied Stress Analysis – Richard G. Budynas, McGraw Hill
3. Advanced Mechanics of Materials – Boresi, Schmidt, Sidebottom, Willey
4. Theory of Elasticity – Timoshenko and Goodier, Mc Graw Hill
5. Advanced Strength of Materials, Vol. 1, 2 – Timoshenko, CBS
6. Advanced Strength of Materials – Den Harteg
7. Experimental Stress Analysis – Dally & Riley
8. Theory of Plates and Shells – Timoshenko Mc Graw Hill
9. The Mathematical Theory of Plasticity - R. Hill, Oxford University Press, 1998

**Syllabus for Unit Test**

	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

## **Elective I: Management Information Systems**

### **TEACHING SCHEME**

Lectures : 04 Hrs/week

### **EXAMINATION SCHEME**

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

**Unit I** (08 Hours)

Knowledge based system, Introduction, Development of data base and knowledge bases, knowledge representing paradigms – rule based, object oriented, semantic nets and frames, uncertainty, fuzzy logic, neural nets.

**Unit II** (08 Hours)

Interference mechanism, goals, control strategies forward and backward chaining, conflict resolution, explanation, blackboard model.

**Unit III** (08 Hours)

Implementation issues: knowledge acquisition, coding, expert system shells, PROLOG, and LISP

**Unit IV** (08 Hours)

Selected applications in manufacturing: product design, process planning and scheduling, robot movement, factory layout, defect analysis, diagnostic maintenance, quality control.

**Unit V** (08 Hours)

Knowledge based approaches for engineering design, blackboard architecture, other knowledge based approaches.

**Unit VI** (08 Hours)

Artificial intelligence.

### **Term Work**

Three case studies from the following

- ÿ Information and knowledge requirement in Manufacturing Function
- ÿ Inventory control systems
- ÿ Production Planning and Control System – Scheduling and capacity requirement calculation.
- ÿ Design information systems.

### **Oral/Practical**

Based on above termwork.

### **Text Books/ References**

1. Kerr R., "Knowledge Based Manufacturing Management", Addison Wiley, 1991
2. Addis T. R., "Designing Knowledge Based System", Prentice Hall, 1985
3. Roltson D. W., "Principles of Artificial Intelligence and Expert Systems Development", McGraw Hill Publications, 1988
4. Chung P. W. H., Love Grove G., "Industrial Engineering Applications of AI and Expert Systems", Gordon & Breach Science Pub., 1993
5. Maus R. and Keyes J., "Hand Book of Expert Systems in Manufacturing", McGraw Hill Publications, 1991
6. C. S. Krishnamurthy, S. Rajeev, "Computer Aided Design" Narosa Pub. House

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## **Elective I: Computational Fluid Dynamics**

### **TEACHING SCHEME**

Lectures : 04 Hrs/week

### **EXAMINATION SCHEME**

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

#### **Unit I**

(08 Hours)

Introduction to Fluid Dynamics, Concepts of Fluid Flow, Pressure distribution in fluids, Reynolds transport theorem, Integral form of conservation equations, Differential form of conservation equations, Different Types of Flows, Euler and Navier Stokes equations, Properties of supersonic and subsonic flows, Flow characteristics over various bodies.

#### **Unit II**

(08 Hours)

Geometric Modeling and CAD Repairing Geometric transformations, Parametric representation of curves and surfaces, Concept of topology, Surface modeling, Faceted models, Solid modeling. Creation of water tight geometry, Faceted Boolean operations, Dependent and independent CAD errors.

#### **Unit III**

(08 Hours)

Introduction to CFD, Philosophy of CFD, Governing equations of fluid dynamics and there physical meaning, Mathematical behavior of governing equations and the impact on CFD , Simple CFD techniques and CFL condition.

#### **Unit IV**

(08 Hours)

Numerical Methods in CFD, Finite Difference, Finite Volume, and Finite Element, Upwind and downwind schemes, Simple and Simpler schemes, Higher order methods, Implicit and explicit methods, Study and transient solutions

#### **Unit V**

(08 Hours)

Surface mesh generation, Surface mesh repair, Volume grid generation, Volume mesh improvement, mesh smoothing algorithms, grid clustering and quality checks for volume mesh. Adaptive, Moving and Hybrid Grids, Need for adaptive and, moving grids, Tet, pyramid, prism, and hex grids, using various elements in combination.

#### **Unit VI**

(08 Hours)

Introduction to Turbulence Modeling, Introduction and background, Algebraic models, One equation models, Two equation models, Near wall treatment, Reynolds stress models, Introduction to Multiphase Modeling Fundamentals of multiphase flows, Eulerian - Lagrangian (ELAG) approach, Eulerian- Eulerian (E2P) approach, Volume Of Fraction (VOF) approach.

#### **Term Work**

Minimum four assignments on above topic to study CFD analysis.

Use of Any CFD software like FLUENT – Basic issues, model development, and post process sing.

## Oral/Practical

Based on Term work.

### Text Books/ References

1. John D. Anderson, "Computational Fluid Dynamics: The Basics with Applications", McGraw Hill, 1995
2. V. V. Ranade, "Computational Flow Modeling for Chemical Reactor Engineering", Process Engineering Science, Volume 5, 2001
3. Patrick Knupp and Stanly Steinberg, "Fundamentals of Grid Generation", CRC Press, 1994
4. D. C. Wilcox, "Turbulence Modelling for CFD", 1993
5. Pieter Wesseling, "An Introduction to Multigrid Methods", John Wiley & Sons, 1992
6. J. F. Thompson, Z. U., A. Warsi and C. W. Mastin, "Numerical Grid Generation: Foundations and Applications", North Holland, 1985
7. S. V. Patankar, "Numerical Heat Transfer and Fluid Flow", McGraw-Hill, 1981
8. Thomas B. Gatski, M. Yousuff Hussaini, John L. Lumley, "Simulation and Modelling of Turbulent Flows", Eds., Oxford University Press, 1996
9. Laney, C. B., "Computational Gas Dynamics", Cambridge Uni. Press, 1998

### Syllabus for Unit Test

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Elective I : Micro-electro Mechanical Systems

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b>Unit I</b>			(08 Hours)
<b>Introduction</b>			
	Micro-Electro-Mechanical Systems (MEMS), Microsystems and their products, miniaturization, applications, mechanical MEMS, thermal MEMS, micro-opto electromechanical systems, magnetic MEMS, radio frequency (RF) MEMS, micro fluidic systems, bio and chemo devices, Nanotechnology - definition, nanoscale, consequences of the nanoscale for technology and society, need and applications of nano electromechanical systems (NEMS)		
<b>Unit II</b>			(08 Hours)
<b>Micro Fabrication Processes &amp; Materials</b>			
	Materials for MEMS - substrate and wafers, silicon as a substrate material, crystal structure, single crystal and polycrystalline, mechanical properties, silicon compounds, silicon piezo-resistors, gallium arsenide, quartz, piezo-electric crystals, polymers, packaging materials; Fabrication Processes - Bulk micro manufacturing, photolithography, photoresists, structural and sacrificial materials, X-ray and electron beam lithography, Thin film deposition - spin coating, thermal oxidation, chemical vapour deposition (CVD), electron beam evaporation, sputtering; Doping - diffusion, ionimplantation; Etching - wet etching, dry etching; Surface micromachining, bulk vs. surface micromachining; Wafer bonding - glass-frit, anodic and fusion bonding; LIGA process and applications.		
<b>Unit III</b>			(08 Hours)
<b>Microsensors and actuators</b>			
	Sensing and actuation, Chemical sensors, Optical sensors, Pressure sensors, Thermal sensors - thermopiles, thermistors, micromachined thermocouple probes, thermal flow sensors, MEMS magnetic sensor, Piezoelectric material as sensing and actuating elements - capacitance, piezomechanics, Piezoactuators as grippers, microgrippers, micromotors, microvalves, micropumps, microaccelerometers, microfluidics, shape memory alloy based optical switch, thermally activated MEMS relay, microspring thermal actuator, data storage cantilever.		
<b>Unit IV</b>			(08 Hours)
<b>Microsystem Design</b>			
	Design constraints and selection of materials, selection of manufacturing process, selection of signal transduction technique, electromechanical system and packaging.		
<b>Unit V</b>			(08 Hours)
<b>Nanomaterials:</b>			
	Molecular building blocks to nanostructures - fullerenes, nanoscaled biomolecules, chemical synthesis of artificial nanostructures, molecular switches and logic gates, nanocomposites; Carbon nanotubes -structure, single walled, multi walled, properties of carbon nanostructures and their synthesis, Potential applications of nano-structures.		
<b>Unit VI</b>			(08 Hours)
<b>Nanofinishing Techniques</b>			
	Abrasive flow machining, magnetic abrasive finishing, magnetorheological finishing, elastic emission machining, ion beam machining, chemical mechanical polishing, Nanomanipulation,		

	Nanolithography, Top-down versus bottom - up assembly, Visualisation, manipulation and characterization at the nanoscale; Applications - in Energy, Tribology, Informatics, MDSicine, etc.		
<b>Text Books/ References</b>			
	<p>1. Bharat Bhushan (Ed.), (2004), Handbook of Nanotechnology, Spinger-Verlag Berlin Heidelberg New York, ISBN 3-540-01218-4</p> <p>2. Hsu, Tai-Ran, (2003), MEMS &amp; MICROSYSTEMS: Design &amp; Manufacture, TMH, ISBN:0-07-048709-X</p> <p>3. Mahalik, N. P., (2007), MEMS, TMH, ISBN: 0-07-4454. Mahalik, N.P. (Ed.) (2006), Micromanufacturing &amp; Nanotechnology, Springer India Pvt. Ltd., ISBN: 978-81-8128-505-8 (Distributed by New Age International, New Delhi)</p> <p>5. Nanosystems: Molecular Machinery, Manufacturing &amp; Computation, K E Drexler, (Wiley),1992), ISBN 0471575186</p> <p>6. P.Rai- Choudhury, Handbook of Microlithography, Micromachining &amp; Microfabrication, SPIE,1997.</p> <p>7. David Ferry, Transports in Nanostructures, Cambridge University Press, 2000.</p> <p>8. Poole, Charles &amp; Owen, Frank J., - Introduction to Nanotechnology, Wiley (India) Pvt. Ltd. ISBN: 978-81-265-10993</p>		
<b>Syllabus for Unit Test</b>			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	



## Elective II : Composite Materials

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week		Theory : 60 Marks
			Duration : 03 Hours
			Internal Assessment : 40 Marks
			Total Credits : 04
<b>Unit I</b>			(08 Hours)
<b>Basic concepts and characteristics</b>			
	Definition and characteristics of composite materials, overview of advantages and limitations of composite materials, significance and objectives, sciences and technology, types and classification of typical composite materials, current status and future prospects.		
<b>Unit II</b>			(08 Hours)
<b>Macromechanical behaviours of lamina:</b>			
	Stress-strain relations for anisotropic materials, engineering constants for orthotropic materials, stress-strain relations for a lamina of arbitrary orientation, biaxial strength theories.		
<b>Unit III</b>			(08 Hours)
<b>Micromechanical behaviour of a lamina</b>			
	Mechanics of materials approach to stiffness, elasticity approach to stiffness, comparison of approaches to stiffness, mechanics of materials approach to strength.		
<b>Unit IV</b>			(08 Hours)
<b>Hygrothermal effects</b>			
	Hygrothermal effects on mechanical behaviours, hygrothermal stress-strain relations, coefficients of thermal and moisture expansion of unidirectional lamina		
<b>Unit V</b>			(08 Hours)
<b>Macromechanical behaviours of a laminate</b>			
	Classical lamination theory, lamina stress-strain behaviour, strain and stress variation in a laminate, laminate forces and moments, special cases of laminate, interlaminar stresses, design of laminates.		
<b>Unit VI</b>			(08 Hours)
<b>Manufacture and testing of composite materials</b>			
	Manufacturing: Stamp moulding, diaphragm forming, thermoforming, filament winding, pultrusion, compression moulding, injection moulding. Testing: Determination of physical properties such as density, fibre volume ratio, void volume ratio, co-efficient of thermal expansion, determination of tensile, compressive and shear properties of unidirectional lamina, determination of interlaminar and intralaminar strength, biaxial testing, characterisation of composites with stress concentration.		
<b>Text Books/ References</b>			
	<ol style="list-style-type: none"> <li>1. Mechanics of Composite Materials by R.M.Jones, McGrawhill-Kogakusha Ltd., Tokyo.</li> <li>2. Engineering Mechanics of Composite Materials by Issac M.Daniel and Ori Ishai, Oxford University Press.</li> <li>3. Analysis and Performance of Fiber Composites by B.D.Agarwal and L.J.Brotuman, John Wiley &amp; Sons.</li> </ol>		

<b>Syllabus for Unit Test</b>			
	Unit Test I		Unit Test I
	Unit Test II		Unit Test II

## Elective II : Analysis and Synthesis of Mechanisms

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I (08 Hours)

#### **Introduction:**

Review of fundamentals of kinematics, D. O. F; Multi loop kinematics chains, Gross motion concepts; Position analysis -Vector loop equations for four bar slider crank.

### Unit II (08 Hours)

#### **Kinematic Analysis:**

Inverted slider crank - Geared five bar and six bar linkages; Analytical method for velocity and acceleration analysis - Four bar linkage jerk analysis - Plane complex mechanism

### Unit III (08 Hours)

#### **Path Curvature Theory:**

Fixed and Moving centroids, inflection points and inflection circle; Graphical constructions - Cubic of stationary curvature; Dimensional synthesis – Function generation; path generation, motion generation.

### Unit IV (08 Hours)

#### **Synthesis of Mechanisms**

Graphical methods; Coupler; curve synthesis, design of six bar mechanisms. Algebraic methods. Application of instant centre in linkage design; Cam mechanism - Determination of optimum size of Cams.

### Unit V (08 Hours)

#### **Dynamic of Mechanisms**

Static force analysis with friction - Inertia force analysis - combined static and inertia force analysis; shaking force, Kinetostatic analysis. Introduction to force and moment; balancing of linkages. The Matrix Method.

### Unit VI (08 Hours)

#### **Spatial Mechanism and Robotics:**

Kinematic analysis of spatial RSSR mechanism; Denavit - Hartenberg parameters; Forward and inverse Kinematics of robotic manipulators.

#### **Term Work**

Practical in Use Of Mechanical Software Packages- Tutorials.

#### **Oral/Practical**

Based on Term work.

**Text Books/ References**

1. Ā Erdman A G & Sandor, G N, “Mechanism Design: Analysis and Synthesis”, prentice hall of India
2. Ā Mallik, A K, Ghosh A, and Gunter Dittrich, “Kinematic Analysis and Synthesis of Mechanisms”, CRC Press London
3. Ā Robert L Norton, “Design of Machinery” McGraw Hill Book Co.
4. Ā Robert HA, “Mechanical Design Systems Handbook”, McGraw Hill Book Co.

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Elective II : Artificial Intelligence

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b>Unit I</b>		(08 Hours)	
<b>Human and machine intelligence</b>			
	Concepts of fifth generation computing, programming in AI environment, developing artificial intelligence system, natural language processing, neural networks.		
<b>Unit II</b>		(08 Hours)	
<b>Introduction to fuzzy logic</b>			
	Basic concepts in fuzzy set theory – operations of fuzzy sets – fuzzy relational equations – propositional, predicate logic – inference – fuzzy logic principles – fuzzy inference – fuzzy rule based systems – fuzzification and defuzzification – types.		
<b>Unit III</b>		(08 Hours)	
<b>Fuzzy logic applications</b>			
	Fuzzy logic controllers – principles – various industrial applications of fuzzy logic control – adaptive fuzzy systems – fuzzy decision making – fuzzy classification – fuzzy pattern recognition – image processing applications – fuzzy optimization.		
<b>Unit IV</b>		(08 Hours)	
<b>Introduction to artificial neural networks</b>			
	Fundamentals of neural networks – neural network architectures – learning methods – taxonomy of neural network architectures – standard back propagation algorithms – selection of various parameters – variations.		
<b>Unit V</b>		(08 Hours)	
<b>Associative memory</b>			
	Associative memory – exponential bidirectional associative memory – adaptive resonance theory – introduction – adaptive resonance theory 1 – adaptive resonance theory 2 – applications – Kohen self organizing maps – counter propagation networks – industrial applications. Expert system development: Definition, choice of domain, collection of knowledge base, selection of inference mechanism, case studies of expert system development in design and manufacturing.		
<b>Unit VI</b>		(08 Hours)	
<b>Industrial application of AI and expert systems</b>			
	Robotic vision systems, image processing techniques, application to object recognition and inspection, automatic speech recognition. Recent advances: Fundamentals of genetic algorithms – hybrid systems – meta heuristic techniques like simulated annealing, tabu search, ant colony optimization, perpetual self organizing, artificial immune systems – applications in design and manufacturing		
<b>Text Books/ References</b>			

	<ol style="list-style-type: none"> <li>1. Robert Levine et al, "A comprehensive guide to AI and expert systems", McGraw Hill Inc, 1986</li> <li>2. Henry C. Mishkoff, "Understanding AI", BPB Publication, New Delhi, 1986</li> <li>3. Peter Jackson, "Introduction to expert systems", First Indian Reprint, 2000, Addison Wesley</li> <li>4. Stuart Russell and Peter Norvig, "Artificial intelligence: a modern approach", Prentice Hall, 1995</li> <li>5. Elaine Rich et al., "Artificial intelligence", McGraw Hill, 1995</li> <li>6. Winston P H, "Artificial intelligence", Addison Wesley, Massachusetts, Third Edition, 1992</li> </ol>
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<b>Syllabus for Unit Test</b>			
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	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	

## Elective II : Design of Experiment

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b>Unit I</b>		(08 Hours)	
<b>Introduction</b>			
	Strategy of Experimentation, Some Typical Applications of Experimental Design, Basic Principles, Guidelines for Designing Experiments, A Brief History of Statistical Design, Summary: Using Statistical Techniques in Experimentation		
<b>Unit II</b>		(08 Hours)	
<b>Simple Comparative Experiments</b>			
	Introduction, Basic Statistical Concepts, Sampling and Sampling Distributions, Inferences About the Differences in Means, Randomized Designs, Hypothesis Testing, Confidence Intervals, Choice of Sample Size, Comparing a Single Mean to a Specified Value		
<b>Unit III</b>		(08 Hours)	
<b>Experiments with a Single Factor:</b>			
	The Analysis of Variance, Analysis of the Fixed Effects Model, Decomposition of the Total Sum of Squares, Statistical Analysis, Estimation of the Model Parameters ,Unbalanced Data, Model Adequacy Checking, The Normality Assumption,Plot of Residuals in Time Sequence, Plot of Residuals Versus Fitted Values, Plots of Residuals Versus Other Variables, Practical Interpretation of Results, A Regression Model, Comparisons Among Treatment Means ,Graphical Comparisons of Means		
<b>Unit IV</b>		(08 Hours)	
<b>Introduction to Factorial Designs</b>			
	Basic Definitions and Principles, The Advantage of Factorials, The Two-Factor Factorial Design, Statistical Analysis of the Fixed Effects Model , Model Adequacy Checking , Estimating the Model Parameters , Choice of Sample Size ,The General Factorial Design, Fitting Response Curves and Surfaces , Blocking in a Factorial Design		
<b>Unit V</b>		(08 Hours)	
<b>The 2<sup>k</sup> Factorial Design</b>			
	Introduction, the 2 <sup>2</sup> Design, the 2 <sup>3</sup> Design, the General 2 <sup>k</sup> Design, a Single Replicate of the 2 <sup>k</sup> Design, 2 <sup>k</sup> Designs are Optimal Designs, The Addition of Center Points to the 2 <sup>k</sup> Design		
<b>Unit VI</b>		(08 Hours)	
<b>Response Surface Methods and Designs</b>			
	Introduction to Response Surface Methodology, The Method of Steepest Ascent, Analysis of a Second-Order Response Surface, Location of the Stationary Point, Characterizing the Response Surface, Ridge Systems, Multiple Responses, Experimental Designs for Fitting Response Surfaces, Designs for Fitting the First-Order Model, Designs for Fitting the Second-Order Model, Blocking in Response Surface Designs, Optimal Designs for Response Surfaces		
<b>Text Books/ References</b>			
	<ol style="list-style-type: none"> <li>1. Design and analysis of experiments, Douglas C. Montgomery, Wiley, 2008</li> <li>2. Introduction to the Design And Analysis of Experiments, Geoffrey Mallin Clarke, R. E. Kempson, Arnold, 1994</li> </ol>		

	3. Experimental Design and Statistics, Stephen Henry Miller, Methuen, 1975		
<b>Syllabus for Unit Test</b>			
	Unit Test I	Unit I,II,III	
	Unit Test II	Unit IV,V,VI	



## Self Study Paper I : Advanced Manufacturing Processes

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

### METAL CUTTING AND MECHANICS OF METAL CUTTING

Introduction to metal removal processes, Chip formation, forces acting on cutting tool and their measurement, Chip thickness, Theory of Ernest and Merchant, theory of Lee and Shafer, Tool wear and tool life, surface finish, thermal aspects, friction in metal cutting and testing of machine tools.

### Unit II

(08 Hours)

### ABRASIVE PROCESSES

Introduction, Grinding wheel-designation and selection, grinding process, grinding process parameters, creep feed grinding, honing, lapping and other finishing processes

(08 Hours)

### Unit III

### FORMING PROCESSES.

Sheet metal forming, punching, extrusion, coning. Plastic molding process, injection molding, blow molding, compression molding. Metal injection molding, powder injection molding, sintering process, and their applications

### Unit IV

(08 Hours)

### UNCONVENTIONAL MACHINING PROCESSES

Need for unconventional processes, Range of non conventional machining processes USM, WJM, AJM, chemical machining, Electrochemical machining, Electrolytic grinding, EDM, LBM, EBM, Plasma arc cutting.

### Unit V

(08 Hours)

### HIGH SPEED MACHINING

Introduction to high speed machining, economics of high speed machining, brief historical perspective, material properties at high strain rates, influence of increasing speed on chip formation, stainless steel, aerospace aluminum and titanium and recommendations.

(08 Hours)

### Unit VI

## GENERATIVE MANUFACTURING PROCESSES (GMP) FOR RAPID PROTOTYPING

General features and classification, Issues related to CAD and GMP software, Overviews of generative manufacturing processes, two dimensional layer-by-layer techniques and direct three-dimensional techniques for RP

### **Text Books/ References**

1. G. Boothroyd and W. A. Knight, Fundamentals of Machining and Machine Tools, CRC Press.
2. E. M. Trent and P. K. Wright, Metal Cutting, Butterworth- Heinemann, Boston.
3. P. N. Rao, Manufacturing Technology, Tata Mc-Graw Hill.
4. D. A. Stephenson and J. S. Agapiou, Metal Cutting Theory and Practice, CRC Press
5. Amitabha Ghosh, Rapid Prototyping
6. Kalpak Jain S. and Schmid S. R., Manufacturing Processes for Engineering Materials, Addition Wesley,
7. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, John Wiley & Sons.

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## **Elective II : Machine Condition Monitoring and Diagnostics**

### **TEACHING SCHEME**

Lectures : 04 Hrs/week  
Practicals : 02 Hrs/week

### **EXAMINATION SCHEME**

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Term Work : 25 Marks  
Pract/Oral : 25 Marks  
Total Credits : 05

#### **Unit I** (08 Hours)

##### **Predictive Maintenance Techniques:**

Predictive maintenance basics, Maintenance philosophies, Evolution of maintenance philosophies, Plant machinery classification and recommendations, Principles of predictive maintenance, Predictive maintenance techniques, Vibration analysis – a key predictive maintenance technique.

#### **Unit II** (08 Hours)

##### **Fundamentals of Vibrations:**

Vibration basics, Spring-mass system: mass, stiffness, damping, System response, What is vibration? The nature of vibration, Harmonics, Limits and standards of vibration.

#### **Unit III** (08 Hours)

##### **Data Acquisition:**

Introduction, Collection of vibration signal – vibration transducers, characteristics and mountings, Conversion of vibrations to electrical signal.

#### **Unit IV** (08 Hours)

##### **Signal Processing, Applications and Representation:**

The fast Fourier transform (FFT) analysis, Time waveform analysis, Phase signal analysis, Spectral signal processes.

#### **Unit V** (08 Hours)

##### **Machinery Fault Diagnosis Using Vibration Analysis:**

Commonly witnessed machinery faults diagnosed by vibration analysis, correcting faults that cause vibration; Balancing, Alignment, Resonance vibration control with dynamic absorbers.

#### **Unit VI** (08 Hours)

##### **Oil and Particle Analysis Oil Fundamentals:**

Condition-based maintenance and oil analysis, Setting up an oil analysis program, Oil analysis – sampling methods, Oil analysis – lubricant properties, Oil analysis – contaminants in lubricants, Particle analysis techniques, Alarm limits for various machines.

#### **Term Work**

Term work shall consist of  
Data acquisition using a velocity pickup.  
Data acquisition using an accelerometer.

Data acquisition of sound signals.  
Spectral analysis of velocity, acceleration noise signals.  
Experiment demonstrating balancing of rotating shaft shaft.  
Three assignments based on above syllabus.

**Oral/Practical**

Based on Term work.

**Text Books/ References**

1. Thomson, W. T., "Theory of Vibration with Applications", CBS Publishers and Distributors, New Delhi, 1990
2. Gupta K., "Introductory Course on Theory and Practice of Mechanical Vibrations", New Age International Ltd., 1984
3. J. S. Rao., "Vibratory Condition Monitoring of Machines", Narosa publishing house, New Delhi
4. Cyril M. Harris, Allan G. Piersol, "Shock and Vibration Handbook", McGraw-Hill Publishing Co.
5. C. Scheffer, Paresh Girdhar, "Practical Machinery Vibration Analysis and Predictive Maintenance", Newnes an imprint of Elsevier

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Self Study Paper I : Product Lifecycle Management

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Product Life Cycle Environment**

Background, Overview, Need, Benefits, Concept of Product Life Cycle. Components / Elements of PLM, Emergence of PLM, Significance of PLM, Customer Involvement. Product Data and Product Workflow, Company's PLM vision, The PLM Strategy, Principles for PLM strategy, Preparing for the PLM strategy, Developing a PLM strategy, Strategy identification and selection, Change Management for PLM.

### Unit II

(08 Hours)

#### **Product Development Process**

Integrated Product development process Conceive – Specification, Concept design, Design - Detailed design, Validation and analysis (simulation), Tool design, Realize - Plan manufacturing , Manufacture, Build/Assemble , Test (quality check) , Service - Sell and Deliver , Use , Maintain and Support, Dispose.

(08 Hours)

### Unit III

#### **Product Development Approaches**

Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

### Unit IV

(08 Hours)

#### **Product Modelling**

Product Modelling - Definition of concepts - Fundamental issues - Role of Process chains and product models -Types of product models – model standardization efforts-types of process chains - Industrial demands. Foundation technologies and standards (e.g. visualization, collaboration and enterprise application integration),

### Unit V

(08 Hours)

#### **Product Data Management (PDM) Technology**

Product Data Management – An Introduction to Concepts, Benefits and

Terminology, PDM functions, definition and architectures of PDM systems, product data interchange, portal integration, PDM acquisition and implementation. Information authoring tools (e.g., MCAD, ECAD, and technical publishing), Core functions (e.g., data vaults, document and content management, workflow and program management), Functional applications (e.g., configuration Management)

(08 Hours)

## **Unit VI**

### **Recent Advances**

Intelligent Information Systems - Knowledge based product and process models - Applications of soft computing in product development process - Advanced database design for integrated manufacturing.

### **Text Books/ References**

1. Product Life Cycle Management - by Antti Saaksvuori, Anselmi Immonen, Springer, 1st Edition (Nov.5, 2003)
2. Product Design & Process Engineering, McGraw Hill – Kogalkusha Ltd., Tokyo, 1974.
3. Product Design & Development – by Kari Ulrich and Steven D. Eppinger, McGraw Hill International Edns, 1999.
4. Effective Product Design and Development – by Stephen Rosenthal, Business One Orwin, Homewood, 1992 ISBN 1-55623-603-4.
5. Burden, Rodger PDM: Product Data Management, Resource Pub, 2003. ISBN 0970035225
6. Clements, Richard Barrett. Chapter 8 ("Design Control") and Chapter 9 ("Document Control") in Quality Manager's Complete Guide to ISO 9000, Prentice Hall, 1993. ISBN 013017534X

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper I : Robust Design of Product and Process

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### Concepts of Quality Engineering

Taguchi's Approach to Quality, On-line and Off-line Quality Control, Difference from Classical Approach, Quality Loss Function, System Design, Parameter Design, Tolerance Design, Causes of Variation, Classification of Parameters, Parameter Design Strategy.

### Unit II

(08 Hours)

#### Introduction to Robust Design

Robustness Strategy & its primary tools: P-Diagram, Quality Measurement, Quality Loss Function, Signal to Noise (S/N) Ratios, Orthogonal Arrays, Steps in Robust Parameter Design. Robust design and Six-Sigma for Lean Enterprises.

(08 Hours)

### Unit III

#### Introduction to Taguchi's Experiment Design

Criteria for the Use of Experiment Design Methods, Applying Experiment Design Methods According To Situation; Problem Analysis and Empiric Parameter Reduction. Orthogonal Arrays, Graphical representation of factor combinations, linear graphs, Variance Analysis (ANOVA), Inner-Outer arrays Design.

### Unit IV

(08 Hours)

#### Parameter Design according to Taguchi

Direct product design, indirect variance analysis, Product design with characteristic values, taking cost into account, Signal-to-noise ratio according to Taguchi.

### Unit V

(08 Hours)

#### Data Analysis

Deterministic and random data, Uncertainty analysis, Tests for significance: Chi-square, Regression modeling, Direct and Interaction effects, ANOVA, F-test, Time Series analysis, Autocorrelation and Autoregressive modeling.

(08 Hours)

### Unit VI

#### Response surface Methodology

Linear experiment designs, quadratic experiment designs.

**Text Books/ References**

1. Montgomery D (2001). Design and Analysis of Experiments, 5th edition, Wiley
2. Phadke, M (1989). Quality Engineering using Robust Design, Prentice Hall.
3. Ross, P (1996). Taguchi Techniques for Quality Engineering, 2nd edition, McGraw Hill.
4. J. Krotzmaier, Optimizing Engineering Design, McGraw Hill Ltd.
5. A. Mitra, Quality Control and Improvement, Pearson Publications.

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI



# Self Study Paper I : Computer Aided Process Planning

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **INTRODUCTION**

The Place of Process Planning in the Manufacturing cycle - Process Planning and Production Planning – Process Planning and Concurrent Engineering, CAPP, Group Technology.

### Unit II

(08 Hours)

#### **PART DESIGN REPRESENTATION**

Design Drafting - Dimensioning - Conventional tolerancing - Geometric tolerancing - CAD - input / output devices - topology - Geometric transformation - Perspective transformation - Data structure – Geometric modelling for process planning - GT coding - The optiz system - The MICLASS system.

(08 Hours)

### Unit III

#### **PROCESS ENGINEERING AND PROCESS PLANNING**

Experienced, based planning - Decision table and decision trees - Process capability analysis - Process Planning -Variant process planning - Generative approach - Forward and Backward planning, Input format.

### Unit IV

(08 Hours)

#### **COMPUTER AIDED PROCESS PLANNING SYSTEMS**

Logical Design of a Process Planning - Implementation considerations -manufacturing system components,production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO,CPPP.

### Unit V

(08 Hours)

#### **AN INTERGARTED PROCESS PLANNING SYSTEMS**

Totally intergarded process planning systems - An Overview - Modulus structure -Data Structure, operation -Report Generation, Expert process planning.

(08 Hours)

### Unit VI

#### **Simulation**

Major activities, purpose, simulation process, types methodology, simulation packages, process quality simulator, computer requirements trends, applications simulation of manufacturing systems.

**Text Books/ References**

1. Gideon Halevi and Roland D. Weill, " Principles of Process Planning ", A logical approach, Chapman & Hall, 1995.
2. Tien-Chien Chang, Richard A.Wysk, "An Introduction to automated process planning systems ", Prentice Hall, 1985.
3. Chang, T.C., " An Expert Process Planning System ", Prentice Hall, 1985.
4. Rao, " Computer Aided Mnuufacturing ", Tata McGraw Hill Publishing Co., 2000.

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Self Study Paper I : Flexible Manufacturing System

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Evolution of Manufacturing Systems**

FMS definition and description, General FMS considerations, Manufacturing cells, Cellular versus Flexible Manufacturing. Systems Planning: Objective, introduction planning, preparation guidelines, the project team, supplier selection, system description and sizing, facility preparation planning, FMS layouts. Human resources: staff considerations, team work, communication and involvement, the supervisors role, personnel selection, job classifications, employee training.

### Unit II

(08 Hours)

#### **Manufacturing's Driving Force**

Definition, description and characteristics. Just in-time manufacturing, definition and description, benefits and relationship to FMS, implementation cornerstones, quality and quantity application principles. Single manufacture Cell – design scheduling of jobs on single manufacturing cells. Group Technology: Concepts, classification and coding, benefits and relationship to FMS, design of group technology using rank order clustering technique.

(08 Hours)

### Unit III

#### **FMS Design**

Using Bottleneck, Extended bottleneck models, Processing and Quality Assurance: Turning centres, Machining centre, construction and operations performed, axes, programming, and format information, work-holding and work-changing equipment, automated features and capabilities, cleaning and deburring – station types and operation description, importance to automated manufacturing, coordinate measuring machines, types, construction and general function, operation cycle description, importance to flexible cells and systems.

### Unit IV

(08 Hours)

#### **Automated movement and storage systems**

AGVs, Robots, automated storage and retrieval systems, storage space design, queuing carousels and automatic work changers, coolant and chip Disposal and recovery systems, auxiliary support equipment, cutting tools and tool Management – introduction, getting control of cutting tools, Tool Management, tool strategies, data transfer, tool monitoring and fault detection, guidelines, work holding considerations, General fixturing, Modular fixturing. FMS and the relationship with workstations – Manual, automated and transfer lines design aspects.

### Unit V

(08 Hours)

## **FMS Software**

Communications networks and Nanotechnology – general functions, and manufacturing usages, hardware configuration, programmable logic controllers, cell controllers, communications networks. FMS implementation.

(08 Hours)

## **Unit VI**

### **FMS and Simulation**

System issues - Types of software - specification and selection - Trends -Application of simulation - software -Manufacturing data systems - data flow -CAD/CAM considerations - Planning FMS database.

### **Text Books/ References**

1. Parrish, D.J., ‘Flexible Manufacturing’, - Butter Worths – Heinemann, Oxford, 1993.
2. Groover, M.P., ‘Automation, Production Systems and CIM’, - Prentice Hall India, 1989.
3. Kusiak, A., ‘Intelligent Manufacturing Systems’, - Prentice Hall, 1990.
4. Considine,D.M., & Considine,G.D., ‘Standard Handbook of Industrial Automation’,-Chapman & Hall, 1986

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Self Study Paper I : Product Design & Process Planning

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Product design and process design functions**

Selection of a right product, essential factors of product design, Morphology of design, sources of new ideas for products, evaluation of new product ideas. Product innovation procedure-Flow chart. Qualifications of product design Engineer. Criteria for success/failure of a product. Value of appearance, colours and Laws of appearance.

### Unit II

(08 Hours)

#### **Product reliability**

Mortality Curve, Reliability systems, Manufacturing reliability and quality control. Patents: Definitions, classes of patents, applying for patents. Trademarks and copyrights. Cost and quality sensitivity of products, Elements of cost of a product, costing methods, cost reduction and cost control activities. Economic analysis, Break even analysis Charts. Value engineering in product design, creativity aspects and techniques. Procedures of value analysis – cost reduction, material and process selection.

(08 Hours)

### Unit III

#### **Various manufacturing processes**

Degree of accuracy and finish obtainable, process capability studies. Methods of improving tolerances. Basic product design rules for Casting, Forging, Machining, Sheet metal and Welding. Physical properties of engineering materials and their importance on products. Selection of plastics, rubber and ceramics for product design.

### Unit IV

(08 Hours)

#### **Industrial ergonomics**

Man-machine considerations, ease of maintenance. Ergonomic considerations in product design- Anthropometry, Design of controls, man-machine information exchange. Process sheet detail and their importance, Advanced techniques for higher productivity. Just-in-time and Kanban System. Modern approaches to product design; quality function development, Rapid prototyping

### Unit V

(08 Hours)

#### **Role of computer in product design**

Management of manufacturing, creation of manufacturing data base, Computer Integrated Manufacturing, communication network, production flow analysis, Group Technology, Computer Aided product design and process Planning. Integrating product design,

manufacture and production control.

(08 Hours)

## **Unit VI**

### **Computer Aided Process Planning**

Logical Design of a Process Planning - Implementation considerations -manufacturing system components,production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO

### **Text Books/ References**

1. Niebel, B.W., and Draper, A.B., Product design and process Engineering, Mc Graw Hill – Kogalkusha Ltd., Tokyo, 1974
2. Chitale, A.K, and Gupta, R.C., Product Design and Manufacturing, Prentice Hall of India Pvt. Ltd., New Delhi, 2004.
3. Mahajan, M. Industrial Engineering and Production Management, Dhanpath Rai & Co., 2000.
4. Considine,D.M., & Considine,G.D., ‘\_Standard Handbook of Industrial Automation’,-Chapman & Hall, 1986

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper I : Experimental Technique and Data analysis

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>	
Lectures	: 04 Hrs/week	Theory	: 60 Marks
		Duration	: 03 Hours
		Internal Assessment	: 40 Marks
		Total Credits	: 04
<b><u>Unit I</u></b>			(08 Hours)
<b>Research Modeling</b>			
	(a) Mathematical – Classification of Models, Development of Models, Stages in Model building, Principles of Modelling, Use of Analogy, Models as Approximations, Data consideration and Testing of Models (b) Heuristics and Simulation – Definition, Applications and reasons for using Heuristics, Heuristic Methods and approaches, Meta-Heuristics; Simulation – Meaning, Applications and Classification of Simulation Models, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.		
<b><u>Unit II</u></b>			(08 Hours)
<b>Experimentation</b>			
	Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments.		
<b><u>Unit III</u></b>			(08 Hours)
<b>Introduction to Data and Errors</b>			
	Types Of Data counts, measurements. Types of error: inherent, instrument, operator. Statistical distributions: Uniform, Binomial, Poisson, Exponential, Normal Estimation of means, proportions, population sizes, variances		
<b><u>Unit IV</u></b>			(08 Hours)
<b>Hypothesis testing</b>			
	Procedures for hypothesis testing, means, proportions, variances, contingency, goodness of fit of data to a proposed model. Use of hypothesis tests to compare products or processes.		
<b><u>Unit V</u></b>			(08 Hours)
<b>Design and analysis</b>			
	Principles of experimental design: randomisation, replication, blocking. Analysis of variance: one-way and two-way analyses, with and without interaction. Cross-classified and nested forms. Fixed and random effect models. Factorial experiments versus one-at-a-time experiments.		
			(08 Hours)

<b><u>Unit VI</u></b>		
<b>Regression analysis</b>		
	Simple and multiple regression analysis. Use of transformation, analysis of residuals, variable selection procedures	
<b>Text Books/ References</b>		
	<ol style="list-style-type: none"> <li>1. C.R Kothari, Research Methodology, Methods &amp; Technique; New Age International Publishers, 2004</li> <li>2. R. Ganesan, Research Methodology for Engineers, MJP Publishers, 2011</li> <li>3. Experimental Methods for Engineers, J. P. Holman, McGraw-Hill Education (2000) ISBN 0071181652.</li> <li>4. Experimental Methods: An Introduction to the Analysis and Presentation of Data, L. Kirkup, Wiley Text Books (1995) ISBN 0471335797</li> <li>5. An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, 2nd Edition, J. R. Taylor, University Science Books (1997) ISBN 093570275X.</li> </ol>	
<b><u>Syllabus for Unit Test</u></b>		
	Unit Test I	Unit I,II,III
	Unit Test II	Unit IV,V,VI



## Self Study Paper I : TRIBOLOGY IN DESIGN

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

#### Unit I

(08 Hours)

##### **Introduction to Tribology:**

Introduction, Friction, Wear, Wear Characterization, Regimes of lubrication, Classification of contacts, lubrication theories. Newton's Law of viscous forces, Effect of pressure and temperature on viscosity.

#### Unit II

(08 Hours)

##### **Hydrodynamic Lubrication:**

Newton's Law of viscous forces, Flow through stationary parallel plates. Hagen's poiseuille's theory, viscometers. Concept of lightly loaded bearings, Petroff's equation, Hydrodynamic Bearings, Pressure development mechanism. Converging and diverging films and pressure induced flow. Reynolds's 2D equation with assumptions. Introduction to idealized slide bearing with fixed shoe and Pivoted shoes. Expression for load carrying capacity. Location of center of pressure.

#### Unit III

(08 Hours)

##### **Hydrostatic Bearings:**

Types of hydrostatic Lubrication systems Expression for discharge, load carrying capacity, Flow rate, Condition for minimum power loss. Torque calculations.

#### Unit IV

(08 Hours)

##### **Elasto Hydrodynamic Lubrication:.**

Introduction to Elasto - hydrodynamic lubricated bearings. Introduction to 'EHL' constant. Grubin type solution, Different regimes in EHL contact

#### Unit V

(08 Hours)

##### **Porous, Gas Bearings and Magnetic Bearings:**

Introduction to porous bearings. Equations for porous bearings and working principal, Fretting phenomenon and it's stages. Introduction to gas bearing, Governing Equation, Infinitely long journal bearings, Externally pressurized gas bearing. Introduction to magnetic bearings, Active magnetic bearings. Different equations used in magnetic bearings and working principal. Advantages and disadvantages of magnetic bearings, Electrical analogy, Magneto-hydrodynamic bearings.

#### Unit VI

(08 Hours)

##### **Tribo Measurement In Instrumentation:**

Surface topography measurements - Electron microscope and friction and wear measurements - Laser method - Instrumentation - International standards - Bearings performance measurements - Bearing vibration measurement.

### **Text Books/ References**

1. Cameron, A. "Basic Lubrication Theory", Ellis Horwood Ltd. , UK,1981
2. Hulling , J. (Editor), "Principles of Tribology", MacMillan ,1984
3. Williams J. A ., "Engineering Tribology", Oxford Univ. Press ,1994
4. Neale M. J., "Tribology Hand Book ", Butterworth Heinemann, 1995
5. Basu S. K., Sengupta S. N., Ahuja B. B., "Fundamentals of Tribology" Prentice Hall of

India Privata Ltd. New Delhi, 2005

6. Mujamdar B. C ., "Introduction to Tribology of Bearing", Wheeler Publishing, New Delhi 2001
7. Susheel Kumar Srivasthava, "Tribology in industry", S. Chand and Co.
8. Dudley D. Fuller, " Theory and practice of Lubrication for Engineers", New York Company 1998
9. Moore, "Principles and applications of Tribology", Pergamon press
10. Pinkus Stemitch, "Theory of Hydrodynamic Lubrication"
11. Gerhand Schwetizer, Hannes Bleuler & Alfons Traxler, "Active Magnetic bearings", Authors working group
12. Radixmovsky, "Lubrication of Bearings - Theoretical Principles and Design" The
13. Oxford press Company, 2000

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

# Self Study Paper I : Manufacturing System and Simulation

## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Fundamentals System concept and design**

Hierarchical structure, Decision making procedure, System types in manufacturing environments; Manufacturing Systems: Structural aspects, transformational aspects, procedural aspects, integrated manufacturing systems; Modes of Production-Jobbing/Intermittent/ Continuous; Mass Production-Economies of Scale, Optimum production scale, Mass Customization; Multi-Product Small Batch Production- Economies of Scope with Diversification; Logistic Systems- Material flow: conversion / transportation / storage

### Unit II

(08 Hours)

#### **Product / Process Planning and Design**

Product Life Cycle, Planning of a new product, Product Design Aspects, Design cost considerations, Concurrent Engineering; Process and Operation Design-Computer Aided Process Planning, Optimum routing analysis using Dynamic Programming and Network Techniques, Criteria for line balancing.

(08 Hours)

### Unit III

#### **Manufacturing Optimization**

Criteria for Evaluation, Optimization of single stage manufacturing- Unit production time and cost; Optimization of multistage manufacturing system-Scope, basic mathematical models; Cost Estimating- Classical metal cutting cost analysis, Industrial cost estimation practices, Estimating material, setup and cycle times.

### Unit IV

(08 Hours)

#### **Information Systems in Manufacturing**

Database structures, hierarchical, network, Relational- concepts, keys, relational operations, query languages; Shop Floor Data Collection Systems-Types of data, on-line and off-line data collection, Automatic data collection systems

### Unit V

(08 Hours)

#### **Computer Simulation in Manufacturing System Analysis**

Characteristics, Models, applications of probability and statistics; Design and evaluation methodology, General framework, Analysis of situation, Setting objectives, Conceptual modeling, Detailed design, Evaluation and Decision.

(08 Hours)

## **Unit VI**

### **Modern approaches in Manufacturing**

Cellular Manufacturing- Group Technology, Composite part, Rank Order Clustering Technique, Hollier method for GT cell layouts; Flexible Manufacturing- Concept, components, architecture; Lean Production concept, principles, Agile Manufacturing- concept, principles and considerations for achieving agility.

#### **Text Books/ References**

1. Katsudo Hitomi, (1998), “Manufacturing Systems Engineering”, Viva Low Priced Student Edition, ISBN 81-85617-88-0
2. B. Wu, “Manufacturing Systems Design & Analysis: Context and Techniques” (2/e), Chapman & Hall, UK, ISBN 041258140X
3. Mikell P. Groover, (2002), “Automation, Production Systems and Computer Integrated Manufacturing”, (2/e), Pearson Education, ISBN 81-7808-511-9
4. Radhakrishan P., Subramaniyan S. and Raju V., “CAD / CAM / CIM”, (3/E), New Age International Publication
5. Luca G. Sartori,(1998), “ Manufacturing Information Systems”, Addison Wesley Publishing Co.
6. N. Viswanadhan & Y, Narhari, (1998), “Performance Modeling of Automated Manufacturing Systems”, Prentice Hall of India

#### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## DISSERTATION STAGE I

### TEACHING SCHEME

Practicals : 07 Hrs/week

### EXAMINATION SCHEME

Term Work : 25 Marks

Practical/Oral : 25 Marks

Total Credits : 15

### Stage-I:

The aim of the dissertation work is to carry out research and development work. Every student will be required to choose the topic of dissertation in consultation with the faculty guide.

This stage will include a report consisting of synopsis, the plan for experimental/theoretical work and the summary of the literature survey carried out till this stage.

## SEMINAR

### TEACHING SCHEME

Practicals : 05 Hrs/week

### EXAMINATION SCHEME

Term Work : 25 Marks

Total Credits : 07

The student will be required to choose the topic of seminar on advanced topics based on courses taught in first and second semester and present the work during the seminar.

## **SEMESTER – IV**

## Self Study Paper II : CAD/CAM Practices in Metal Forming

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Fundamentals of Material Forming:**

Introduction of forming processes. Concept of Formability, formability limits and formability diagram. Wire and Tube Drawing: Introduction rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Heat treatment, variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, work hardening, lubrication in wire drawing. Tube drawing: Methods, force calculation, stock penetration. Lubrication in tube drawing.

### Unit II

(08 Hours)

#### **Forging:**

Introduction, classification of forging processes. Forging equipment- Hammers, presses, furnaces etc. construction working capacities and selection of equipment. Basic forging operations such as drawing, fullering edging, blocking etc. Forgability tests, design of forging as a product, friction in forging. Forging defects and the remedies. New technologies: Liquid metal forging, Isothermal forging, No draft forging, P/M forging, Rotary swaging, Roll forging, lubrication in forging.

(08 Hours)

### Unit III

#### **Rolling of Metals:**

Scope and importance of rolling. Types of Rolling Mills- construction and working. Roll bite, reduction, elongation and spread. Deformation in rolling and determination forces required. Process variables, redundant deformation. Roll flattening, Roll camber - its effect on rolling process, mill spring. Defects in rolling. Automatic gauge control- Roll pass classification & design. Lubrication in rolling.

### Unit IV

(08 Hours)

#### **Sheet Metal Working:**

Sheet Metal properties, gauges and surface conditions. Study of presses and equipments used, various cutting and forming operations, types of dies used, force requirement, theory of shear, methods of force reduction, defects, lubricants used. Miscellaneous sheet metal working operations: Metal spinning, fine blanking, coining, embossing, rubber forming, stretch forming.

Design of Press Tools:

General classification and components of press tools, types of dies simple, compound, combination dies, various press working operations such as punching, blanking, deep drawing, bending, forming etc. Design and calculations for above press working



dies.

(08 Hours)

## **Unit V**

### **Extrusion:**

Types: Direct, reverse, impact, hydrostatic extrusion. Dies for extrusion, stock penetration. Extrusion ratio of force equipment (with and without friction), metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes. Advanced Metal Forming Processes:

High velocity forming- principles, comparison of high velocity and conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic forming. Stretch forming, Coining Embossing, Curling, Spinning, Flow forming advantages, limitations and application of the process.

(08 Hours)

## **Unit VI**

### **Finite-Element Method**

Basics of Metal Forming and Finite-Element Method - Comparison of Finite-Difference and Finite Element Methods with Analytical Solutions - Spatial Discretization - Shape Functions - Assembly of the Stiffness Matrix. Finite Elements for Large Deformation - Solution of Linear Finite-Element Systems and Nonlinear Finite-Element Systems, Typical Finite Elements.

### **Text Books/ References**

1. Dieter, "Mechanical Metallurgy"
2. P. N. Rao, "Manufacturing Technology", Tata McGraw Hill
3. G.W. Rowe, "Principles of Industrial Metal Working Process", Edward Arnold
4. Dr. R. Narayanswamy, "Metal Forming Technology", Ahuja Book Co
5. Surender Kumar, "Principles of Metal Working"
6. "ASM Metal hand book Vol: 4 forming"
7. Shiro Kobayashi, Soo Ik oh and Taylan Atlan , "Metal Forming and Finite Element Method", Oxford pub, 1992.
- 8.

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Optimization Techniques

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction to Optimization**

Statement of an Optimization Problem - Design Vector, Design Constraints, Constraint Surface, Objective Function, Objective Function Surfaces. Classification of Optimization Problems - Classification Based on the Existence of Constraints, Nature of the Design Variables, Physical Structure of the Problem, Nature of the Equations Involved, Permissible Values of the Design Variables, Deterministic Nature of the Variables, Separability of the Functions and Number of Objective Functions

### Unit II

(08 Hours)

#### **One-Dimensional Unconstrained Minimization**

Introduction , Theory Related to Single Variable (Univariate) Minimization , Unimodality and Bracketing the Minimum, Fibonacci Method, Golden Section Method ,Polynomial-Based Methods. Programming using MATLAB

(08 Hours)

### Unit III

#### **Unconstrained Optimization**

Introduction Necessary and Sufficient Conditions for Optimality Convexity Basic Concepts: Starting Design, Direction Vector, and Step Size. The Steepest Descent Method The Conjugate Gradient Method Newton's Method Quasi-Newton Methods Approximate Line Search Using MATLAB

### Unit IV

(08 Hours)

#### **Stochastic Programming**

Introduction, Basic Concepts of Probability Theory, Stochastic Linear Programming, Stochastic Nonlinear Programming and Stochastic Geometric Programming

### Unit V

(08 Hours)

#### **Modern Methods of Optimization**

Genetic Algorithms, Simulated Annealing, Particle Swarm Optimization, Neural-Network-Based Optimization and Ant Colony Optimization

(08 Hours)

**Unit VI**

**Multiobjective Optimization**

Introduction, Concept of Pareto Optimality, Generation of the Entire Pareto Curve. Methods to Identify a Single Best Compromise Solution .

**Text Books/ References**

1. Singeresu S. Rao, Engineering Optimization-Theory and Practice, New Age International Limited Publishers.
2. J. S. Arora, Introduction to Optimum Design, McGraw Hill, New York
3. S. S. Stricker, Optimizing Performance of Energy Systems, Battelle Press, New York.
4. Ashok D. Belegundu and Tirupathi R. Chandrupatla Optimization concepts and applications in engineering

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Robotics and Sensors

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction**

Brief History, Basic concepts, Three laws of Robotics, Robot and Robotic mechanism, Automation and Robotics, Need for industrial Robots, Robot generations, Robot anatomy, Classification, Robot performance parameters, Socio-Economic aspects of Robotisation.

### Unit II

(08 Hours)

#### **Grippers**

Introduction, types of end effectors, types of grippers, tools as end effectors, Guidelines for design of robotic gripper, force analysis of mechanical pneumatic and hydraulic grippers. Robot Drives Introduction, Classification of Drives, Characteristics of Drives, Types of Drives, Comparison of Drive system, Actuation Schemes, Reduction and Transmission Systems.

(08 Hours)

### Unit III

#### **Sensors and Controllers**

Internal and external sensors, position, velocity and acceleration sensors, proximity sensors, force sensors, laser range finder. Robot vision: image processing fundamentals for robotic applications, image acquisition and pre-processing. Segmentation and region characterization object recognition by image matching and based on features.

### Unit IV

(08 Hours)

#### **Kinematics**

Introduction, Rotation and Transformation, Denavit-Hartenberg Parameters, Mapping revisited, Forward kinematics, Inverse kinematics.

### Unit V

(08 Hours)

#### **Vision System for Robotics**

Introduction, Need, Robot Vision System – Levels of processing, Functions of Machine Vision System, Image Acquisition, Sampling, Image Processing, Image Processing Technique, Edge detection, A typical vision system for robot, System hardware and function.

(08 Hours)

### Unit VI

#### **Robot Programming**

Robot languages: AL, AML, RAIL, RPL, VAL, Demonstration of points in space :  
Continuous path (CP), Via points (VP), Programmed points (PP).

**Text Books/ References**

1. Groover, Weiss, "Industrial Robotics", Tata McGraw-Hill.
2. Fu Ks, Re Congalez and CSG Lee, "Robotics- Control, Sensing, Vision and Intelligence", Tata McGraw Hill.
3. Koren Yoram, "Industrial Robotics", Tata McGraw-Hill.
4. Puranik M.T. and P.R.Ghorpade, "Robotics Fundamental", Nirali Publication, Pune.
5. Spong M.W., S. Huchrison and M. Vidyasagar, "Robot Modelling and Control", Willey-2006.
- 6.

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Rapid Prototyping

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction**

Need - Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital prototyping - Virtual prototyping-Rapid Tooling - Benefits- Applications, materials used in rapid prototyping

### Unit II

(08 Hours)

#### **Reverse Engineering and CAD Modeling**

Basic concept- Digitization techniques – Model Reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data Requirements – geometric modeling techniques: Wire frame, surface and solid modeling – data formats -Data interfacing, Part orientation and support generation, Support structure design.

(08 Hours)

### Unit III

#### **Liquid Based Rapid Prototyping**

Stereolithography (SLA): Apparatus: Principle, per-build process, part-building, post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications.

### Unit IV

(08 Hours)

#### **Solid Based Rapid Prototyping System**

Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications

### Unit V

(08 Hours)

#### **Powder Based Rapid Prototyping Systems**

Selective Laser Sintering(SLS): Principle, process, Indirect and direct SLS- powder structures, modeling of SLS, materials, post processing, post curing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping(LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

(08 Hours)

### Unit VI

## **Other Rapid Prototyping Technologies**

Three dimensional Printing (3DP):Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Examples and case studies

## **Text Books/ References**

1. Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F and Lim C.S., World Scientific Publishers, 2003.
2. Rapid prototyping, Andreas Gebhardt, Hanser Gardener Publications, 2003
3. Rapid Prototyping and Engineering applications : A tool box for prototypedevelopment, Liou W.Liou, Frank W.Liou, CRC Press, 2007.
4. Rapid Prototyping: Theory and practice, Ali K. Kamrani, Emad Abouel Nasr, Springer,2006.
5. Rapid Tooling: Technologies and Industrial Applications, Peter D.Hilton,Hilton/Jacobs, Paul F.Jacobs, CRC press, 2000

## **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Design for Manufacture

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction**

General design principles for manufacturability, strength and mechanical factors, mechanisms selection, evaluation method, geometrical tolerances, tolerance control and utilization. Economic Use of Raw Materials: Ferrous steel, hot rolled steel, cold finished steel, stainless steel, non ferrous materials aluminum, copper, brass, non metallic materials, plastics, rubber and composites

### Unit II

(08 Hours)

#### **Components Design I**

Metal extrusion, metal stamping, fine blanking, four slide parts, spring and wire forms, spun metal parts, cold headed parts, extruded parts, tube and section bends, rolled formed parts, power metal parts, forging electro forming parts, specialized forming methods, turned parts, machined round holes, drilled parts, milled parts.

(08 Hours)

### Unit III

#### **Components Design II**

Planned shaped and slotted parts, screw threaded contoured and internal ground parts, center less ground, electrical discharged, rolled furnished parts, electro chemical and advanced machine parts. Sand cast, die cast, investment cast and other cast products. Non Metallic Components Design Thermosetting plastic, injection moulded and rotational moulded parts, blow moulded, welded plastic articles, ceramics

### Unit IV

(08 Hours)

#### **Composite Materials**

Introduction, Classification of composites, Types of composite, Properties, Metal matrix composite, Ceramic matrix composite, Fiber Reinforced plastic, Manufacturing methods, Applications in Different field. Ceramic, Properties and applications of ceramics. Manufacturing of ceramics.

### Unit V

(08 Hours)

#### **Assembled Parts Design I**

Welded parts, arc, resistance, brazed and soldered parts, gear box assembly, bearing assembly.



(08 Hours)

## **Unit VI**

### **Assembled Parts Design II**

Retention, bolted connection, screwed connections, flanged connections, centred connections, press fitted connections, surface finishing, plated parts, heat treated parts, NC machining, group technology, low cost automation, computer aided manufacture, product design requirements.

### **Text Books/ References**

1. James G. Bralla, —Hand book of product design for manufacturing| McGraw Hill Co., 1986
2. K.G. Swift —Knowledge based design for Manufacture|, Kogan page Limited, 1987.
3. S H Avner, Physical Metallurgy, McGraw Hill Publication

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Theory of Elasticity & Plasticity

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### Basic Concepts of Stress

Definition, State of Stress at a point, Stress tensor, invariants of stress tensor, principle stresses, stress ellipsoid, derivation for maximum shear stress and planes of maximum shear stress, octahedral shear stress, Deviatoric and Hydrostatic components of stress, Invariance of Deviatoric stress tensor, plane stress.

### Unit II

(08 Hours)

#### Basic concepts of Strain

Deformation tensor, Strain tensor and rotation tensor; invariants of strain tensor, principle strains, derivation for maximum shear strain and planes of maximum shear strain, octahedral shear strain, Deviatoric and Hydrostatic components of strain tensor, Invariance of Deviatoric strain tensor, plane strain.

(08 Hours)

### Unit III

#### Generalized Hooke's Law

Stress-strain relationships for an isotropic body for three dimensional stress space, for plane stress and plane strain conditions, differential equations of equilibrium, compatibility equations, Material (D) matrix for Orthotropic Materials.

### Unit IV

(08 Hours)

#### True stress and true strain

Von-Mise's and Tresca yield criteria, Haigh-Westergard stress space representation of von - Mise's and Tresca yield criteria, effective stress and effective strain, St. Venants theory of plastic flow, Prandtl-Reuss and Levy-Mise's constitutive equations of plastic flow, Strain hardening and work hardening theories, work of plastic deformation.

### Unit V

(08 Hours)

#### Analysis methods

Slab method, Slip line field method, uniform deformation energy method, upper and lower bound solutions. Application of Slab method to forging, wire drawing, extrusion and rolling processes.

(08 Hours)

## **Unit VI**

### **Stresses in flat Plate**

Stresses in circular and rectangular plates due to various types of loading and end conditions  
buckling of plates

### **Text Books/ References**

1. Timoshenko and Goodieer, Theory of Elasticity, Mcgraw Hill Publications 3Rd Edition,
2. Madleson, Theory of Plasticity,
3. J. Chakrabarty, Theory of Plasticity, 2 nd edition, McGraw Hill Publications 1998
4. George E Dieter, Mechanical Metallurgy, McGraw Hill Publications 1988

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Design of Dies

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

#### Unit I

(08 Hours)

##### **Design principles**

Design principles for dies of thermo-plastic and thermo-setting components. Impression core cavities, strength of cavities, guide pillars and bushes, ejection systems, cooling methods, bolster types. Split moulds, methods of actuating the splits, moulds of threaded components, internal & external under cuts, moulds with under – feed systems. Design principles and standards for Transfer and compression moulding dies. Design of Tools: Mould for a spindle component with sleeve, pin ejection. Mould with splits Multi-cavity mould with stripper plate, inserts, and ejectors.

#### Unit II

(08 Hours)

##### **Specifications & Elements of Blow Moulding**

Determination of number of cavities, types of cooling system, design of cooling channels, heat transfer considerations, types of ejectors, determination of mould opening force & ejection force, use of CAD for mould design, defects and remedies

(08 Hours)

#### Unit III

##### **Design of Dies for metal mould Castings**

Design of Dies for metal mould Castings, Die casting, Shell moulding. Design of casting cavity, sprue, slug, fixed and movable cores, finger cam, core, pin, draft, ejector pins, ejector plate, gate, goose-neck, nozzle, over-flow, platen plunger, runner, slot, slide, vent, water line. Design of hot chamber, cold chamber machines, vertical, horizontal,, die locking machines, toggle and hydraulic systems, injection systems, rack and pinion, knockout pins and plates, hydraulic ejection, Other parts of die casting machines

#### Unit IV

(08 Hours)

##### **Design of various types of dies**

Design of various types of dies – Single cavity, multi cavity, combination, unit dies. Alignment of dies with sprue. Design approach for die elements. Selection of materials and heat treatment for die casting dies and elements – die casting alloys – types of die casting alloys, Case studies on executed dies and design details. Finishing, Trimming, and inspection. Gravity die casting – Die design with cores and inserts – Bulk forming tools. Mould flow analysis. Softwares used for Die Design.

#### Unit V

(08 Hours)

##### **Open die forging**

Open die forging, Advantages of open die forging over closed die forging. Calculation of allowances and tolerances. Methods of open die forging. Design of dies. Closed die forging. Preparation of material for forging. Calculation of raw-stock, cutting off, heating in furnaces. Allowances and tolerances for closed die forging as per IS: 3469 1974.

(08 Hours)

## **Unit VI**

### **Die blocks for forging operations**

Die blocks for forging operations. Design of fuller impression, Roller impression, Bender impression, Blocker impression, Finisher impression. Swaging tools. Planning layout of multi impression dies. Flash and cutter calculations –additional operations on forging, piercing, and trimming dies, coining dies. Horizontal forging machines. Design of upsetting dies. Calculations on upsetting dies

### **Text Books/ References**

1. Rusinoff S.E., Forging & Forming Metals, Taraporewala, Bombay, 1952.
2. Dochlar H.H., Die Casting Dies, McGrawhill, 1951.
3. I.S. Standards, BSI., New Delhi.
4. Pye R.G.W., Injection Mould Design, Longman scientific & Technical Publishers, London, 1989.

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Integrated Product Design & Development

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction**

Definition and morphology of product design (seven phases), standardization, simplification and specialization in product design, modern approaches-concurrent design and quality function deployment, product development, product development versus product design, types of design and redesign, modern product development process, product development team and product development planning with reference to ISO standard, difference between product verification and production validation.

### Unit II

(08 Hours)

#### **Product Development – Technical and Business Concerns**

Technology Forecasting and Technology S-Curve (Technology Stage), Mission Statement and Technical Questioning, Economic Analysis of Product, Customer Needs and Satisfaction, Customer Population and Market Segmentation, Customer Needs-Types and Models, Gathering Customer Needs Information, Analysis of Gathered Information.

(08 Hours)

### Unit III

#### **Product Development from Concept to Product Function**

Generating concepts, information gathering, and brainstorming, morphological analysis, concept selection-design evaluation, estimation of technical feasibility, concept selection process, Pugh's concept, selection charts, numerical concept scoring, process of concept embodiment, system modeling, FMEA, functional modeling and decomposition, fast method, subtract and operate procedure, establishing system functionality, augmentation and aggregation.

### Unit IV

(08 Hours)

#### **Product Development in the Context of Reverse Engineering**

Product Teardown Process, Tear Down Methods - Force Flow Diagrams, Measurement and Experimentation, Applications of Product Teardown, Benchmarking Approach and Detailed Procedure, Tools Used In Benchmarking -Indented Assembly Cost Analysis, Function - Form Diagrams, Trend Analysis, Setting Product Specifications, Introduction to Product Portfolio and Architecture.

### Unit V

(08 Hours)

#### **Design for Manufacture, Assembly and Environment**

Design guidelines, design for manufacture, design for assembly, design for piece part production,

manufacturing cost analysis, need and importance of design for environment, global, local and regional issues, basic DFE methods-guidelines and applications, life cycle assessment - basic method, weighed sum assessment method, life cycle assessment method, DFX, product testing, product validation, field trials, virtual trials, iterations.

(08 Hours)

## **Unit VI**

### **Product development Methodology:**

Integrated product development process invariant, Integrated product development process, steps in IPD methodology, Product requirement planning and management, problem identification and solving methodology

### **Text Books/ References**

1. K. Chitale; R.C. Gupta, Product Design and Manufacturing, Prentice - Hall India.
2. Effective Product Design and Development, Stephen Rosenthal, Business One Orwin, Homewood, 1992, ISBN, 1-55623-603-4
3. Tool Design – Integrated Methods for successful Product Engineering, Stuart Pugh, Addison Wesley Publishing, New York, NY, 1991, ISBN 0-202-41639-5
4. Concurrent Engineering Fundamentals volume II Integrated Product development, Biren Prasad, Prentice Hall International series in Industrial and system Engineering
5. Product Design and Development, Karl T. Ulrich and Steven D. Eppinger, McGraw – Hill International Edns. 1999
6. Dieter George E., Engineering Design McGraw Hill Pub. Company, 2000
7. Kevin Otto and Kristin Wood, Product Design: Techniques in Reverse Engineering and New Product Development, Pearson Education Inc.
8. Grieves, Michael, Product Lifecycle Management McGraw-Hill, 2006. ISBN 0071452303
9. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub. 1986

### **Syllabus for Unit Test**

Unit Test I	Unit I, II, III
Unit Test II	Unit IV, V, VI

## Self Study Paper II : Design for Manufacturing & Assembly

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction**

Design philosophy – steps in Design process – General Design rules for manufacturability – basic principles of designing for economical production –creativity in design. Application of linear & non-linear optimization techniques. Materials: Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts. Philosophy for design for X.

### Unit II

(08 Hours)

#### **Machining Process**

Overview of various machining processes – general design rules for machining -Dimensional tolerance and surface roughness – Design for machining – Ease –Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

(08 Hours)

### Unit III

#### **Metal Casting**

Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

### Unit IV

(08 Hours)

#### **Metal joining**

Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints. Forging – Design factors for forging – Closed die forging design – parting lines of dies drop forging die design – general design recommendations

### Unit V

(08 Hours)

#### **Extrusion and sheet Metal work**

Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, and Deep Drawing – Keeler Goodman Forming Line Diagram –Component Design for Blanking.

(08 Hours)



## **Unit VI**

### **Plastics**

Visco-elastic and creep behavior in plastics – Design guidelines for Plastic components – Design considerations for Injection Moulding – Design guidelines for machining and joining of plastics Assembly: Compliance analysis and interference analysis for the design of assembly Design and development of features for automatic assembly – liaison diagrams. Influence on the productivity and cost.

### **Text Books/ References**

1. A K Chitale, R C Gupta “ Product Design and Manufacturing”, PHI, New Delhi, 2003
2. George E Deiter, “Engineering Design”, Mc GrawHills Intl, 2002.
3. John Cobert, “Design for Manufacturing”, Addison Welsely, 2000.
4. Surender Kumar and Gautham S., “ Design and Manufacturing”, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 1998.
5. Material Selection and Design Handbook, Vol – 20, ASM International, 1997.

### **Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## Self Study Paper II : Concurrent Engineering

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Total Credits : 04

### Unit I

(08 Hours)

#### **Introduction:**

Background and challenges faced by modern production environment, sequential engineering process, Concurrent engineering definition and requirement, meaning of concurrent objectives of CE, benefits of CE. Sequential engineering.

### Unit II

(08 Hours)

#### **Product Life Cycle Management :**

Life cycle design of products, life cycle costs. Support for CE: Classes of support for CE activity, CE organizational, structure CE, team composition and duties, Computer based Support, CE Implementation Process.

(08 Hours)

### Unit III

#### **Quality Function Deployment:**

Industrial Design, Quality Function Deployment, house of quality, Translation process of quality function deployment (QFD). Modeling of Concurrent Engineering Design: Compatibility approach, Compatibility index, implementation of the Compatibility model, integrating the compatibility Concerns.

### Unit IV

(08 Hours)

#### **Design for Manufacture (DFM):**

Introduction, role of DFM in CE, DFM methods, e.g. value engineering, DFM guidelines, design for assembly, creative design methods, product family themes, design axioms, Taguchi design methods, Computer based approach to DFM. Evaluation of manufacturability and assimilability

### Unit V

(08 Hours)

#### **Quality by Design:**

Quality engineering & methodology for robust product design, parameter and Tolerance design, Quality loss function and signal to noise ratio for designing the quality, experimental approach.

(08 Hours)

**Unit VI**

**Design for X-ability:**

Design for reliability, life cycle serviceability design, design for maintainability, design for economics, decomposition in concurrent design, concurrent design case studies.

**Text Books/ References**

1. Concurrent Engineering- Kusiak - John Wiley & Sons
2. Concurrent Engineering- Menon - Chapman & Hall
3. David M. Anderson, Design For Manufacturing And Concurrent Engineering, CIM press, 2004
4. G. H. Haung, Design for X: Concurrent Engineering Approach, Chapman & Hall, 1996.
5. Shina, S.G., Concurrent Engineering and Design for Manufacture of Electronics Products, Van Nostrand Reinhold, New York, 1991.

**Syllabus for Unit Test**

Unit Test I	Unit I,II,III
Unit Test II	Unit IV,V,VI

## DISSERTATION STAGE II

### TEACHING SCHEME

Practicals : 10 Hrs/week

### EXAMINATION SCHEME

Term Work : 150 Marks  
Pract/Oral : 75 Marks  
Total Credits : 32

### Stage-II:

This stage will include comprehensive report on literature survey, design and fabrication of experimental set up and / or development of model, relevant computer program. The student is require to publish at least one national/international paper based on the dissertation work. The publication / accepted paper for publication shall be included in the report.

Student has to submit the authentic copy of dissertation Stage-I report.

**Bharati Vidyapeeth University**  
**College of Engineering**  
**Department of Civil Engineering**

**Proposed Structure of M.Tech (Civil – Hydraulic Engineering) 2015**  
**Based on Choice Based Credit System**

Semester I										Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18		
Subjects	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
Advanced Fluid Mechanics	04	02	60	20	10	10	25	25	150	04	01	05
Irrigation Water Management	04	02	60	20	10	10	25	25	150	04	01	05
Computational Methods in Hydraulic Engineering	04	--	60	20	10	10	-	-	100	04	-	04
Hydrology	04	--	60	20	10	10	-	-	100	04	-	04
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>500</b>	<b>16</b>	<b>02</b>	<b>18</b>

Semester II										Total Duration: 20 hrs/week		
										Total Marks :500		
										Total Credits: 18		
Subjects	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Oral	Total Marks	TH	TW &OR	Total Credits
Sediment Transport & River Engineering	04	02	60	20	10	10	25	25	150	04	01	05
Hydraulic Structures	04	--	60	20	10	10	--	--	100	04	-	04
Open Channel Flow	04	--	60	20	10	10	--	--	100	04	-	04
Optimization Techniques in Hydraulics	04	02	60	20	10	10	25	25	150	04	01	05
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>500</b>	<b>16</b>	<b>02</b>	<b>18</b>

Semester III										Total Duration: 28 hrs/week Total Marks : 475 Total Credits: 40		
Subject	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
Elective –I	04	02	60	20	10	10	25	25	150	04	01	05
Elective –II	04	02	60	20	10	10	25	25	150	04	01	05
**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	100	04	-	04
Seminar	-	05	-	-	--	--	25	25	50	-	05	05
Dissertation Stage –I	-	07	-	-	---	--	25	--	25		21	21
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>475</b>	<b>12</b>	<b>28</b>	<b>40</b>

Elective – I	Elective – II
<ul style="list-style-type: none"> <li>Coastal Engineering</li> <li>Hydraulic Modeling Techniques</li> </ul>	<ul style="list-style-type: none"> <li>Water Power Engineering</li> <li>Environmental Fluid Mechanics</li> <li>Numerical Methods in Hydraulic Engineering</li> </ul>

Semester IV										Total Duration: 14hrs/week Total Marks : 325 Total Credits: 34		
Subject	Teaching Scheme (Hrs/Week)		Examination Scheme (Marks)							Examination Scheme (Credits)		
	L	P	Theory	Unit Test	Attendance	Tutorial /assignments	TW	Oral	Total Marks	TH	TW & OR	Total Credits
**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	100	04	-	04
Dissertation Stage –II	-	10	-	-	--	-	150	75	225		30	30
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>325</b>	<b>04</b>	<b>30</b>	<b>34</b>

### List of Self Study Papers

Sr.No	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
	1	Water Resources Planning and Management
2	Ground Water Hydrology	Urban Water Management
3	Instrumentation in Hydraulics	River Engineering
4	Disaster Management	Planning of Ports
5	Operation and Maintenance of Hydraulic Structures	Soil conservation and Watershed Management
6	Application of Remote Sensing To Water Resources	Reservoir Sedimentation
7	Floods and Flood management	Tides and Tidal Hydraulics
8	Environmental Impact assessment for Water Resources Projects	Dam break analysis



## **SEMESTER I**

# 1: ADVANCED FLUID MECHANICS

## TEACHING SCHEME

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

## EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Term Work : 25 Marks  
Oral. : 25 Marks  
Credits : 5

### Unit-I

(08 Hours)

Kinematics of Flow: Flow visualization, stream lines, streak lines, path lines, continuity equation in cartesian and cylindrical polar coordinates system, accelerations, rotation, vorticity.

### Unit-II

(08 Hours)

Velocity potential and stream function, flow-net, Laplace equation and its solution by graphical and relaxation methods, simple flow patterns.

### Unit-III

(08 Hours)

Dynamics of Flow: Integration of Euler's equation along streamline and in cartesian coordinate system. Bernoulli's equation, momentum equation, applications of energy and momentum equations to different problems.

### Unit-IV

(08 Hours)

Navier-Stokes equations for incompressible fluids, Stokes law, creeping flow, Helle-shaw motion, flow between parallel plates, flow near suddenly accelerated plate, flow in a circular pipe. Review of dimensional analysis, drag on immersed bodies.

### Unit-V

(08 Hours)

Boundary layer on flat plate, b. L. equations, Blasius solution, Karman's momentum and Integral equation, laminar and turbulent boundary layers, transition mechanisms, b.L.separation

### Unit-VI

(08 Hours)

Turbulent Flow: Nature of turbulence, scales of turbulence, different averages, Reynolds rules of averaging, Reynolds equations, statistical approach, isotropic and homogeneous turbulence, spectrum of turbulence.

## Text Books / References

Shames, "Mechanics of Fluids", McGraw Hill  
Rouse H. Ed, "Advanced Fluid Mechanics", John Wiley, 1959  
Schlichting H., "Boundary Layer Theory", McGraw Hill series in Mechanical Engineering  
Garde R. J., "Turbulent Flow", New Age Publisher, New Delhi, 1994  
Garde R. J., Mirajgaoker A. G., "Engineering Fluid Mechanics", SciTech Publisher, Chennai, 2004

## Syllabus for Unit Test

Unit Test 1  
Unit Test 2

Units I , II & III  
Units IV, V & VI

## 2: IRRIGATION WATER MANAGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
T. W. : 25 Marks  
Or. : 25 Marks  
Credits : 5

#### Unit – I

(08 Hours)

Soil Plant water relationship-Water relation of soils, Soil moisture and plant growth, estimating water requirement of crops, evapotranspiration and consumptive use , soil water availability to plants..

#### Unit – II

(08 Hours)

Water Application methods- Surface and sub surface irrigation methods ,Border Irrigation, Check basin, Furrow, Sprinkler and drip irrigation. Prospective new methods of irrigation

#### Unit – III

(08 Hours)

Design of drip and sprinkler irrigation systems-Hydraulic design of various Components of Drip and sprinkler Irrigation

#### Unit – IV

(08 Hours)

Measurement of Irrigation Water-Variou methods, Weirs, Parshall flumes, orifices, meter gates, tracer method. Irrigation efficiency, components of project irrigation efficiency, efficiency of irrigation practices, water use and operation of irrigation system..

#### Unit – V

(08 Hours)

Scheduling of irrigation , time of irrigation ,frequency and interval of irrigation ,Water conveyance and control-Surface water distribution system, under ground Pipe line Irrigation distribution system.

#### Unit VI

(08 Hours)

Study Salt problems in Irrigated Agriculture-Salt balance, Quality of irrigation water, Plant response to saline and alkali soils, Reclamation and management of salt affected soils, Case studies.

### Text Books / References

Irrigation Theory and Practice –A.M.Michael, Vikas Publishing House.  
Irrigation Engineering- G.L. Asawa, Wiley Eastern Ltd.  
Irrigation water management- D.K.Majumdar. PHI Pvt. Ltd, 2013

### Syllabus for Unit Test

Unit Test 1  
Unit Test 2

Units I, II & III  
Units IV, V & VI

### 3: COMPUTATIONAL METHODS IN HYDRAULIC ENGINEERING

#### TEACHING SCHEME

Lectures : 04 Hrs/Week

#### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit-I

(08 Hours)

Complex Variables: Function of complex variables, Analytic function, Cauchy-Riemann equations (Cartesian and polar form), Harmonic functions, Construction of Analytic function, Milne-Thompson method.

#### Unit-II

(08 Hours)

Complex Variables: Transformations or Mapping, Conformal mapping, Bilinear transformations, The Schwarz-Christoffel transformation, Complex Integration, Cauchy's Integral theorem, Cauchy's Integral formula, Residue theorem, Taylor's and Laurent's series. Applications to boundary value problems.

#### Unit-III

(08 Hours)

Numerical Solution of Partial Differential Equations: Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems. System of Linear equations- Jacobi, Gauss Seidel, Relaxation methods.

#### Unit-IV

(08 Hours)

Numerical Methods: Curve fitting : Method of least squares, Straight line, Second degree parabola, Exponential curve. Numerical Integration-General Quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule, Newton-Cotes Integration formulae, Gauss-Quadrature two point and three points formulae.

#### Unit-V

(08 Hours)

Statistics: Measure of central tendency, measures of dispersion, Moments, Skewness and Kurtosis. Coefficient of Correlation and Regression, Multiple and Partial Correlation coefficient, Reliability of regression estimates (standard error of estimates).

#### Unit-VI

(08 Hours)

Probability : Classical definition of probability, Addition and multiplication theorem of probability, Conditional Probability, Random variable, discrete and continuous random variables, Binomial, Poisson, Normal, Geometric, Exponential Beta, Gamma Distributions, Sampling distributions, Testing of Hypothesis, Large sample tests for means and proportions, small sample tests based on Chi-square test of goodness of fit and independence of attributes.

#### Text Books / References

Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd. Mumbai  
Wylie C. R., Barret L. C., "Advanced Engineering Mathematics", McGraw-Hill  
B.S.Grewal, "Engineering Mathematics" (Khanna Publications, Delhi)  
P.N.Vertikar & J. N. Vertikar, "Applied Mathematics"(Volume I & II) , P.V.G.Publications, Pune.

Murray R. Spiegel, "Schaum's Outline of theory and problems of "Complex Variables", McGraw Hill Book Company

S. C. Gupta & V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand & Sons , Delhi

S.S. Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall of India Pvt. Ltd., New Delhi

Irwin Miller & John E. Freund, "Probability & Statistics For Engineers", Prentice Hall of India Pvt. Ltd., New Delhi

#### Syllabus for Unit Test

Unit Test 1

Units I , II & III

Unit Test 2

Units IV, V & VI

## 4: HYDROLOGY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit-I (08 Hours)

Forms of precipitation, hydrologic cycle, climate and seasons in India. Water availability in India and world. Methods of measuring precipitation, location of rain gauge, rainfall mass curve and rainfall hyetograph, intensity-duration-frequency analysis, depth-area-duration analysis, PMP,

#### Unit-II

Evaporation , Evaporimeters, empirical evaporation equations, empirical method of evaporation estimation, Evapotranspiration , Measurement of evapotranspiration, evapotranspiration equations , Infiltration , Infiltration capacity, measurement of infiltration, modeling infiltration capacity , infiltration indices.

#### Unit-III (08 Hours)

Runoff: runoff components, factors affecting runoff, basin yield, runoff-rainfall relations.

Data Analysis: Correlation, regression analysis, transformations, stochastic process, and time series analysis ,auto correlation analysis and synthetic flow generation models using random variates.

#### Unit-IV (08 Hours)

Unit Hydro graph, S-curve and IUH, Cleark's method of IUH. Synthetic Unit-hydrograph. Floods: Frequency analysis, normal, log-normal and Gumbel's distributions, envelope curves, empirical formulae and regional flood frequency analysis.

#### Unit-V (08 Hours)

.Flood Routing- Introduction , basic equations, Hydrologic/ storage routing in reservoir and channels, Hydraulic methods of flood routing, Simple cases.

#### Unit-VI (08 Hours)

Ground Water Hydraulics: Types of aquifers, distribution of surface and sub surface water in global and Indian context, Darcy's law, Dupuits assumptions, application of Darcy's law to simple flow systems, differential equation for confined and unconfined aquifers, wells fully and partially penetrating, multiple wells, interference of wells, pumping test with steady and unsteady flow. Ground Water Development: Ground water exploration, types of wells, construction and design of wells, screens, pumping equipment, ground water quality, ground water pollution

### Text Books / References

P. Jayarami Reddy, "Textbook of Hydrology", Laxmi Publication, New Delhi

P. Jayarami Reddy, "Stochastic Hydrology", Laxmi Publication, New Delhi

R. H. Mccuen and W. M. Snyder, "Hydrologic Modelin Statistical Methods and Applications"  
Prentice Hall, New Jersey, U. S. A

K. N. Mutreja, "Applied Hydrology", Tata McGraw Hill Publication

V.T.Chow, "Applied Hydrology", Tata McGraw Hill Publication

Raghunath H. M., "Ground water", New Age International Publication  
Linsely ,Kohler ,Pauhlas, Applied Hydrology, Mcgraw hill Publishers.

**Syllabus for Unit Test**

Unit Test 1

Units I , II & III

Unit Test 2

Units IV, V & VI

## **SEMESTER II**



## 5 : SEDIMENT TRANSPORT AND RIVER ENGINEERING

### TEACHING SCHEME

Lectures : 04 Hrs/week  
Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
T.W. : 25 Marks  
Oral : 25 Marks  
Credits : 5

#### Unit-I (08 Hours)

Introduction: Sediment problems, significant sediment properties, beginning of sediment movement – Shields analysis, critical tractive stress of non uniform materials.

#### Unit-II (08 Hours)

Bed Forms and Resistance: Description of bed forms, flow regimes, their significance, resistance analysis, different resistance laws.

#### Unit-III (08 Hours)

Modes of sediment transport, bed load transport, Dubuoy's equation. Einstein's approach, Meyer Peter and Muller's equation, suspended load transport, total load transport microscopic and macroscopic methods.

#### Unit-IV (08 Hours)

Design of stable channels: Regime method, Kennedy's method, Lacey's method, Blench and Simons-Albertson method and tractive force approach.

#### Unit-V (08 Hours)

Sediment Measurement: Bed load measurement, suspended load measurement, erosion from catchments, aggradation, degradation, silting of reservoirs, scour around bridge piers in uniform and non-uniform sediments.

#### Unit-VI (08 Hours)

Planforms and their prediction, river channel dimensions and their analysis, river training: objectives of river training, methods of river training by guide banks, spurs, levees, cut offs, pitched island and vanes, methods of bank protection.

### Text Books / References

Garde R. J., Ranga Raju K. G., "Mechanics of Sediment Transportation and Alluvial Stream Problems", New Age International (P) Limited, New Delhi, 2004  
Garde R. J., "River Morphology", New Age International (P) Limited, New Delhi, 2006

### Syllabus for Unit Test

Unit Test 1	Units I , II & III
Unit Test 2	Units IV, V & VI

## 6: HYDRAULIC STRUCTURES

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit-I

(08 Hours)

Gravity Dams-Concrete, masonry , Forces acting on a gravity dam, earthquake force-pseudo static and dynamic response approach, load classification, stability analysis, distribution of shear and normal stresses, principal stresses .

#### Unit-II

(08 Hours)

Stress concentration around opening, foundation treatment, use of colgrout masonry in gravity dams, Roller Compacted Concrete Dams: Materials for R.C.C mixture, design concepts, construction methods, advantages.

#### Unit-III

(08 Hours)

Earth Dam: Cross section of earth dam, Seepage through dam and its foundation, stability analysis for sudden draw down condition and steady seepage condition, during construction stages.

#### Unit-IV

(08 Hours)

Seismic effects, pore pressure, protection of upstream and down stream slopes, design of filters. Rock fill Dams: Relevant rock fill characteristic, general design principles, method of construction and compaction.

#### Unit-V

(08 Hours)

Spill ways: Determination of capacity, types of spillways, ogee, siphon, chute, side, shaft, orifice spillway and stepped spillway, their hydraulic design, crest profile, energy dissipaters and divide walls.

#### Unit-VI

(08 Hours)

Spillway gates: Vibration, types of gates, radial, drum, vertical lift and automatic gates. Instrumentation in Dams: necessity, measurements and their purpose, planning of installation of instruments. Weirs and Barrages, water bridges and culverts ,design concepts .

### Text Books / References

Bharat Singh,Varshney R.S.“Engineering of Embankment Dams”, Oxford & IBH Publishing Co.,1995.

Thomas, “The Engineering of Large Dams”, John Wiley & Sons

Varshney R. S., “Concrete Dams”, Oxford and IBH Publishing Co.

Vishcher D. L. and Hager W. H.,“Dam Hydraulics”,John Wiley & Sons

“Design of Small Dams”, USBR Oxford IBH Publishers

USBR Monogram -25, Stilling basins.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

## 7: OPEN CHANNEL FLOW

### TEACHING SCHEME

Lectures : 04 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

- Unit-I** (08Hours)  
Basic Concepts of Fluid Flow: Classification of flow, differential form of continuity and momentum equations, energy equation, energy and momentum correction coefficients, pressure variation in vertical.
- Unit-II** (08 Hours)  
Steady Uniform Flow in Rigid Boundary Channels: Shear stress on the boundary, velocity distribution in the vertical, resistance laws and their limitations, Stickler's equation, conveyance and section factor.
- Unit-III** (08 Hours)  
Specific energy, specific force and critical depth, control section, applications of specific energy and critical depth concepts.
- Unit-IV** (08 Hours)  
Gradually varied flow, governing equations, classification of surface curves, computation of gradually varied flow in prismatic and non-prismatic channels, graphical, direct and numerical integration methods
- Unit-V** (08 Hours)  
Rapidly varied flow and application of momentum equation, hydraulic jump in horizontal and sloping rectangular channels, location and length of jump.
- Unit-VI** (08 Hours)  
Unsteady flows : Waves and classification, celerity of waves, surges , equations of motion, and method of characteristics.

### Text Books / References

K .G. Ranga Raju, "Flow Through Open Channels", Tata McGraw Hill Publication 1993

Chaudhry M.H., 'Open channel flow', Springer, New York, 2007.

F. M. Henderson, "Open Channel Flow", The McMillan Company, N. Y., 1966

K. Subramanya, "Flow in Open Channels", Tata McGraw Hill Publication, 1990

V. T. Chow, "Open Channel Flow", McGraw Hill Publication, 1990

Garde R. J. & Mirajgaokar, "Engineering Fluid Mechanics", SciTech Publishers, Chennai , 2004

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 8: OPTIMIZATION IN HYDRAULICS

### TEACHING SCHEME

Lectures : 04 Hrs/week  
Practicals : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Marks : 40 Marks  
Term Work : 25 Marks  
Oral. : 25 Marks

**Unit-I** (08 Hours)  
Concept and need of Optimization; Linear Programming: Formulation of problem, graphical solutions, simplex method, Big M method, Two-phase method, duality.

**Unit-II** (08 Hours)  
Transportation problems-BFS-Optimality test, maximization problems. Assignment Problems - minimization, maximization.

**Unit-III** (08 Hours)  
Nonlinear Programming: Unconstrained one dimensional search methods - Dichotomous search, Fibonacci, golden section; Multivariable unconstrained methods-gradient techniques, steepest ascent, descent methods, Newton's method .

**Unit-IV** (08 Hours)  
Nonlinear Programming :Constrained method : Lagrangian multiplier techniques, Khun- Tuckers conditions, Dynamic Programming: Principle of optimality, recursive equation.

**Unit-V** (08 Hours)  
Introduction to genetic algorithms, simulated annealing, neural networks and fuzzy systems for solving optimization problems.

**Unit-VI** (08 Hours)  
Model formulation and case studies : Conjunctive use of ground water and surface water, hydropower optimization, crop yield optimization, multi-basin and multi-reservoir systems.

### Text Books / References

Rao S.S., 'Engineering Optimization -Theory and Practice', New Age International(P) Ltd., 1914.  
Taha H.A., "Operation Research - An Introduction", Prentice - Hall, 2009.  
Wagner, H. M., 'Principles of Operations Research', Prentice - Hall, 1975.  
Vedula S. and Mujumdar P. P.'Water resources engineering', Tata McGraw Hill Education, 2005.  
Deb Kalyanmoy. 'Optimization for Engineering Design - Algorithms and Examples' PHI Learning (P) Ltd, 2012.  
Louks D. P, Stedinger J. R. and Haith D. A., Water Resources Systems Planning and Analysis, Prentice Hall, Inc. Engelwood Cliffs, 1981.

### Syllabus for Unit Test

Unit Test 1 Units I , II, III  
Unit Test 2 Units IV, V, VI

## SEMESTER III

## 9 : ELECTIVE I: COASTAL ENGINEERING

### TEACHING SCHEME

Lectures : 04 Hrs/week  
Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Termwork : 25 Marks  
Oral : 25 Marks  
Credits : 5

#### Unit-I

(08 Hours)

Basic understanding of wave mechanics including wave generation, propagation, form and assessment in the surf zone. Statistical and spectral analysis of recorded wave data and prediction in coastal zone.

#### Unit-II

(08 Hours)

Global tidal cycle, tidal analysis. Types of tides, effect of tides, significance in coastal engineering, Coastal process-erosion/accretion due to waves, estimation of littoral drift, Effect of construction of coastal structures on stability of shoreline / beaches, shoreline configuration

#### Unit-III

(08 Hours)

Introduction to Coastal structures:, Design criteria and functional aspects of coastal structures: sea wall, revetment, bulk-head, quay- wall, jetties, breakwater types : rubble-mound, composite, floating and pneumatic types, design of RBW , offshore structures: oil platform, design criteria for sub marine pipelines, cables, response of oil platform members , floating structure to wave load –vibration and spacing of piles, forces on piles.

#### Unit-IV

(08 Hours)

Dredging technology: types of dredgers, Radio active tracers studies for feasibility of dumping ground for dredged materials- environmental aspects of dredging etc.

#### Unit-V

(08 Hours)

Planning and management of port and Harbors, Modern trends and techniques in port engineering.- Roll on-Roll off/ Lift on –Lift off etc. Special purpose ports: Concepts of twin /mother port, SBM , outer to outer port etc. Significance of port cost analysis economics.

#### Unit-VI

(08 Hours)

Pollution in Coastal zone, disposal of waste/dredged spoils, design criteria of coastal outfall inlets and system. Oil spills and contaminants, coastal zone management: activities in coastal zone, CRZ, Issues related to Integrated coastal zone management. Coastal regulation zone.

### Text Books / References

Basic Coastal Engineering-R.M.Sorensen,2006.  
Coastal Hydrodynamics-J.S.Mani ,I IT Madras  
Shore Protection Manual-U.S.Waterways Experiment Station Corps of Engineer,  
Coastal Protection Manual 2002.  
Narasimhan and S. Kathirolu, “ Harbour and Coastal Engineering”, Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai

### Syllabus for Unit Test

Unit Test 1  
Unit Test 2

Units I, II & III  
Units IV, V & VI

## 9 : ELECTIVE I : HYDRAULIC MODELLING TECHNIQUES

### TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Term work : 25 Marks

Oral : 25 Marks

Credits : 5

### Unit-I

Dimensional analysis: Units, dimensions of physical quantities, different methods of obtaining dimensionless parameters viz., Rayleigh's method, method of repeating variables, Buckingham  $\pi$  theorem, Reynolds number, Froude number, Mach number, Euler Number and Weber number.

### Unit-II

(08 Hours)

Determination of scales for models, Necessity of distortion of scales, scale effects. Movable bed models. Construction and operation of hydraulic models. Wind tunnels, flumes-2D, comprehensive models-3D.

### Unit-III (08 Hours)

Measuring Equipments: Flumes, Weirs, flow meters, pressure transducers, hot film anemometer, Current meter, Laser Doppler, pointer gauges.

### Unit-IV

(08 Hours)

Application to coastal and tidal problems. Design of Regular & Random (3D and 2D) wave modelling techniques, stability of coastal structures, Simulation of littoral drift, Design of sand trap, Distorted scale tidal modelling technique (rigid/movable) for Estuarine Ports,

### Unit-V

(08 Hours)

Rigid bed models and movable bed models, bank protection works, barrages and weirs, canal offtakes, power intakes, gates, bridges and intakes. Applications for structures in hilly regions – Dams, spillways and energy dissipaters, combination of rigid and movable bed models, sedimentation and flushing of reservoirs.

### Unit-VI (08 Hours)

Introduction to basic mathematical modelling techniques for hydraulic phenomena & processes related to various hydraulic structures, Advantages & limitations for interpretation of the results, need of validation with field/prototype data- Typical case studies using software.

### Text Books / References

“Langhaar- Dimensional Analysis”

Hydraulic Modeling”, IAHR Bulletin no 7

“Fluid Mechanics”, Dr. R. J. Garde Scitech Publications Chennai

River behaviour control and training-CBIP Publications (60) revised no (279)

Narasimhan and S. Kathirolu, “ Harbour and Coastal Engineering”, Vol I&II, Ocean and Coastal Engineering Publication, NIOT, Chennai

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI



## 10 : ELECTIVE II WATER POWER ENGINEERING

### TEACHING SCHEME

Lectures : 04 Hrs/week  
Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Term work : 25 Marks  
Oral : 25 Marks  
Credits : 5

#### Unit -I (08 Hours)

Classification of Hydropower plants, low & high head plants. Run of river plants, High head diversion plants, pumped storage plants, Electrical load on turbines load factor, power factor, capacity factor, load duration curve, firm power, secondary power.

#### Unit -II (08 Hours)

Assessment of available power, Essential stream flow data for water power studies flow duration curves, Intakes structures, location and intake type, shape of inlet, aeration in inlets, design of intake, sediment exclusion arrangement.

#### Unit -III (08 Hours)

Penstocks and Accessories, classification of pen stocks, design criteria for penstocks, Economical diameter of penstocks, Anchor blocks, conduit valves, Bends & manifolds.

#### Unit -IV (08 Hours)

Water hammer and surges, channel surges, water hammer, resonance in penstocks. Function of surge tank, Types of surge tanks, Differential surge tanks.

#### Unit -V (08 Hours)

Turbines- Type of turbines, Hydraulic features, Turbine size, lay out arrangements, Hydraulics of turbines, draft turbines, cavitation in turbines, characteristics of turbines.

#### Unit -V (08 Hours)

Planning of power house – Power house structure, under ground power station, components of under ground power house, types of layouts, small scale Hydropower, Potential of small scale Hydropower.

### Text Books / References

Dandekar M.M., K.N.Sharma “Water Power Engineering “ Vikas Publishing house.  
Varshney R.S.”Hydro power Structures” Nemchand & Bros, Roorkey.

### Syllabus for Unit Test

Unit Test 1	Units I, II & III
Unit Test 2	Units IV, V & IV

## 10 : ELECTIVE II: NUMERICAL METHODS IN HYDRAULIC ENGINEERING

### TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Term work : 25 Marks

Oral : 25 Marks

Credits : 5

### Unit-1

(08 Hours)

Governing equations of 1-D and 2-D unsteady flow : St. Venant equations, Boussinesq equations, groundwater flow equations and boundary conditions.

### Unit-2

(08 Hours)

Numerical method for one dimensional flow : Method of characteristics, characteristics, initial and boundary conditions, characteristic grid method, method of specified intervals, other numerical methods.

### Unit-3

(08 Hours)

Numerical method for one dimensional flow : Finite difference method, explicit finite difference schemes, implicit finite difference schemes, stability.

### Unit-4

(08 Hours)

Numerical method for two dimensional flow : Finite difference method, explicit finite difference schemes, implicit finite difference schemes, stability.

### Unit-5

(08 Hours)

Numerical method for ground water flow : Explicit finite difference method, Implicit finite difference method, finite element method, application.

### Unit-6

(08 Hours)

Applications of unsteady flows using commercial 1-D and 2-D software.

### References

Chaudhry M. Hanif, Open Channel Flow, Spinger, 2007.

Abbott M. B. and Minns A. W., Computational Hydraulics, Gower Technical, 1998.

Vreugdenhil, C. B., Computational Hydraulics, 1989.

Fenton, J., Computational Hydraulics, 2010

Popescu I., Computational Hydraulics, Numerical methods and modelling paperback, IWA Publishing, 2014.

Rastogi A. K., Numerical ground water hydrology, Penram, 2007.

Pinder G. F. and Gray W. G., Finite Element Simulation in Surface and Subsurface Hydrology, 1977.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 10 ELECTIVE II: ENVIRONMENTAL FLUID MECHANICS

### TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Term work : 25 Marks

Oral : 25 Marks

Credits : 5

### Unit-I

(08 Hours)

Global wind currents, atmospheric boundary layer, simulation of boundary layer in wind tunnel and applications to forces on structures, use of wind tunnel for studying dispersion, diffusion. Cyclones, anti cyclones, and tornadoes, Tsunami.

### Unit-II

(08 Hours)

Waves, deep and shallow water waves, braking of waves, littoral drift and sediment transport by waves, dispersion and diffusion in coastal waters, ocean out falls.

### Unit-III

(08 Hours)

Vortex formation at intakes, similarity criteria, hydraulic design of sumps, design of water intakes.

### Unit-IV

(08 Hours)

Heated water disposal in reservoirs and channels, mathematical considerations, solution techniques, physical modeling.

### Unit-V

(08 Hours)

Thermal plumes, dispersion and diffusion in atmosphere.

### Unit-VI

(08 Hours)

Problem and numerical solution.

Dam break

### Text Books / References

Fisher H. B., List E. J., Imberger J. and Brooks N.H., "Mixing of Inland and Coastal Waters, Academic Press, NY, 1979

Bernard Le, Mehaute, "Introduction to Hydrodynamics and Water Waves, Springer-Verlag", NY, 1996

Khauss J., "Swirling Flow Problems at Intakes, Hydraulic Structure Design Manual-I", IAHR, Ed. 1987

Fredsoe J and Deigaard R., "Mechanics of Coastal Sediment Transport"

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## **11 SELF STUDY PAPER I**

## **12 SEMINAR**

### **TEACHING SCHEME**

Practical : 01 Hrs/week

### **EXAMINATION SCHEME**

Term work : 25 Marks:

Oral : 25 Marks

Credits : 5

Each student will select a topic in the area of Hydraulic Engineering keeping track of the recent technological trends and developments. Students will make a seminar presentation using audio visual aids and submit the seminar report in the form of bound journal.

## **13 DISSERTATION STAGE I**

### **TEACHING SCHEME**

Practical : 02 Hrs/week

### **EXAMINATION SCHEME**

Term work : 25 Marks

Credits : 21

Dissertation stage-I will include identification of problem, preparation of synopsis literature survey and formulation of problem.

## SEMESTER IV

## **14 : SELF STUDY PAPER II**

## **15 : DISSERTATION STAGE II**

### **TEACHING SCHEME**

Practical : 04 Hrs/week

### **EXAMINATION SCHEME**

Term work : 150 Marks

Oral : 75 Marks

Credits : 30

Dissertation stage-II will include experimentation, data analysis and submission of final report.

## 11 : SELF STUDY PAPER I: WATER RESOURCES PLANNING AND MANAGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit-I

(08 Hours)

Water Resources of India: Land resources of India, water sources per capita water availability, Irrigation potential, methods of assessment of water resources.

#### Unit-II

(08 Hours)

Water Resources Development: Objectives, planning for water resources development, water resources system design, economics of water resources development, micro and macro economics, discounting factors, discounting techniques – present worth, rate of return, benefit cost analysis, annual cost methods, profitability analysis.

#### Unit-III

(08 Hours)

Integrated and conjunctive use of water, allocating water for various uses. Irrigation water management, constraints in irrigation development. National water policy.

#### Unit-IV

(08 Hours)

Augmentation of water resources: Conservation of water, augmentation of water resources, method of artificial recharge.

#### Unit-V

(08 Hours)

Water quality: Quality of water for irrigation and municipal use, water pollution and its control. Development of water resources and environment. Environmental impacts of water storage reservoirs.

#### Unit-VI

(08 Hours)

Water logging and land reclamation: Causes of water logging, anti logging measures, factors responsible for formation of saline and alkali soils, ill effects of salinity and alkalinity, land reclamation methods.

### Text Books / References

Ray K. Linsley, Joseph B. Franzini, "Water Resources Engineering", McGraw Hill Publication

R. K. Sharma, T. K. Sharma, "Hydrology and Water Resources Engineering", Dhanpat Rai Publication

P. P. Mujumdar, Vedula, "Water Resources Engineering", Tata McGraw Hill Publications.

### Syllabus for Unit Test

Unit Test 1

Units I , II & III

Unit Test 2

Units IV, V & VI

## 11 : SELF STUDY PAPER I: GROUND WATER HYDROLOGY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit – I (08 Hours)

Hydrological cycle, role of ground water in hydrological cycle, aquifers, classification and characteristics.

#### Unit – II (08 Hours)

Ground water hydraulics- Darcy's law and application, flow nets-application.

#### Unit – III (08 Hours)

Ground water hydraulics- mass conservation, aquifer flow equation, heterogeneity, anisotropy, unsaturated flow, recharge, stream-aquifer interaction, well hydraulics.

#### Unit – IV (08 Hours)

Application of ground water hydraulics for estimation of yield- case study.

#### Unit – V (08 Hours)

Model (Numerical) in ground water hydraulics

#### Unit – VI (08 Hours)

Working organization: Global and Indian data collection, water quality and control.

### Text Books/References

Groundwater Hydrology, David Keith Todd and Larry W. Mays

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI



## 11: SELF STUDY PAPER I: INSTRUMENTATION IN HYDRAULICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit – I (08 Hours)

Definition of instruments, purpose of instrumentation, system of application of instrumentation, different classifications of instruments, main hydraulic and other civil engineering parameters involved.

#### Unit – II (08 Hours)

Qualifications and characteristic of instruments, calibration and errors – definitions, utility and dependability, transducers - their purpose, characteristics and usage, decision on the requirements for selection of instruments, need of system analysis before the selection of instruments.

#### Unit – III (08 Hours)

Specific instruments : measurement of velocity and discharge, requirements for field and laboratory, methods of measurement and different structures used, supporting structure requirements, designs parameters.

#### Unit – IV (08 Hours)

Methodologies adopted for observations, requirements for good instruments and Instrumentation, application of above requirements to instrument systems.

#### Unit – V (08 Hours)

Specific instruments : measurement of pressure and strain, requirements for field and laboratory methods of measurement and different structures used, supporting structure requirements, designs parameters.

#### Unit – IV (08 Hours)

Modern electronic and high precision instruments. hot film anemometer, 3D observations for velocities, eddies, etc.

### Text Books/References

Handbook for Flow measurement and documentation – South Florida Management District, USA  
Calibration of Pressure Measurements – University of Porto Rico  
Calibration of Pressure Measurements – USBR No 1040-1989  
Discharge measurement structures – USBR; Agricultural research Service  
Experimental Uncertainty and Measurement errors – An update - World Water and Environment Conference May 2005

### Syllabus for Unit Test

Unit Test 1  
Unit Test 2

Units I, II & III  
Units IV, V & IV

## 11 : SELF STUDY PAPER I : DISASTER MANGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit – I

(08 Hours)

Factors causing disaster & damage to properties & human lives- Natural man made, cause & short term / long term effects & needs to take measures.

#### Unit – II

(08 Hours)

Extreme value conditions- Waves, flooding, storm surge, earthquake & Tsunami etc.

#### Unit – III

(08 Hours)

Failure of hydraulic structures - dams, fires in plants, (Thermal, Nuclear etc.), oil tanker leakage, sinking etc.

#### Unit – IV

(08 Hours)

Measures to avoid disasters (manmade), measures for minimum damage natural Disasters.

#### Unit – V

(08 Hours)

Warnings systems pre disaster- remote sensing, satellite, media, (Radio, Tv), communication systems.

#### Unit – VI

(08 Hours)

Rescue operation, -Helicopter, Life saving systems, transportation, detection of areas of disaster, Global, National, Local management systems for all various activities.

### Text Books/References

Harsh K. Gupta, Disaster Management, Universities Press(India), 2003.  
Sundar I., Sezhiyan T., Disaster Management,, Sarup and Sons, 2007.  
Thomas D. Schneid and Larry R. Collins, Disaster Management and Preparedness, 2002.  
Awasthy Amit, Disaster Management : Warning response and Community Relocation, Global India Publications, 2009.  
Pinkowski Jack, Disaster Management Handbook, CRC Press, 2008.  
Sharma Vinod K., Disaster Management : First India Disaster Management Training Country Workshop, New Delhi, 1993.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

# 11 : SELF STUDY PAPER I : OPERATION AND MAINTENANCE OF HYDRAULIC STRUCTURES

## TEACHING SCHEME

Lectures : 04 Hrs/Week

## EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

### Unit – I

(08 Hours)

Introduction : Hydraulic structures, types, major hydraulic structures requiring operation and maintenance, dams, types.

### Unit – II

(08 Hours)

Dam failures : historic dam failures, their causes, modes of failures of Embankment dams, external erosion, internal erosion, structural failure, safety requirements/measures, Modes of failures of concrete dams, external erosion, internal erosion, structural failure, safety requirements/measures

### Unit – III

(08 Hours)

Guidelines for operations of dams, Operations of typical embankment dam and concrete dam

### Unit – IV

(08 Hours)

Inspection guidelines of dams, inspection of embankment dam : the crest, the upstream slope, the downstream slope, the abutments, the downstream toe etc. inspection of concrete dam , inspection, of appurtenant works, spillway, outlets etc.

### Unit – V

(08 Hours)

Monitoring and surveillance of embankment dams : Task and purpose of monitoring, Monitoring of pore pressure, seepage, monitoring of displacements, measurements of stresses, seismic measurements , general principles on the selection and positioning layout of measuring instruments, Monitoring and surveillance of concrete dams : On monitoring, surveillance and instrumentation of concrete dams in general, Monitoring by precise survey methods, surveillance with embedded instruments

### Unit VI

(08 Hours)

Maintenance of embankment dam, maintenance of concrete dam, maintenance of appurtenant works, spillway, outlets etc.

## Text Books / References

Ljubomir Tanchev, *St. Cyril and Methodius University, Skopje, Macedonia (Emeritus)*, Dams and Appurtenant Hydraulic Structures, Taylor & Francis, 2005.

British Columbia, Dam Safety Guidelines Inspection and Maintenance of Dams, 2011.

Texas commission on Environmental Quality, Guidelines for operation and Maintenance of dams in Texas

## Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 11 : SELF STUDY PAPER I: APPLICATION OF REMOTE SENSING TO HYDRAULICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

**Unit – I** (08 Hours)

Principles of electromagnetic remote sensing, electromagnetic spectrum. aerial photography, satellite imagery.

**Unit – II** (08 Hours)

Infra red photography, temperature difference in water, aeromagnetic surveys at Low Altitude.

**Unit – III** (08 Hours)

Photographic techniques by aircrafts, satellites their principles & interpretation, aerial magnetic surveys a) subsurface rock structure b) flow of ground water.

**Unit – IV** (08 Hours)

Electrical conductance of rock, velocity of sound through different rocks , Electrical resistivity surveys.

**Unit – V** (08 Hours)

Preparation of maps on political land use, physiographic land gradient, methodology, geology of soil, hydrology and water shed , ground water potential, hydrogeology, agronomy, forestry, Civil engineering, A R. S. system classification a) Passive b) Active (A) Remote Sensing Characteristics i) Spatial resolution ii) Spectral resolution iii) Radiometric resolution iv) (B) Temporal resolution , 1D Extraction of information, fundamentals of Photogrammetric, Thermal infrared sensor (C) Side looking airborne radar (SLAR) (D) Land remote sensing satellite systems- satellites of different nations their sensors, No. of bands.

**Unit – VI** (08 Hours)

Fundamental concepts in computer aided image classification, data preprocessing : radiometric correction, geometric correction, large classifications : soft x hard classifiers, Contextual x Neural networks Classifiers, integration of Remote Sensing & GIS – Separate but equal, Seamless integration, Total integration.

### Text Books/References

Chor Pang Lo, Albert K. W. Yeung, Concepts & Techniques of geographic information system, Prentice Hall, 2002

Paul Longly, Geographic Information Systems and Science, John Wiley & Sons, 2005.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## **11 : SELF STUDY PAPER I : ENVIRONMENTAL IMPACT ASSESSMENT FOR WATER RESOURCES PROJECT**

### **Unit – I**

(08 Hours)

Environmental Aspects of Water Resources Development, Rehabilitation of people affected by the project, submergence of the forest area, water logging and salinity in command areas, adverse effects on wild life ,water borne diseases, siltation of manmade reservoirs.

### **Unit – II**

(08 Hours)

Effect of dam construction on downstream river regime. Sediment transport, National water policy and recommendations for environmental monitoring of water resources projects.

### **Unit – III**

(08 Hours)

Environmental Impact Assessment methodology. Description of site and its Development description of present and projected conditions, assessment of probable impacts, compliance with regulations , review of alternatives.

### **Unit – IV**

(08 Hours)

Environmentally sound water resources management, Various Case studies, catchment area treatment, compensatory afforestation, command area treatment , status of environmental monitoring of water resources development projects.

### **Unit – V**

(08 Hours)

Socio economic issues related to water resources project. Deforestation ,submergence of land, change in land use pattern, submergence of existing roads, construction of new approach roads, construction of new town ships and other infrastructure.

### **Unit – VI**

(08 Hours)

Environmental legislation in India with respect to water resources projects. Water-prevention and control of pollution act, wild life protection act, forest conservation act, environmental protection act.

### **Text Books/References**

Government of India National water policy

Central water commission Guide lines for sustainable water resources development and management, 1992.

Central board of Irrigation and Power- Seminar on Environmental Management of Water Resources and Power Projects, 1995

### **Syllabus for Unit Test**

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 11:SELF STUDY PAPER I– FLOODS AND FLOOD MANAGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit – I

(08 Hours)

Introduction, Necessity, General information on flood damages at global level and in India. Various methods of flood estimation and models.

#### Unit – II

(08 Hours)

Flood routing through channels , various method, with case studies.

#### Unit – III

(08 Hours)

Flood Mitigation, Identification of floods and flood zones.

#### Unit – IV

(08 Hours)

Flood control – Single & multipurpose reservoir , reservoir operation , rule curve, routing, zones of reservoir, structural and non structural measures.

#### Unit – V

(08 Hours)

Special floods- Estimation , dam break, PMF, Application for damage evolution.

#### Unit – VI

(08 Hours)

Aspects of flood management- identification of areas, extent & duration of flood, Environmental & Ecological aspects, economics of flood control project.

### Text Books/References

“Flood & Flood control” Workshop proceedings at CWPRS Pune

“Flood forecasting & Warning” CWC guideline.

“Flood & Flood control” NIH Roorkey.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

## 14 : SELF STUDY PAPER II : OFFSHORE STRUCTURES

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit – I (08 Hours)

Types of ocean Structures,- Onshore / Offshore, Requirement of structures, its types/ classification- depth, function, design aspect.

#### Unit -II (08 Hours)

History of development of offshore structures, installation of platforms, development in Indian continental shelf in future, need for crude oil and availability

#### Unit -III (08 Hours)

Basic design criteria for drag/ lift forces, design principles for structural members , spacing, wave data and vibration analysis.

#### Unit -IV (08 Hours)

Additional facilities/ functions related for oil transportations, storage, transport, pumping from oil well to the refinery .

#### Unit -V (08 Hours)

Safety of offshore structures natural/ manmade ,accidental- case studies , factors affecting stability, design of pipe lines.

#### Unit -VI (08 Hours)

Environmental aspects- oil leakages, pollution, fire protection, extreme wave conditions-storm, Tsunami etc. Economic aspects in design, Installation, maintenance, and operations related to offshore structures

### Text Books/References

Brunn Per, B. U. Naik, "Shore Protection Manual", NIO Goa

Quinn A. D., "Port Planning", McGraw Hill Book Co., New York

Richard Silvester, "Coastal Engineering" Vol. I, II, University of western Australia.

Shore Protection Manual – 1984 and Coastal Protection Manual – 2002,

US Waterways Experiment Station, Corps of Engineer, Coastal Engineering research centre, Vicksburg , USA

Narasinhan and Kathirolu, "Harbor and Coastal Engineering", Vol. I & II, Ocean and Coastal engineering Publication, NIOT, Chennai

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV

## 14 : SELF STUDY PAPER II: URBAN WATER MANAGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit – I (08 Hours)

Drinking water qualities, potable limits, water softening processes, common impurities, alkalinity, acidity, Water purification, storage, treatment of waters, settling basins, slow sand filters, pressure and gravity filters

#### Unit – II (08 Hours)

Storage of water, service reservoirs, cisterns, elevated tanks, pressure equalizing Reservoirs, distribution of waters, demand of water for domestic and public purpose, wastage of water, prevention of leakages, different methods of distribution, design of distribution system, intermittent and constant system of supply

#### Unit – III (08 Hours)

Pipes of different metals, cement concrete pipes, Valves, meters taps

#### Unit – IV (08 Hours)

Pumping of water, suction and delivery pipes, water pumps, design of pumping stations

#### Unit – V (08 Hours)

Ground water and wells, water bearing strata, discharge from wells, tests of yields, depression head, cone of depression

#### Unit – IV (08 Hours)

Methods of boring, strainers, well lining

### Text Books/References

Water supply and sanitary engineering by G. s Birdie and J. S. Birdie.,  
Dhanpatrai Publications, 2006.

Water supply engineering by B. C. Punmia, Laxmi publications, 2009.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & IV



## 14 : SELF STUDY PAPER II : RIVER ENGINEERING

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit – I

(08 Hours)

Classification of Rivers: Based on different approach/criteria, River plan forms and their Characteristics, Development/variation of plan forms in meandering and migration, braiding, its characteristics and causes for their development.

#### Unit – II

(08 Hours)

Rivers in equilibrium: Channel stability, regime relations and applications, Natural constraints and their effects on the river regime, Hydraulic structures and their effects in the river regime.

#### Unit – III

(08 Hours)

Rivers in dynamics: Bed level changes, aggradation and degradation confluences and braiding, their causes and effects on river regime.

#### Unit – IV

(08 Hours)

River flow control structures: weirs, barrages, intakes, bridges and diversion structures, design and operational concepts, river improvement methods.

#### Unit – V

(08 Hours)

Rivers training works: Rivers training structures for weirs, barrages, intakes, bridges, diversion structures, hydraulic design and operational concepts, river improvement.

#### Unit – VI

(08 Hours)

Rivers navigation: Advantages and disadvantages, hydraulic structures for river navigation, river dredging, necessity and effects.

### Text Books/References

River mechanics, Pierre Y, Julian (2002), Cambridge University Press  
Brown S. A. 1985a, "Design of spur – type, Stream stabilization structure, final report," Federal highway administration.  
Knighton, D., 1998, Fluvial forms and processes, Arnold, Baltimore.

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 14 : SELF STUDY PAPER II : PLANNING OF PORTS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

#### Unit – I

(08 Hours)

Port development requirement, world port development- Major, Minor Fisheries, Indian port service, General planning of port requirement, Roll of modeling in planning of port, present status of Indian port & future demands of next four decades

#### Unit -II

(08 Hours)

Modern port facilities, roll of road / rail link with planning of ports, Automation in port development

#### Unit- III

(08 Hours)

Analysis of case studies- evaluation , comments suggestions  
Special purpose berths in ports- Container, oil, Car transport .

#### Unit -IV

(08 Hours)

Port cost analysis and economics', maintenance of port structures, Modern trends- Roll of management techniques , skill in operation for safety purpose ,concept of GDP/GNP.

#### Unit -V

(08 Hours)

Concept of mother port, outer to outer port, offshore port etc. SBM linked transport, efficacy of port-Transport ,cost per tonne, VLCC

#### Unit -VI

(08 Hours)

Limiting factors for planning of ports-facilities, pollution, draft requirement, maintenance of port, measures for various aspects, development, National policy

### Text Books/References

Quinn A. D., "Port Planning", McGraw Hill Book Co., New York.

Shore Protection Manual – 1984 and Coastal Protection Manual – 2002,

US Waterways Experiment Station, Corps of Engineer, Coastal Engineering research centre, Vicksburg , USA

Narasimhan and Kathirola, "Harbor and Coastal Engineering", Vol. I & II, Ocean and Coastal engineering Publication, NIOT, Chennai

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 14 : SELF STUDY PAPER II : SOIL CONSERVATION AND WATERSHED MANAGEMENT

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit – I (08 Hours)

Watershed concept-Size , shape, physiographic , climate, drainage, land use, vegetation, geology and soils, hydrology , hydrogeology.

#### Unit – II (08 Hours)

Water Erosion- Mechanics of water erosion, types of erosion, estimation of water erosion losses, measurement of water erosion.

#### Unit – III (08 Hours)

Water erosion control- land classification for soil conservation, mechanical methods of water erosion control , biological methods of water erosion control.

#### Unit – IV (08 Hours)

Soil conservation in special problem areas – hilly areas, control of gullies, ravine reclamation, waterlogged and wetlands.

#### Unit – V (08 Hours)

Land use management practices in semiarid and arid zones –problems of soil and water Management in semi arid and arid zones of India, control measures.

#### Unit – VI (08 Hours)

Watershed Management- Planning for watershed management, measures for watershed management , land use planning, water harvesting and recycling ,socio economic aspects, recent trends in watershed management.

### Text Books/References

Watershed Management-JVS Murthy, New Age International Publishers, 2009

Soil Erosion and conservation, R.P. Tripathy , H.P.Sing, New Age International Publishers, 2008

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 14 : SELF STUDY PAPER II : RESERVOIR SEDIMENTATION

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

(08 Hours)

#### Unit – I

Introduction : Scope and significance of reservoir sedimentation, properties of sediments. Basic concepts of sedimentation, bed load, suspended load sediment inflow, sediment out flow, trap efficiency, retention time.

#### Unit – II

(08 Hours)

Reservoir sedimentation process Settling of sediments, Density currents, pattern of reservoir sedimentation . Aggregation above dams, Degradation below dams, sources of sediments.

#### Unit – III

(08 Hours)

Reservoir sedimentation Prediction , Factors affecting sedimentation, various methods of predicting sedimentation Empirical studies, Mathematical modeling.

#### Unit – IV

(08 Hours)

Measurement of reservoir sedimentation , need for measurement , measurement of sediments in Rivers, streams etc. Measurements of suspended load, reservoir survey for sediments methods of measurements of sediments , sediments transport ,capacity survey, remote sensing techniques.

#### Unit – V

(08 Hours)

Sedimentation of reservoirs in India case studies, control of reservoir sedimentation, soil conservation measures, vegetation land treatment measures to check inflow of sediments in to reservoirs. Removal of sediments from reservoir.

#### Unit – VI

(08 Hours)

Estimate life of reservoir , different concepts and procedures practiced in USA, Japan, India.

### Text Books/References

Reservoir sedimentation and control Central water Commission 1991, New Delhi.

Sedimentation of reservoirs-National Institute of Hydrology Dept. RN – 26-1985-86.

Life of reservoir – Technical report No.19. CBIP – New Delhi

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

## 14 : SELF STUDY PAPER II: TIDES AND TIDAL HYDRAULICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Internal Assessment : 40 Marks  
Credits : 4

#### Unit I

Definition of tide, Generation of tides, reasons for formation , Role of celestial bodies, Global tidal Phenomenon, Amphedormic point, Co-tidal lines, tidal constituents, coriolis force, Harmonic analysis, High water, low water, intertidal zones.

#### Unit II

Sidereal day ,Solar day, Lunar day, Declination of moon, Sidereal year, Lunar month, Apibelson, Peribelson , Apogee, Perigee, Force diagram for tide generation, if of lunar and earth axis

#### Unit III

Theories of tides, Tidal predictions, tidal inequality, types of tides, tidal duration, Amplitude, tidal variaties, spring tides, neap tides, Effects of tide, tidal scenario in India and world, Diurnal tides, mixed tides, semi-dia tides, shift of tides.

#### Unit IV

Different similitude's, similarities, Hydraulic models, tidal in Distortions in model, Reasons for distortions, Fixed bed and movable bed tidal models, Layout of tidal model, different instruments for tidal model studies, Automatic tide generator in model, inferances from tidal model studies.

#### Unit V

Definition of tidal inlet, different features, stability of tidal inlet, Hydraulic processes near tidal inlet, tidal prism, formulae for assessment of stability of tidal inlets, different types of tidal inlets, meaoewes for stabilization of inlet effect of littoral drift, jarretts clarification, kenlegen's k, importance of tides in port and harbor operations.

#### Unit VI

Global tide ranges, range variation along Indian coast, different forms of unconventional/renewable energy their cheeris sources, tidal power, economies of tidal power, potential locations of tidal power plants around world and in India, single basin/double basin-single cycle/double cycle model of power generation, case study of existing/operating tidal power plants.

### Text Books/References

Coastal Engineering Manual (CEM) USA corps of engineering

Ven Te Chow-Open Channel Hydraulics.

Jarrette M.A. : Stability of coastal inlets.

CWPRS Brochures on model Studies.

Indian institute of Ocean Technology : Coastal Manual Dr.Kathirola, at Chennai.

## **Syllabus for Unit Test**

Unit Test 1  
Unit Test 2

Units I, II & III  
Units IV, V & IV

## 14 : SELF STUDY PAPER II : DAM BREAK ANALYSIS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Internal Assessment : 40 Marks

Credits : 4

**Unit – I** (08 Hours)

Introduction: Review of dams in India, Necessity of Dam Break Analysis

**Unit – II** (08 Hours)

Design criteria of Dams: Earth, Gravity, Arc Dams with likelihood of Exceedence

**Unit – III** (08 Hours)

Types of Failures : Type of dam, Structural, Purpose, Parameters of Failure

**Unit – IV** (08 Hours)

Aspects in Dam Break Analysis : Economic, Managerial, Social, Environmental

**Unit – V** (08 Hours)

Hydraulics of Dam Break Analysis : St. Venant's equations - forms, methods of Solution Simulation Models – DAMBRK, FLDWAV, MIKE 11, HECRAS

**Unit – VI** (08 Hours)

Case Study, Review of Literature, Data Collection and Compilation.

### Text Books/References

F M Henderson "Open Channel Flow", Macmillan Publishing Co, NY

Ven Te Chow "Open Channel Hydraulics", McGraw Hill Book Co. NY

Rouse H "Engineering Hydraulics", John Wiley & Sons, Inc.

Streeter V L and Wylie E B "Hydraulic Transients", McGraw Hill Book Co. NY

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'Hydraulic Reference Manual', CPD – 69, January 2010

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'User's Manual', CPD – 68, January 2010

"HEC-RAS 4.1 : River Analysis System", US Army Corps Of Engineers, Hydrologic Engineering Centre, 'Applications Guide', CPD – 70, January 2010

### Syllabus for Unit Test

Unit Test 1

Units I, II & III

Unit Test 2

Units IV, V & VI

**Annexure B**  
**Proposed Structure of M.Tech Computer Engineering**  
**CBCS Pattern (2015-16)**  
**STRUCTURE & EXAMINATION PATTERN**

Semester I											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Advanced Database Management System	04	02	60	20	10	10	25	25	04	01	05	
Advanced Software Engineering	04	02	60	20	10	10	25	25	04	01	05	
Mobile Operating System	04	--	60	20	10	10	-	-	04	-	04	
Distributed Computing	04	--	60	20	10	10	--	--	04	-	04	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	

Semester II											Total Duration: 20 hrs/week Total Marks :500 Total Credits: 18	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
High Performance Computing	04	02	60	20	10	10	25	25	04	01	05	
Advanced Computer Algorithms	04	02	60	20	10	10	25	25	04	01	05	
Web Technologies	04	--	60	20	10	10	--	--	04	--	04	
Wireless Communication and Security	04	--	60	20	10	10	--	--	04	--	04	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	



Semester III											Total Duration: 28 hrs/week Total Marks : 500 Total Credits: 40	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Elective I	04	02	60	20	10	10	25	25	04	01	05	
Elective II	04	02	60	20	10	10	25	25	04	01	05	
Self Study Paper I	04	--	60	20	10	10	-	-	04	-	04	
Seminar	-	05	-	-	--	--	25	25		05	05	
Dissertation Stage I	-	07	-	-	--	--	25	-	-	21	21	
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>12</b>	<b>28</b>	<b>40</b>	

Elective – I	Elective - II
a) E-Commerce and ERP	a) Cryptography and Network Security
b) Information Storage Management	b)Parallel computing
c) Cyber Security	c)Wireless Sensor Network
d) Big Data & Analytics	d)Storage Area Network

Semester IV											Total Duration: 14 hrs/week Total Marks : 325 Total Credits: 34	
Subject	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	TH	TW/PR/OR		
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>	

**List of Self Study paper I & II**

<b>Self Study Paper I</b>	<b>Self Study Paper II</b>
Enterprise Resource Planning	Grid Computing
Bioinformatics	Research Methods in Computer Science
Information Retrieval and Web Search	Middle ware Technologies
Speech Processing	Agile Systems
Sensor Network and Embedded Systems	Soft Computing
Computer Graphics and Visualization	E-Commerce and Payment Systems
Cloud Computing	Knowledge Representation and Reasoning
Pervasive computing	Computational Intelligence
Data Warehousing and Data Mining	High Performance Information systems
Software Security	Advanced Web Technologies

# Advanced Database Management System

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		TW&OR : 50 Marks	01 Credits
<b>UNIT - I</b>	<b>Parallel and Distributed Databases :</b>		<b>(08 Hours)</b>
	Architectures for parallel database, Parallel query Evaluation, Parallelizing individual operation, Parallel Query Optimization, Distributed DBMS Architecture, Storing data in distributed DBMS, Distributed Catalog Management, Distributed query processing, Updating distributed data, Distributed concurrence control, Distributed recovery.		
<b>UNIT - II</b>	<b>Web databases :</b>		<b>(08 Hours)</b>
	Web search engines, web search architecture, Inverted indexes the IR way, Inverted indexes for web search engines, web crawling, web search statistics.		
<b>UNIT - III</b>	<b>Data Warehousing and Data Mining:</b>		<b>(08Hours)</b>
	<b>Data Warehousing:</b> Introduction Data Warehousing OLAP, Implementation Techniques for OLAP, Views and decision support. <b>Data Mining:</b> Introduction, Counting Co-occurrences, Mining for rules, Tree structured rules, Clustering, Similarity search over sequences, Additional data mining tasks.		
<b>UNIT - IV</b>	<b>Object Database Systems and XML:</b>		<b>(08 Hours)</b>
	<b>Object Database Systems:</b> User defined abstract data types, Structured types, Objects, Objects Identity and Reference types, Inheritance, database design for an ORDBMS, Comparing RDBMS with OODBMS and ORDBMS. <b>XML:</b> Introduction, Structure of XML Data, XML Document Schema, Querying and Transformation, API to XML, Storage of XML Data, XML Applications.		
<b>UNIT - V</b>	<b>Spatial Data Management:</b>		<b>(08 Hours)</b>
	Types of Spatial Data and Queries Application involving Spatial data, Introduction to spatial Indexes, Indexing based on space filling Curves, Grid files, R trees, High command Indexing.		
<b>UNIT - VI</b>	<b>Deductive Databases AND Advanced Transaction Processing:</b>		<b>(08 Hours)</b>
	<b>Deductive Databases:</b> Recursive Queries, Theoretical foundation, Recursive Queries with Negation, Efficient evaluation of Recursive Queries, Additional Transaction Processing, Advance transaction processing Integrated access to Multiply data sources, Mobile database, multiplying database, Geographic Information systems, Temporal and Sequence database, Information Visualization. <b>Advanced Transaction Processing:</b> Transact ion-Processing Monitors, Transactional Workflows, Main- Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions and Transaction Management in Multi-databases.		

**Reference Books:**

1.	Rob & Colonel, "Database System Design Implementation & Management", Thomson Learning
2.	Date, "An Introduction to database system", Addison Wesley Pub
3.	Desai "Principles of Repagination database", Galgotia Publications
4.	Mallach, "Decision Support and Data Warehouse Systems", TMH
5.	Raghu Ram Krishnan, "Database Management Systems", IInd edition
6.	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 5th Edition , McGraw Hill International Edition.
7.	Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Systems",Morgan Kaufmann publishers
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

# Advanced Software Engineering

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	TW&OR : 50 Marks	01 Credits

<b>UNIT - I</b>	<b>Software Development Process:</b>	<b>(08 Hours)</b>
	Software Processes, SDLC Models, Waterfall Model, The V Model, Prototyping Model, Iterative Model, Spiral Model. Agile Development, Agile Principles, XP, Scrum, AUP, Kanban, ASD, DSDM, FDD, Agile practices, Empirical Model in Software engineering	
<b>UNIT - II</b>	<b>Requirement Engineering and Black Box Testing:</b>	<b>(08 Hours)</b>
	Requirement Engineering: Requirements phase and its importance, Requirement Elicitation and Analysis, Process models (DFD), Data models (ERD), Software, Requirement Specification Standard and Preparation, Characteristics of good SRS Documents, traceability matrix and its importance, CASE tool, and its basic features. Black box testing: Test case design and implementation, Automated testing and limitations, debugging methods, Black box testing methods.	
<b>UNIT - III</b>	<b>Process Improvement and Verification:</b>	<b>[08 Hrs ]</b>
	Process and product quality, Process classification, Process Measurement, Process Analysis and Modelling, Process change, The CMMI process improvement framework, Configuration Management Planning, Change management, Version and release management, System building, CASE tools for configuration management.	
<b>UNIT - IV</b>	<b>User interface Design, Maintenance and reengineering:</b>	<b>(08 Hours)</b>
	User interface design issues: The UI design process, User analysis, User interface prototyping, Interface Evaluation. Software Maintenance: Reengineering, Business process reengineering, software reengineering, reverse engineering, restructuring, Forward engineering, The economics of reengineering.	
<b>UNIT - V</b>	<b>Software Reuse, CBSE:</b>	<b>(08 Hours)</b>
	The reuse landscape, Design patterns, Frameworks, Generator based reuse, Application frameworks, Application system reuse, components and component models, The CBSE process, component composition, service oriented software engineering - services as reusable components, service engineering, software development with services.	
<b>UNIT - VI</b>	<b>Quality Management and SAQ:</b>	<b>(08 Hours)</b>
	Quality Management - Quality Concepts, Software Quality, The review technique, cost impact of software defects, defect amplification and removal, Review metrics and their use, Reviews: A formal spectrum, Informal spectrum, Formal technical reviews, SQA: Background issues, Elements of SQA: SQA tasks, goals and metrics, Formal approaches to SQA: statistical SQA, Software reliability. The ISO 9126 quality factors, Mc Call's quality factors, The SQA plan	

## References

1. Ian Sommerville, "Software Engineering: Update", 8th Edition

2. Roger S. Pressman and Roger, "Software Engineering: A Practitioner's Approach"	
3. Shari Lawrence Pfleeger and Joanne M Atlee, "Software Engineering", 3rd Edition	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

# Mobile Operating System

<b>Mobile Operating System</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>Introduction to Mobile Operating Systems:</b>	<b>(08 Hours)</b>
	Brief History of Mobile Operating Systems, OS-Interfaces, Multilevel Views of OS, Categories, Small and Specialized OS, 64-Bit OS, Processes and Threads, System Performance and Models: Performance of Computer Systems, Performance Metrics, Workload and System Parameters, Simulation Models: Types, Discrete-Event Model, Stochastic Model.	
<b>UNIT - II</b>	<b>Multiprogramming:</b>	<b>(08 Hours)</b>
	System with Multiprogramming, Processor Scheduling, Synchronization, Deadlocks, File Management, Memory Management: Process Address Space, Contiguous Memory Allocation, Non Contiguous Memory Allocation, Virtual Memory, Paging with Virtual Memory.	
<b>UNIT - III</b>	<b>Security and Protection:</b>	<b>(08 Hours)</b>
	Components for Security and Protection, Physical Security, User Authentication, Protection, Secure Communications, Digital Certificates, System Vulnerabilities, Invasive and Malicious Software, Defending the System and User, Intrusion Detection Management.	
<b>UNIT - IV</b>	<b>Mobile Ecosystems:</b>	<b>(08 Hours)</b>
	Application Framework, Developing a Mobile Strategy, Mobile Information Architecture, Mobile Design: Elements of Mobile Design, Ubiquity in the Mobile Web, Mobile Web Development	
<b>UNIT - V</b>	<b>Introduction to Linux:</b>	<b>(08 Hours)</b>
	Command Line Interface, Files and Directories, Shell Variables, Script Files, Connecting a Remote Linux Server. Java Modeling Framework, Java and Posix Threads.	
<b>UNIT - VI</b>	<b>Case Study:</b>	<b>(08 Hours)</b>
	Android SDK, iOS, Windows, Mobile Web Apps vs. Mobile Applications	
<b>Reference Books:</b>		
[1] Jose M Garrido, Richard Schlesinger, Kenneth Hoganson, Principles of Modern Operating Systems.		
[2] By Brian Fling, Mobile Design and Development: Practical concepts and techniques for Creating Mobile Sites and Web Apps, O'Reilly Publications		
[3] Brian Fling, Mobile Design and Development, O'Reilly Publications.		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

# Distributed Computing

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04Hours / Week		End Semester Examination: 60 Marks		04 Credits	
		Continuous Assessment: 40 Marks			
<b>UNIT – I</b>	<b>Distributed System Concepts:</b>				<b>(08 Hours)</b>
	Distributed Computing Models, Software Concepts, Issues in Designing Distributed Systems Client-Server Model. Case Studies. Network Communication: LAN and WAN Technologies, Protocols for Network Systems, Asynchronous Transfer Mode, Protocols for Distributed Systems.				
<b>UNIT – II</b>	<b>Interprocess Communication:</b>				<b>(08 Hours)</b>
	Message Passing, Advantages and Features of Message Passing Systems, IPC Message Format, IPC Synchronization, Message Buffering Strategies, Multidatagram Messaging, Process Addressing Techniques, Failure Handling Mechanism. Case Study: IPC in Mach				
<b>UNIT – III</b>	<b>Remote Communication:</b>				<b>(08 Hours)</b>
	Introduction, Remote Procedural Call, RPC Implementation, RPC Implementation, Parameter Passing Semantics, Server Management, RPC Call Semantics, Communication Protocols, Client Server Binding, Exception Handling and Security, RPC in Heterogeneous Environment, Failure Handling, RPC Optimization, Case Study: Sun RPC, Java RMI.				
<b>UNIT – IV</b>	<b>Synchronization:</b>				<b>(08 Hours)</b>
	Clock Synchronization, Physical Clocks, Clock Synchronization Algorithms, Logical Clocks, Global State, Mutual Exclusion, Election Algorithms, Deadlocks: Prevention, Detection Recovery, Deadlocks in Message Communication.				
<b>UNIT – V</b>	<b>Distributed System Management:</b>				
	Resource Management, Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Process Management in Distributed Environment, Process Migration, Threads, Fault Tolerance, Component Faults, System Failures and Use of Redundancy				<b>(08 Hours)</b>
<b>UNIT – VI</b>	<b>Distributed Shared Memory:</b>				
	Architecture, Types of DSM, Hardware DSM, and Design Issues in DSM Systems. Distributed File Systems, Naming, Security in Distributed Systems, Real Time Distributed Operating System, Distributed Database Management System, Emerging Trends in Distributed Computing.				<b>(08 Hours)</b>
<b>Reference Books:</b>					
1. H. Attiya, J. Welch Distributed Computing - Fundamentals, Simulation and Advanced Topics, Wiley Publications.					
2. Vijay Garg, Elements of Distributed Computing, Wiley Publications.					
3. S. Mahajan, S. Shan, Distributed Computing, Oxford Publications.					
<b>Syllabus for Unit Test:</b>					
Unit Test -1	UNIT – I, UNIT – II				
Unit Test -2	UNIT – III, UNIT – IV				
Unit Test-3	UNIT –V, UNIT-VI				



# High Performance Computing

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits

UNIT - I	Computer organization:	(08 Hours)
	Memory, Registers, Instruction set architecture, Instruction processing, Pipelined processors: Pipelining, Structural, data and control hazards, Impact on programming. Cache memory: Organization, impact on programming, virtual caches, Operating systems: Processes and system calls, Process management, Program profiling.	
UNIT - II	Modern Computer Architectures :	(08 Hours)
	Memory, Floating-Point Numbers, Programming and Tuning Software - What a Compiler Does, Timing and Profiling, Eliminating Clutter, Loop Optimizations, Program execution, Program, Compilation, Object files, Function call and return, Address space, Data and its representation. Parallel Processing Concepts - Levels of parallelism instruction, transaction, task, thread, memory, and function, Models SIMD, MIMD, SIMT, SPMD, Dataflow Models, and Demand-driven Computation etc. Case Study: Cluster Computing network.	
UNIT - III	Parallel Algorithms:	(08 Hours)
	Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs, Randomization: Parallel Pseudo-Random Number Generators, Sorting, Monte Carlo techniques	
UNIT - IV	Parallel Programming:	(08 Hours)
	Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays).	
UNIT - V	High-End Computer Systems:	(08 Hours)
	Memory Hierarchies, Multi-core Processors: Homogeneous and Heterogeneous, Shared-memory Symmetric Multiprocessors, Vector Computers, Distributed Memory Computers, Supercomputers and Petascale Systems, Application Accelerators / Reconfigurable Computing, Novel computers: Stream, multithreaded, and purpose-built, Architectures: N-wide superscalar architectures, multi-core, multi-threaded	
UNIT - VI	Achieving Performance:	(08 Hours)
	Performance metrics and measurements, Measuring performance, Identifying performance bottlenecks, Restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, Using existing libraries, tools, and frameworks, CASE tools.	

## Reference Books:

1. Highly Parallel Computing", by George S. Almasi and Alan Gottlieb
2. "Advanced Computer Architecture: Parallelism, Scalability, Programmability", by Kai Hwang, McGraw Hill 1993
3. "Parallel Computer Architecture: A hardware/Software Approach", by David Culler Jaswinder Pal Singh, Morgan Kaufmann, 1999.
4. "Scalable Parallel Computing", by Kai Hwang, McGraw Hill 1998.

5. "Principles and Practices on Interconnection Networks", by William James Dally and Brian Towles, Morgan Kaufman 2004.	
6. GPU Gems 3 --- by Hubert Nguyen (Chapter 29 to Chapter 41)	
7. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, © 2003.	
8. Petascale Computing: Algorithms and Applications, David A. Bader (Ed.), Chapman & Hall/CRC Computational Science Series, © 2007.	
9. J. L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann.	
10. Silberschatz, P. B. Galvin, G. Gagne, Operating System Concepts, John Wiley.	
11. R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall.	
12. John Levesque (Author), Gene Wagenbreth (Author), High Performance Computing: Programming and Applications (Chapman & Hall/CRC Computational Science)	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

<b>Advanced Computer Algorithms</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	TW & OR : 50 Marks	01 Credit
<b>UNIT – I</b>	<b>Introduction:</b>	<b>(08 Hours)</b>
	Asymptotic notation, Models of Computation, Algorithm & their complexity, Random Analysis machines, Computational complexity of RAM programs, A stored program model, Abstractions of the RAM, A primitive model of computation(Turing Machines),Relational between Turing machine & RAM model ,Pidgin ALGOL A high level lang.	
<b>UNIT - II</b>	<b>Algorithm Analysis and Algorithm Design techniques:</b>	<b>(08 Hours)</b>
	<b>Algorithm Analysis:</b> Analyzing Algorithm, Designing Algorithm, Time & Space Complexity, Average & Worst case analysis, Lower Bounds. <b>Algorithm Design techniques:</b> Divide & Conquer, Search Traversals, Dynamic Programming, Backtracking, Branch & Bound, Greedy Algorithm	
<b>UNIT - III</b>	<b>Sorting and Searching Algorithm :</b>	<b>(08 Hours)</b>
	The Sorting problem, Radix Sorting, Sorting by comparison, Heap sort-an $O(n \log n)$ comparison sort, Quick Sort-an $O(n \log n)$ expected time sort, Expected time for Order statistics, Binary Search, binary search trees, optimal binary search tree, B-Trees Algorithms on graph: Elementary graph Algorithm, Minimum spanning tree, Single Source shortest Path, All pairs shortest path	
<b>UNIT – IV</b>	<b>String Processing Algorithm and Divide and conquer method and Greedy method:</b>	<b>(08 Hours)</b>
	<b>String Processing Algorithm:</b> The naive string matching, The Robin-Karp algorithm, String matching with Finite Automata, Knuth Morris Pratt Algorithm <b>Divide and conquer method:</b> Binary search, Mergesort, Quick sort, Strassen's matrix multiplication. <b>The Greedy method:</b> Knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees.	
<b>UNIT – V</b>	<b>Dynamic Programming, Back Tracking, Branch &amp; Bound:</b>	<b>(08 Hours)</b>
	<b>Dynamic Programming:</b> Multistage graphs, OBST, 0/1 Knapsack, traveling sales man problem. <b>Back Tracking:</b> Eight Queens problem, graph coloring, Hamiltonian cycles, Knapsack problem, Maze problem. <b>Branch &amp; Bound:</b> 0/1 Knapsack, Traveling salesman problem lower bound theory-comparisons trees for sorting/searching, lower bound on parallel computation.	
<b>UNIT – VI</b>	<b>NP-hard and NP-complete problems:</b>	<b>(08 Hours)</b>
	Algorithms, Complexity- intractability, Non-Deterministic Polynomial time ( NP) Decision problems, Cooks Theorem, NP-Complete problems- satisfiability problem, vertex cover problem. NP-Hard problems-graph, scheduling, code generation problems, Simplified NP Hard Problems, Approximation Algorithm for NP Hard Problem.	
<b>Reference Books:</b>		
1. Bressard, "Fundamental of Algorithm"		
2. Horowitz, Sahani, "Fundamentals of Computer Algorithms", Galgotia		
3. Thomas H. Cormen and Charles E. L. Leiserson, "Introduction to Algorithm", PHI		
4. V. Aho and J. D. Ullman, "Design and Analysis of Algorithms", Addison Wesley		

5. E. V. Krishna Murthy, "Introduction to Theory of Computer"

**Syllabus for Unit Test:**

Unit Test -1

UNIT – I, UNIT – II, UNIT - III

Unit Test -2

UNIT – IV, UNIT – V, UNIT - VI

# Web Technologies

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week	End Semester Examination: 60 Marks	04 Credits
	Continuous Assessment: 40 Marks	

<b>UNIT – I</b>	<b>Web Environment:</b>	<b>(08 Hours)</b>
	<p>WWW, HTTP, Web Server and its deployment, N-Tier Arch., Services of Web Server – Mail server, News server, Proxy server, Multimedia server.</p> <p><b>XML Primer :</b></p> <p>Mark-up languages, XML, Uses of XML. WELL-FORMED XML: Parsing XML, Tags, text, elements, attributes, comments and empty elements. XML Declaration, Processing, Instructions, Errors in XML</p> <p>XML NAMESPACES: Need for namespaces, How XML namespaces work, URIs, When to use, namespace. <b>VALIDATION:</b> Document type definitions (DTD), Sharing vocabularies, Anatomy of DTD, Developing DTDs, DTD Limitations.</p> <p><b>XML SCHEMAS:</b> Benefit of XML schemas, Elements of XML Schema Definition, Creating a Schema from multiple documents. XPATH, XSLT, Xquery</p>	
<b>UNIT – II</b>	<b>JSP :</b>	<b>(08 Hours)</b>
	JSP overview, JSP language basics, JSP translation and compilation directives, Standard java objects from JSP, JSP configuration and deployment, actions and tags of JSP; Java servlets – Arch, servlet interface, applications of servlets.	
<b>UNIT – III</b>	<b>ASP :</b>	<b>(08 Hours)</b>
	Objects and Components, Handling databases, Data Retrieval from Databases, applications of ASP, session management, ASP with .NET	
<b>UNIT – IV</b>	<b>Web Technologies :</b>	<b>(08 Hours)</b>
	<p>Server side programs. CGI programs. Client side scripts. The Applet Concept.</p> <p>Search Engine Optimization: Strategies, Optimizing Search strategies, Robots, Spiders and Crawlers, Mobile Search Engine Optimization.</p>	
<b>UNIT – V</b>	<b>The Web as an example of client server computing :</b>	<b>(08 Hours)</b>
	<p>Characteristics of web servers: handling permissions. File Management Capabilities of common server architectures , Role of client Computer.</p> <p>Nature of Client server relationship. Web protocols Support tools for website creation and management. Developing Internet Information servers. Publishing information and application.</p>	

<b>UNIT – VI</b>	<b>Building Web applications :</b>	<b>(08 Hours)</b>
	Protocols at the application layer. Principles of Web engineering. Database driven websites. RPC. Lightweight distributed objects. The role of the middleware. Support tools. Security issues in Distributed object systems. Enterprise- wide web base.	
<b>Reference Books:</b>		
	1. Information Architecture for the World Wide Web, Peter Morville and Louis Rosenfied, O'REILLY, 2007	
	2. Internet and World Wide Web: How to Program, Deitel and Deitel, 4th Edition, Prentice Hall, 2009	
	3. Beginning XML, David Hunter et al, 4th Edition, Wrox/John Wiley, 2007	
	4. Herbert Schildt, "Complete Reference JAVA 2", TMH	
	5. Jerri L. Ledford, "Search Engine Optimization", 2 <sup>nd</sup> Edition, Wiley Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT - III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI	

## Wireless Communication And Security

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
		Continuous Assessment: 40 Marks	
<b>UNIT - I</b>	<b>Introduction :</b>		<b>(08 Hours)</b>
	A Short history of wireless communication. A market for mobile communication. Some research topics. A simplified reference model. Wireless Transmission. <b>Frequencies for Radio Transmission:</b> Signal antennas, signal propagation. Multiplicity, modulation, spread spectrum, cellular systems.		
<b>UNIT - II</b>	<b>Medium Access Control:</b>		<b>(08 Hours)</b>
	Motivation for a specialized MAC. SDMA, FDMA, TDMA, CDMA, Comparison of S/T/F/CDMA. <b>Telecommunication Systems:</b> GSM, DECT, TETRA, UMTS.		
<b>UNIT - III</b>	<b>Satellite Systems :</b>		<b>(08 Hours)</b>
	Basics, Routing, Localization, Handover. <b>Broadcast Systems :</b> Cyclic repetition of data, digital audio broadcasting, digital video broadcasting		
<b>UNIT - IV</b>	<b>Wireless LAN:</b> Infrared vs. radio transmission, Ad-Hoc networks, IEEE802.11, Bluetooth, Case Study on WLAN. <b>Wireless ATM :</b> Motivation for WATM, WATM services reference model, functions, radio access layer, handover, location management, addressing, mobile quality of service, access point control protocol, Case Study on WATM.		<b>(08 Hours)</b>
<b>UNIT - V</b>	<b>Mobile Network Layer:</b>		<b>(08 Hours)</b>
	Mobile IP, Dynamic host configuration protocol, Ad-hoc Networks. <b>Mobile Transport Layer :</b> Traditional TCP, Indirect TCP, Mobile TCP.		
<b>UNIT - VI</b>	<b>Performance Issues :</b>		<b>(08 Hours)</b>
	QOS issues, Security issues, Non line of sight issues, Power control issues. <b>Security</b> Encryption and Authentication, Key pre-distribution and management, Secure Ad-Hoc Networks, Denial-of-Service Attacks, Energy-aware Security Mechanisms		
<b>References:</b>			
[1] Jochen Schiller, "Mobile Communication", Pearson Education, Asia			
[2] Mallick, "Mobile and Wireless Design Essentials", Wiley computer publication			
[3] Andy Dornan, "The Essential Guide of Wireless Communications Applications", Pearson Education Asia			
[4] Weisman, "The Essential guide to RF and wireless", Pearson Education Asia			
[5] Lee, "Mobile Cellular Telecommunications", MGH			
<b>Syllabus for Unit Test:</b>			
Unit Test -1	UNIT – I, UNIT – II, UNIT – III		
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI		

## E-Commerce and ERP

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 50 Marks		01 Credit	
<b>UNIT - I</b>					
<b>Ecommerce business models and concepts, EC infrastructure, Ecommerce:</b>				<b>(06 Hours)</b>	
Ecommerce business models and concepts, EC infrastructure, Ecommerce -Frame work, anatomy of E-Commerce applications					
E-Commerce Consumer applications, E-Commerce organization. Applications. Consumer Oriented Electronic commerce - Mercantile Process models					
<b>UNIT - II</b>					
<b>E-Security and payment systems, Electronic payment systems :</b>				<b>(06 Hours)</b>	
E-Security and payment systems, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems. Inter Organizational Commerce - EDI, EDI Implementation, Value added networks.					
<b>UNIT - III</b>					
<b>Concepts and communications, ethical, social and political EC issues, Intra Organizational Commerce:</b>				<b>(06 Hours)</b>	
Concepts and communications, ethical, social and political EC issues, Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.					
Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research. Marketing, online retailing, services, content and media, social networks.					
<b>UNIT - IV</b>					
<b>Introduction To ERP:</b>					
Introduction To ERP: Evolution of ERP, What is ERP? Reasons for the growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantage of ERP.					
<b>UNIT - V</b>					
<b>Overview of Enterprise:</b>					
An overview of Enterprise, Integrated Management Information, Business Modeling, ERP for Small Business, ERP for make to order companies, business Process Mapping for ERP Module Design, Customized ERP, Hardware Environment and its Selection for ERP Implementation.				<b>(06 Hours)</b>	
<b>UNIT - VI</b>					
<b>ERP Market:</b>				<b>(06 Hours)</b>	
ERP Market: Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Company, System Software Associates, Inc. (SSA) QAD, A Comparative Assessment and Selection of ERP Packages and Modules.ERP implementation lifecycle, issues in implementing Vendors, Consultants and users, In-House Implementation - pros and cons, vendors, consultants, end user.					
<b>Reference Books:</b>					
1. Laudon K., C. G. Traver, E-Commerce Prentice Hall, 2010					
2. William S. Davis, John Benamati, E-Commerce Basics: Technology Foundations and E-Business Applications, Prentice Hall.					
3. Enterprise Resource Planning – Alexis Leon					
4. ERP Ware: ERP Implementation Framework – V.K. Garg & N.K. Venkitakrishnan					



<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

# Information Storage and Management

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04Hours / Week		End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		PR & OR : 50 Marks	01 Credits
<b>UNIT - I</b>	<b>Introduction to Storage Technology:</b>		<b>[8Hrs]</b>
	Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, Traditional file storage and its pitfalls. The five pillars of technology, Overview of 12 storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.		
<b>UNIT - II</b>	<b>Storage Systems Architecture:</b>		<b>[8Hrs]</b>
	Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.		
<b>UNIT - III</b>	<b>Introduction to Networked Storage:</b>		<b>[8Hrs]</b>
	JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.		
<b>UNIT - IV</b>	<b>Introduction to Information Availability:</b>		<b>[8Hrs]</b>
	Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques. Case study: Storage Network for Business Continuity.		
<b>UNIT - V</b>	<b>Managing &amp; Monitoring:</b>		<b>[8Hrs]</b>
	Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change, Problem reporting, prioritization, and handling techniques, Management tools overview		
<b>UNIT - VI</b>	<b>Information storage on cloud:</b>		<b>[8Hrs]</b>
	Concept of Cloud, Cloud Computing, storage on Cloud, ClouVocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.		

**References:**

- 1) Information Storage and Management Storing, Managing, and Protecting Digital Information, by EMC, Hopkinton and Massachusetts, Wiley, ISBN:9788126521470
- 2) G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.

- 3) Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.
- 4) John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.

<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT – III
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI

# Cyber Security

<b>Cyber Security</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits
<b>UNIT - I</b>	<b>Cyber Security Fundamentals:</b>	<b>(08 Hours)</b>
	Network and Security Concepts, Authentication, Authorization, Non repudiation, Confidentiality, Integrity, Availability, Basic Cryptography, Symmetric Encryption, Public Key Encryption, The Domain Name System, Firewalls, Virtualization, Microsoft Windows Security Principles	
<b>UNIT - II</b>	<b>Attacker's Techniques:</b>	<b>(08 Hours)</b>
	Types of Proxies, Tunneling Techniques, Phishing, Smishing, Vishing, and Mobile Malicious Threat Infrastructure.	
<b>UNIT - III</b>	<b>Exploitation:</b>	<b>(08 Hours)</b>
	Shell code, Stack-Based Buffer Overflows, Format String Vulnerabilities, Malicious PDFs, Web Exploit Tools, Brute Force and Dictionary Attacks, Misdirection, Reconnaissance, and Cross-Site Scripting, DNS Amplification Attacks.	
<b>UNIT - IV</b>	<b>Malicious Code:</b>	<b>(08 Hours)</b>
	Self-Replicating Malicious Code, Virtual Machine Obfuscation, Persistent Software Techniques, Privileged User Accounts and Escalation of Privileges, Token Kidnapping, Man-in-the-Middle Attack.	
<b>UNIT - V</b>	<b>Defense and Analysis Techniques:</b>	<b>(08 Hours)</b>
	Memory Forensics, Capabilities of Memory Forensics, Memory Analysis Frameworks, In-Memory Forensics and Using Volatility, Honey pots, Malicious Code Naming, Automated Malicious Code Analysis Systems	
<b>UNIT - VI</b>	<b>Cyber Security Real World Impact:</b>	<b>(08 hours)</b>
	Cyber security and internal political security, International conflict in cyberspace, Nation-state cyber attack mitigation strategies, IP V6 address space, Improved security, privacy concerns, uneven world wide deployment. Case study	
<b>Reference Books:</b>		
1. Cyber security essentials by James Graham, Richard Howard, Ryan Olson		
2. Strategic Cyber Security by Kenneth Geers		
<b>Syllabus for Unit Test:</b>		
Unit Test -1	UNIT – I, UNIT – II, UNIT – III	
Unit Test -2	UNIT – IV, UNIT – V, UNIT – VI	

## Big Data Analytics

<b>Big Data Analytics</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04Hours / Week	End Semester Examination: 60 Marks	04Credits
Practical: 02 Hours / Week	Continuous Assessment: 40 Marks	
	PR & OR : 50 Marks	01 Credits
<b>UNIT - I</b>	<b>Introduction:</b>	<b>(08 Hours)</b>
	Introduction to Big data, Data Exposition, Types of data, Need for big data, Big data & its sources, Three Characteristics of big data, Challenges of Conventional Systems – Big data Problem, Traditional IT Analytics Approach, Big data use cases, Handling limitations of Big data, big data platform. Evolution of Analytic Scalability.	
<b>UNIT - II</b>	<b>Big Data Storage and Computing Platforms:</b>	<b>(08 Hours)</b>
	Big Data Storage and Computing Platforms: Traditional RDBMS, NoSQL, NewSQL, and Hadoop, Parallel computing systems, Programming models for batch, interactive, and streaming applications, Trade-offs between programming models, Survey of new emerging database and storage systems for Big Data, Tradeoffs between reduced consistency, performance, and availability, MangoDB: Introduction, overview, Design Goals for MangoDB, MangoDB shell, MangoDB applications, Multimedia database application.	
<b>UNIT - III</b>	<b>Regression Modeling - Multivariate Analysis:</b>	<b>(08 Hours)</b>
	Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods	
<b>UNIT - IV</b>	<b>Introduction To Streams Concepts:</b>	<b>(08 Hours)</b>
	Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.	
<b>UNIT - V</b>	<b>Mining Frequent Itemsets:</b>	<b>(08 Hours)</b>
	Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in Non-Euclidean Space – Clustering for Streams and Parallelism	
<b>UNIT - VI</b>	<b>MapReduce:</b>	<b>(08 Hours)</b>
	MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques; Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association-Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies-Industry challenges and application of Analytics.	
<b>Text Books:</b>		
1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.		
2. Ohlhorst, Frank J. Big Data Analytics: Turning Big Data into Big Money. Copyright © 2012 SAS Institute Inc., Cary, North Carolina, USA.		
3. AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.		
4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced		

Analytics”, John Wiley & sons, 2012.	
5. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007	
6. Pete Warden, “Big Data Glossary”, O’Reilly, 2011	
7. Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

# Cryptography and Network Security

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04Hours / Week		End Semester Examination: 60 Marks		04Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		PR & OR : 50 Marks		01 Credits	
<b>UNIT - I</b>	<b>Introduction:</b>				<b>(08 Hours)</b>
	Services, Mechanisms and Attacks, The OSI Security Architecture, A Model for Network Security. Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. Block Ciphers and the Data Encryption Standard: Simplified DES, Block Cipher Principles, The Data Encryption Standard, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.				
<b>UNIT - II</b>	<b>Introduction to Finite Fields:</b>				<b>(08 Hours)</b>
	Introduction to Finite Fields: Groups, Rings, Fields, Modular Arithmetic, Euclid's Algorithm, Finite Fields of the Form GF, Polynomial Arithmetic, Finite Fields of the Form GF. Advanced Encryption Standard: Evaluation Criteria for AES, The AES Cipher. Contemporary Symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher. Confidentiality Using Symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation				
<b>UNIT - III</b>	<b>Public-Key Encryption and Hash Functions:</b>				<b>(08 Hours)</b>
	Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms. Public-Key Cryptography and RSA, Principles, The RSA Algorithm, Key Management, Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography				
<b>UNIT - IV</b>	<b>Message Authentication and Hash Functions:</b>				<b>(08 Hours)</b>
	Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions. Hash Algorithms: MD5 Message Digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC, Digital Signatures, Authentication Protocols, Digital Signature Standard.				
<b>UNIT - V</b>	<b>Authentication Applications:</b>				<b>(08 Hours)</b>
	Kerbos, X.509 Authentication Service, E-mail Security, Pretty Good Privacy, S/MIME, IP Security, Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Associations, Key Management Web Security: Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.				
<b>UNIT - VI</b>	<b>System Security:</b>				<b>(08 Hours)</b>
	Intruders, Intrusion Detection, Password Management. Malicious Software, Firewalls: Firewall Design Principles, Trusted Systems.				
<ol style="list-style-type: none"> <li>1. William Stallings, "Cryptography and Network Security", Principles and Practices, Pearson Education, Sixth Edition.</li> <li>2. Behrouz A. Forouzan, "Cryptography and Network Security", McGraw Hill Publication</li> <li>3. Atul Kahate, "Cryptography and Network Security", McGraw Hill(India)Publication, Third Edition.</li> </ol>					
<b>Syllabus for Unit Test:</b>					

Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI



## Parallel Computing

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 50 Marks		01 Credit	
<b>UNIT - I</b>	<b>Introduction to Parallel Programming Paradigms:</b>				<b>(08 Hours)</b>
	Types of Parallelism , Parallel Computation Models, Memory less Parallel Computers, Parallel Computers with Memory, Flynn's Taxonomy, The Data-Parallel Model, Networked Computers, The Performance of Parallel Algorithms, Amdahl's Law, Gustafson Barsis's Law, Karp-Flatt Metric, Multidimensional Meshes, Hypercube-Based Machines, Routing in Networks, The PRAM Model.				
<b>UNIT - II</b>	<b>Convergence of Parallel Architecture:</b>				<b>(08 Hours)</b>
	Communication Architecture, Shared Address Space, Message Passing, Convergence, Data parallel processing, Other Parallel Architectures, A Generic parallel architectures, shared memory systems and cache coherence, distributed-memory systems, interconnection networks and routing, Architectural Trends, Application Trends, Technology Trends, Supercomputers case study: Param.				
<b>UNIT - III</b>	<b>Programming scalable systems:</b>				<b>(08 Hours)</b>
	The message-passing model, the message-passing interface, MPI standard basic concepts of MPI: MPI_Init, MPI_Comm_size, MPI_Comm_rank, MPI_Send, MPI_Recv, MPI_Finalize, timing the MPI programs: MPI_Wtime, MPI_Wtick, collective communication: MPI_Reduce, MPI_Barrier, MPI_Bcast, MPI_Gather, MPI_Scatter, case studies: the sieve of Eratosthenes, Floyd's algorithm, Matrix-vector multiplication.				
<b>UNIT - IV</b>	<b>Shared-Memory Programming:</b>				<b>(08 Hours)</b>
	Shared-memory model, OpenMP standard, Parallel for loops, Parallel for pragma, private variables, critical sections, reductions, parallel loop optimizations, general data parallelism, functional parallelism, case studies: the sieve of Eratosthenes, Floyd's algorithm, matrixvector multiplication – distributed shared-memory programming, DSM primitives.				
<b>UNIT - V</b>	<b>Implications for Programming Models and Case Study:</b>				<b>(08 Hours)</b>
	Naming, Replication, Overhead and granularity of communication, Block Data transfer, Synchronization, Hardware Cost and Design Complexity, Case Study: Ocean, Ray trace, Data mining.				
<b>UNIT - VI</b>	<b>Fundamental Design issues:</b>				<b>(08 Hours)</b>
	Partitioning of data, Mapping of data onto the processors, Reproducibility of results, Synchronization, Scalability and Predictability of performance, Performance & Scalability, Performance Requirements, Types of performance requirements, Performance Metrics of Parallel Systems, Communication Abstraction, Programming model requirements, Communication and Replication, Starssen's Matrix multiplication to compute complexity less than $O(n^3)$ .				
<b>References:</b>					
1. Parallel Programming – Techniques and applications Using Networked Workstations and Parallel Computers, Barry Wilkinson and Michael Allen, Prentice Hall, 1999					

2. Multi-Core Programming - Increasing Performance through Software MultiThreading, Shameem Akhter and Jason Roberts, Intel Press 2006.	
3. Parallel Programming in C with MPI and OpenMP, Michael J. Quinn, McGraw Hill 2003.	
4. Introduction to Parallel Computing by AnanthGrama, George Karypis, Vipin Kumar, and Anshul Gupta.	
5. Programming Massively Parallel Processors by D.Kirk and W. Hwu	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

## Wireless Sensor Networks

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Theory: 04 Hours / Week		End Semester Examination: 60 Marks	04 Credits
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks	
		Term Work: 50 Marks	01 Credit
<b>UNIT - I</b>	<b>Introduction &amp; Characteristics of Wireless Sensor Networks :</b>		<b>(08 Hours)</b>
	Introduction, Brief Historical Survey of Sensor Networks. Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Mote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.		
<b>UNIT - II</b>	<b>Medium Access Control Protocols:</b>		<b>(08 Hours)</b>
	Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol, <b>Case Study:</b> IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling, ZigBee.		
<b>UNIT - III</b>	<b>Routing And Data Gathering Protocols:</b>		<b>(08 Hours)</b>
	Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Point-to-Point VPN Tunneling Protocol and Challenges- Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GAF, GPSR – Real Time routing Protocols – APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB,		
<b>UNIT - IV</b>	<b>Embedded Operating Systems:</b>		<b>(08 Hours)</b>
	Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS –OSPM - EYES OS. Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.		
<b>UNIT - V</b>	<b>Transport Control Protocols and Middlewares for Wireless Sensor Networks :</b>		<b>(08 Hours)</b>
	Traditional Transport Control Protocols: TCP (RFC 793), UDP (RFC 768), MobileIP, Introduction, WSN Middleware Principles, Middleware Architecture: Existing Middleware: MiLAN (Middleware Linking Applications and Networks), IrisNet (Internet-Scale Resource-Intensive Sensor Networks Services)		
<b>UNIT - VI</b>	<b>Applications of WSN:</b>		<b>(08 Hours)</b>
	WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications.		
<b>References:</b>			
1. Kazem Sohrawy, Daniel Minoli and Taieb Znati, “ Wireless Sensor Networks Technology, Protocols, and Applications”, John Wiley & Sons, 2007.			
2. Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons, Ltd, 2005.			
3. K. Akkaya and M. Younis, “A survey of routing protocols in wireless sensor networks”, Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325–349.			

4. Philip Levis, “ TinyOS Programming”.	
5. Anna Ha’c, “Wireless Sensor Network Designs”, John Wiley & Sons Ltd.	
6. Wireless sensor networks Edited by C. S. Raghavendra Pub: Springer.	
7. Fundamentals of Sensor Network Programming: Applications and Technology By Sridhar S. Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley.	
8. Ad Hoc Wireless Networks: Architectures And Protocols By Murthy Pub: Pearson Education	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

# Storage Area Network

<b>TEACHING SCHEME:</b>		<b>EXAMINATION SCHEME:</b>		<b>CREDITS ALLOTTED:</b>	
Theory: 04 Hours / Week		End Semester Examination: 60 Marks		04 Credits	
Practical: 02 Hours / Week		Continuous Assessment: 40 Marks			
		Term Work: 50 Marks		01 Credit	
<b>UNIT - I</b>	<b>Information Storage and Data Centre Environment:</b>				<b>(08 Hours)</b>
	Information Storage, Evolution of Storage Architecture, Data Center Infrastructure, Virtualization and Cloud Computing, Application, Database Management System (DBMS), Host (Compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Disk I/O Controller Utilization, Host Access to Data, Direct-Attached Storage, Storage Design Based on Application Requirements and Disk Performance, Data Protection: RAID.				
<b>UNIT - II</b>	<b>Data and Information in SAN:</b>				<b>(08 Hours)</b>
	Data organization: File vs. Block, Object, Data store, Searchable models, File Systems, Volume Managers, Caches, Prefetching, Storage Networking Technologies, What Storage Networking Is, What to Expect from SANs, Leading up to SANs, Killer Apps for SANs				
<b>UNIT - III</b>	<b>SAN Hardware Ecosystem:</b>				<b>(08 Hours)</b>
	Components of an Intelligent Storage System, Front End, Cache, Back End, Physical Disk, Storage Provisioning, Virtual Storage Provisioning, Types of Intelligent Storage Systems – DAS, SAN, NAS, Comparing DAS, SAN & NAS, Host Bus Adapters, SFPs, FC Cables and Connectors, SCSI/SATA/SAS Cables and Connectors, JBODs, RAID Arrays, RAID Controllers, External Storage Boxes, Tape Drive, Tape Library, NAS Device, NAS Head, Fiber Channel Switches, Bridges, FC Appliances.				
<b>UNIT - IV</b>	<b>Storage Virtualization:</b>				<b>(08 Hours)</b>
	Storage Virtualization, Disk Virtualization, Block Virtualization, File Virtualization, File system Virtualization, Tape Virtualization, Tape Library Virtualization, Host Based Virtualization, Network Based Virtualization, Storage Device Virtualization.				
<b>UNIT - V</b>	<b>Protocols in SAN:</b>				<b>(08 Hours)</b>
	ATA and SATA, SPI – Parallel SCSI, SAS – Serial Attached SCSI, SAS Topology, SAS Devices, FC Topologies, FC Ports, FC Protocol Layers, FC WWNs, FC Addresses, FC Frame, FC Flow Control, Zoning, Lun Masking, iSCSI Topology, iSCSI Initiators and Targets, iSCSI Names and Addresses, Speeding Up iSCSI, iSCSI Advantages, iSCSI Limitation, Comparing Storage Protocols.				
<b>UNIT - VI</b>	<b>SAN Managements and Storage Systems:</b>				<b>(08 Hours)</b>
	Storage Management, Storage Vs. Data Classification, Information Lifecycle Management, Hierarchical Storage Management, RTO and RPO, Backup and Restore, Snapshot & CDP, De-duplication, Storage Provisioning, Storage Migration, SRM, Case study - Google FS/BigTable, Programming models: Hadoop, NAS.				
<b>References:</b>					
[1] Storage Area Network Essentials: A complete Guide to Understanding and Implementing SANs (Hard Cover) By Richard Barker, Paul Massigliar By Wiley 2001.					
[2] Storage Networks Explained: Basics and Application of Fibre Channel SAN, NAS iSCSI and InfiniBand By Ulf Troppens, Rainer Erkens, Wolfgang Miiller Wiley 2004.					
[3] Using SANs and NAS By W. Curtis Preston, Mike Loukides.					
[4] Information Storage and Management, 2nd Edition, Edited by Somasundaram Gnanasundaram, Alok					

Shrivastava	
<b>Syllabus for Unit Test:</b>	
Unit Test -1	UNIT – I, UNIT – II, UNIT - III
Unit Test -2	UNIT – IV, UNIT – V, UNIT - VI

**Proposed Structure of M.Tech Information Technology  
CBCS Pattern (2015-16)**

**STRUCTURE & EXAMINATION PATTERN**

**MTech Information Technology**

Semester I		Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18									
Subjects	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract / Oral	TH	TW/PR/OR	
Software Architecture	04	02	60	20	10	10	25	25	04	01	05
Machine Learning	04	02	60	20	10	10	25	25	04	01	05
Mobile Networks & Communication	04	--	60	20	10	10	--	--	04	--	04
Parallel Programming & Algorithms	04	--	60	20	10	10	--	--	04	--	04
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>

<b>M.Tech (IT) Semester - I</b>		<b>Subject : SOFTWARE ARCHITECTURE</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>	
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>	
<b>Practical : 02 hrs/week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>	
	<b>Term Work:25 Marks</b>	<b>Total Credits : 05</b>	
	<b>Prat/Oral : 25 Marks</b>		
The aim of the course is to design a system to provide the solution to the existing system			
<b>Course Objectives:</b>			
1) Analyze the problem in existing system.			
2) Apply the efficient solution by wisely designing the architecture.			
<b>Course Prerequisites:</b>			
<b>Students should have knowledge of</b>			
1) Basic knowledge of java programming.			
...			
<b>Course Outcome:</b>			
<b>Students will be able to:</b>			
1) Understand problems in existing system			
2) Analyze feasibility of design proposed.			
3) Analyze the technology suitable to build the proposed system.			
4) Understand the use of design pattern to design the architecture			
5) Analyze the adherence of solution with the requirement			
6) Apply the efficient architecture to optimize the performance of the system			
...			
<b>UNIT-I</b>	<b>INTRODUCTION TO SOFTWARE ARCHITECTURE</b>	<b>( Hours)</b>	
	Introduction to Software Architecture, Architecture of Business Cycle, software architecture requirements, Types of Architecture, Documenting software architectures, recent trends in software architectures.	06	
<b>UNIT-II</b>	<b>DESIGN CONCERNS</b>	<b>( Hours)</b>	
	Introduction to the issues in design, Considering important aspects during the design SRS, Cost, Security, Resources, Compatibility, Scalability, dependency. Selection of Technology according to the requirement.	06	



<b>UNIT-III</b>	<b>DESIGN PATTERNS</b>	<b>( Hours)</b>
	Introduction to Design patterns, principles and expectations Types of design patterns Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite. Rules and regulations to select design patterns.	06
<b>UNIT-IV</b>	<b>TECHNOLOGIS USED IN MIDDLEWARE</b>	<b>( Hours)</b>
	Types of Middleware, Application servers, Introduction to Java EE, Introduction to Java EE , JDBC, RPC, RMI, EJB Architecture, Entity, Session, Message beans, XML, XSLT. Specifications and characteristics of Middleware technologies. Recent advances in Middleware technologies.	06
<b>UNIT-V</b>	<b>N TIER ARCHITECTURE</b>	<b>( Hours)</b>
	Introduction to tiers in Architecture, Types of Tiers , XML, Client side technologies HTML, DHTML, Java Applets, ActiveX controls, DOM, AJAX. Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.	06
<b>UNIT-VI</b>	<b>SERVER SIDE TECHNOLOGY</b>	<b>( Hours)</b>
	Multi-tier architectures, introduction to server side technologies: JSP, JSF, SOA, MVC. Java Servlets, introduction to framework struts, spring.	06

**Assignment List:**

- 1) **Design an architecture to solve collision problem in Traffic Signaling System**
- 2) **Design generalized and specialized approach to simulate traffic signaling system.**
- 3) **Implement all types of driver to connect front end with back end using modular approach.**
- 4) **Implement and maintain cookies in a structured relational database.**
- 5) **Implement data and page transfer using servlet.**
- 6) **Implement library management system using JSP.**
- 7) **Implement**
- 8) **Implement CRUD functionality using MVC architecture with struts framework.**

**Text Books:**

- 1) Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman  
Publisher: Addison Wesley
- 2) Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Publication
- 3) OCM Java EE 6 Enterprise Architect Exam Guide (Oracle Press) by Paul Allen , Joseph Bambara, Oracle Press.

<b>Reference Books:</b>	
1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Pearson Education
3)	Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions Gregor Hohpe, Bobby Woolf, Publisher: Addison Wesley
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

<b>M.Tech (IT) Semester - I      Subject : Machine Learning</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
<b>Practical : 02 Hrs</b>	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work:25 Marks</b>	
	<b>Prat/Oral : 25 Marks</b>	<b>Total Credits : 05</b>
<b>Course Objectives:</b>		
1) Introduces fundamental concepts and methods for machine learning		
2) Familiarize with basic learning algorithms and techniques and their applications		
<b>Course Prerequisites:</b>		
Students should be familiar with logic, elementary probability theory, elementary linear algebra, and multivariable calculus		
<b>Course Outcome:</b>		
..		
<b>Students will be able to:</b>		
1) Understand regression		
2) Understand basic probability theory		
3) Understand estimation and classification techniques		
4).Understand Bayesian and Monto Carlo methods		
5).Understand concepts of Lagrange multipliers and Clustering		
6) Understand Hidden Markov Models		
<b>UNIT-I</b>		<b>( 08 Hours)</b>
	<p>Introduction to Machine Learning: Types of Machine Learning, A simple problem.</p> <p>Linear Regression: The ID case, Multidimensional inputs, Multidimensional outputs.</p> <p>Non Linear Regression: Basis function regression, Over fitting and Regularization,</p> <p>Artificial Neural Networks, K-Nearest Neighbors.</p>	

	Quadratics: Optimizing a quadratic.	
<b>UNIT-II</b>		<b>( 08 Hours)</b>
	Basic Probability Theory: Classical logic, Basic definitions and rules, Discrete random Variables, Binomial and Multinomial distributions, Mathematical expectations. Probability Density Functions(PDFs): Mathematical expectation, mean, and variance, Uniform distributions, Gaussian distributions: Diagonalization, Conditional Gaussian Distribution.	
<b>UNIT-III</b>		<b>( 08 Hours)</b>
	Estimation: Learning a binomial distribution, Bayes' Rule, parameter estimation: MAP, ML, and Bayes' Estimates, Learning Gaussians, MAP nonlinear regression. Classification: Class Conditionals, Logistic Regression, Artificial Neural Networks, K-Nearest Neighbor Classification, generative vs. Discriminative models, Classification by LS Regression, Naïve Baye's: Discrete Input Features, Learning, Gradient Decsnt: Finite differences.	
<b>UNIT-IV</b>		<b>( 08 Hours)</b>
	Cross Validation, Bayesian methods: Bayesian Regression, Hyperparameters, Bayesian model Selection. Monte Carlo Methods: Sampling Faussions, Importance Sampling, Markov Chain Monte Carlo (MCMC). Principal Components Analysis: The model and learning, Reconstruction, Properties of PCA, Whitening, Modelling, Probabilistic PCA.	
<b>UNIT-V</b>		<b>(08 Hours)</b>
	<b>Lagrange Multipliers:</b> Examples, Least-Squares PCA in one-dimension, Multiple constraints, Inequality constraints.  <b>Clustering:</b> K-means Clustering, K-medoids Clustering, Mixtures of Gaussians: Learning, Numerical issues, the Free Energy, proofs, Relation to K-means, Degeneracy. Determining the number of clusters.	
<b>UNIT-VI</b>		<b>(08 Hours)</b>
	<b>Hidden Markov Models:</b> Markov Models, Hidden Markov Models, Viterbi Algoriyhm, The Forward Algorithm,	
<b>Assignment List:</b>		
1)	<b>To study and implement K-Nearest neighbor algoritm</b>	
2)	<b>Problems solving on Probability density functions and Gaussian distribution</b>	
3)	<b>Solving problems related to classification and estimation</b>	
4)	<b>Solving problems related to Bayesian method and Monte Carlo methods</b>	
5)	<b>To study and implement K-means clustering</b>	

<b>6)</b>	<b>Comparison of various Hidden Markov Models</b>	
<b>Text Books:</b>		
<b>1)</b>	Y Kononenko, "Machine Learning And Data Mining: Introduction to Principles and Algorithms", Horwood Publishing	
<b>2)</b>	Kevin Patrick Murphy, "Machine Learning: a Probabilistic Perspective", MIT Press	
<b>Reference Books:</b>		
<b>1)</b>	Tom Mitchell, "Machine Learning", McGraw-Hill, 1997	
<b>2)</b>	Michael Berry & Gordon Linoff, "Mastering Data Mining", John Wiley & Sons	
<b>3)</b>	Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, "Data Mining: A Knowledge DiscoveryK. Approach", Springer	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

<b>M.Tech (IT) Semester - I Subject : MOBILE NETWORKS AND COMMUNICATION</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
	<b>Continuous assessment : 40 Marks</b>	<b>Total Credits : 04</b>
<b>Course Objectives:</b>		
To gain an understanding of the principles behind the design of wireless communication systems and technologies.		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
Computer Networking & communication system		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand mobile cellular architecture.		
2) Understand the multiple access schemes & IEEE802.11		
3) Analyze the technology channel interference in path propagation.		
4) Understand the technology switching and traffic system.		
5) Analyze the GSM System.		
6) Understand the technology HEPERLAN & Android system.		
<b>UNIT-I</b>	<b>Introduction to Mobile Communication</b>	<b>( Hours)</b>
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
<b>UNIT-II</b>	<b>Multiple Access Schemes</b>	<b>( Hours)</b>
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
<b>UNIT-III</b>	<b>Propagation Path Loss and Propagation Models</b>	<b>( Hours)</b>
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
<b>UNIT-IV</b>	<b>Switching and traffic</b>	<b>( Hours)</b>
	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and	08

	mobility management.	
<b>UNIT-V</b>	<b>Practical Cellular Mobile system-GSM</b>	<b>( Hours)</b>
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers. <b>CDMA:</b> Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
<b>UNIT-VI</b>	<b>Wireless Local Area Networks</b>	<b>( Hours)</b>
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. <b>Introduction to Android</b> Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08
<b>Text Books:</b>		
1)	William C.Y.Lee, “Mobile cellular Telecommunication” ,2nd Ed. McGraw-Hill Ā	
2)	Jochen Schiller, “Mobile Communication” Pearson Education Ā	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
<b>Reference Books:</b>		
1)	V. K. Garg, “IS-95 CDMA &CDMA 2000”, Pearson Education	
2)	W. Frank Ableson,Robi sen, Chris King, “ Android IN ACTION “, Third Edition, Dreamtech Press	
3)	Mobile Computing By Rajkamal (Oxford).	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test - 1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test - 2</b>	<b>Unit IV, V and VI</b>	

<b>M.Tech (IT) Semester - I Subject: MOBILE NETWORKS AND COMMUNICATION</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
	<b>Continuous assessment : 40 Marks</b>	<b>Total Credits : 04</b>
<b>Course Objectives:</b>		
To gain an understanding of the principles behind the design of wireless communication systems and technologies.		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
Computer Networking & communication system		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand mobile cellular architecture.		
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6) Understand the technology HEPERLAN & Android system.		
<b>UNIT-I</b>	<b>Introduction to Mobile Communication</b>	<b>( Hours)</b>
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
<b>UNIT-II</b>	<b>Multiple Access Schemes</b>	<b>( Hours)</b>
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
<b>UNIT-III</b>	<b>Propagation Path Loss and Propagation Models</b>	<b>( Hours)</b>
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
<b>UNIT-IV</b>	<b>Switching and traffic</b>	<b>( Hours)</b>



	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and mobility management.	08
<b>UNIT-V</b>	<b>Practical Cellular Mobile system-GSM</b>	<b>( Hours)</b>
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers. <b>CDMA:</b> Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
<b>UNIT-VI</b>	<b>Wireless Local Area Networks</b>	<b>( Hours)</b>
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. <b>Introduction to Android</b> Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08
<b>Text Books:</b>		
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2)	Jochen Schiller, “Mobile Communication” Pearson Education Ā	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
<b>Reference Books:</b>		
1)	V. K. Garg, “IS-95 CDMA &CDMA 2000”, Pearson Education	
2)	W. Frank Ableson,Robi sen, Chris King, “ Android IN ACTION “, Third Edition, Dreamtech Press	
3)	Mobile Computing By Rajkamal (Oxford).	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

**Proposed Structure of M.Tech Information Technology  
CBCS Pattern (2015-16)**

**STRUCTURE & EXAMINATION PATTERN**

**MTech - Information Technology**

Semester II											Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18	
Subjects	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits	
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	T W	Pract/ Oral	TH	TW/ PR/ OR		
Research Foundation	04	--	60	20	10	10	--	--	04	--	04	
Information Retrieval	04	02	60	20	10	10	25	25	04	01	05	
Real Time Systems	04	--	60	20	10	10	--	--	04	--	04	
Information Security	04	02	60	20	10	10	25	25	04	01	05	
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>	

<b>M.Tech IT Semester II</b>		<b>Subject: Research Foundation</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>		<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>		<b>Theory : 04</b>
	<b>Continuous assessment : 40 Marks</b>		<b>Total Credits : 04</b>
<b>Course Objectives:</b>			
1) Assist students in planning and carrying out research projects, further research oriented studies or jobs			
2) The students are exposed to the principles, procedures and techniques of implementing a research finding.			
3) Students involve with finding out the literature using information technology / computer technology and with using the tools for data analysis in various sectors, and writing the reviews, papers, reports and thesis.			
<b>Course Prerequisites:</b>			
<b>Students should have knowledge of</b>			
1) Problem definition			
2) Project Preparation and publications			
3) Mathematical and Statistical Analysis			
<b>Course Outcome:</b>			
<b>Students will be able to:</b>			
1) Define and describe the research, research process and research methods.			
2) Understand and apply research methods including design, data analysis, and interpretation.			
3) Project Report, and Research Paper writing			
<b>UNIT-I</b>	<b>Research Idea</b>		<b>( Hours)</b>
	Introduction to research. Research: objectives, motivation, types, approaches, methods and methodology. Research and scientific method.		08
<b>UNIT-II</b>	<b>Research Processes</b>		<b>( Hours)</b>
	How research is done, research processes, research criteria, research problem definition, problem selection, need of defining the problem, techniques involved in defining a problem.		08
<b>UNIT-III</b>	<b>Research Design</b>		<b>( Hours)</b>
	Research design: idea, why research designs, characteristics of design, types of designs, experimental design.		08
<b>UNIT-IV</b>	<b>Novelty</b>		<b>( Hours)</b>
	Novelty and Originality in Research: Resources, skills, time management, role of supervisor and research scholar, interaction with subject experts.		06
<b>UNIT-V</b>	<b>Paper, Thesis and Report Writing</b>		<b>( Hours)</b>
	Thesis Writing: Title, Abstract, Introduction, Literature review / previous works, Methodology, Result / Data analysis, Comparisons		08

	with earlier works, Conclusion, Future Scopes and References (IEEE / Springer / ACM / Elsevier formats). Importance of literature review, source of literature: books, journals, proceedings, thesis and dissertations, unpublished documents. On-line Searching: Database, SciFinder, Scopus, Science Direct, Searching research articles, Citation Index, Impact Factor, H-index.	
<b>UNIT-VI</b>	<b>Tools</b>	<b>( Hours)</b>
	Analytical tools, Introduction to data analysis, linear data and non-linear data, exponential type data, logarithmic type data, power function data and polynomials of different orders. Plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and Sigmoidal type data. Quantitative Techniques: Steps of quantitative analysis, reliability of the data, errors classification, accuracy, precision, statistical errors. LaTeX: Writing scientific report, research report, revision, writing project proposal, paper writing for international journals, conference presentation, Slides preparation, pictures, graphs and citation styles.	10
<b>Assignment List:</b>		
1)	Briefly describe the different steps involved in a research process. What do you mean by research? Explain its significance in modern times.	
2)	Write short notes on: Design of the research project; Ex post facto research; Motivation in research; Objectives of research; Criteria of good research; Research and scientific method.	
3)	Describe the different types of research, clearly pointing out the difference between an experiment and a survey.	
4)	What is the necessity of defining a research problem? Explain.	
5)	Explain the meaning of the following in context of Research design: (a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.	
6)	Distinguish between an experiment and survey. Explain fully the survey method of research.	
7)	Write short notes on the following: (a) Cross tabulation; (b) Discriminant analysis; (c) Coefficient of contingency; (d) Multicollinearity; (e) Partial association between two attributes.	
8)	5. Distinguish between the following:	

	<p>(a) Statistic and parameter;  (b) Confidence level and significance level;  (c) Random sampling and non-random sampling;  (d) Sampling of attributes and sampling of variables;  (e) Point estimate and interval estimation.</p> <p>7. 8. In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.</p>
9)	<p>(a) 500 articles were selected at random out of a batch containing 10000 articles and 30 were found defective. How many defective articles would you reasonably expect to find in the whole batch?  (b) In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.</p>
10	<p>“We can teach methods of analysis, yet any extensive research... requires something equally important: an organisation or synthesis which provides the essential structure into which the pieces of analysis fit.” Examine this statement and show how a good research report may be prepared.</p>
<b>Text Books:</b>	
1)	C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
2)	P. Oliver, Writing Your Thesis, New Delhi: Vistaar Publications, 2004.
<b>Reference Books:</b>	
1)	R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
2)	F. Mittelbach and M. Goossens, The LATEX Companion, 2nd. ed. Addison Wesley, 2004.
3)	J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd. ed. Sage Publications, 2008.
4)	Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
5)	B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis, 2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
6)	Gregory, Ethics in Research, Continuum, 2005.
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

<b>M.Tech IT Semester II</b>		<b>Subject : Information Retrieval</b>		
<b>Teaching Scheme</b>		<b>Examination Scheme</b>		<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>		<b>End Semester Examination : 60 Marks</b>		<b>Theory :04</b>
<b>Practical :02</b>		<b>Continuous assessment : 40 Marks</b>		<b>Practical : 01</b>
		<b>Term Work:25 Marks</b>		
		<b>Prat/Oral : 25 Marks</b>		<b>Total Credits : 05</b>
<b>Course Objectives:</b>				
1) To provide students with an overview of the main principles and methods underlying the domain of Information Retrieval.				
2) To address more recent developments in IR such as collaborative filtering and Latent Semantic Indexing.				
<b>Course Prerequisites:</b>				
<b>Students should have knowledge of</b>				
1) Basic basic information retrieval techniques.				
2) Data Structures and Algorithm Analysis				
<b>Course Outcome:</b>				
<b>Students will be able to:</b>				
1) Understand the impact on web of information retrieval.				
2) Understand basic information retrieval models.				
3) understand experimental evaluation of information retrieval				
4) understand information retrieval implementation in search engines				
5) understand language-model based retrieval				
6) understand Information Extraction and Integration				
<b>UNIT-I</b>	<b>Introduction</b>			<b>( Hours)</b>
	Goals and history of IR. <b>IR Basics:</b> inverted index, query and document representations, boolean retrieval, simple tf/idf and other ranking schemes.			08
	The impact of the web on IR. Information behavior, browsing vs seeking, types of search			
<b>UNIT-II</b>	<b>Basic IR Models</b>			<b>( Hours)</b>
	Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity.			08
	<b>Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval:</b>			
	Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation.			

<b>UNIT-III</b>	<b>Experimental Evaluation of IR</b>	<b>( Hours)</b>
	Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections.  <b>Query Operations and Languages:</b>  Relevance feedback; Query expansion; Query languages.  <b>Text Representation:</b>  Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML).	08
<b>UNIT-IV</b>	<b>Web Search</b>	<b>( Hours)</b>
	Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents.  <b>Text Categorization:</b> Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization.	08
<b>UNIT-V</b>	<b>Language-Model Based Retrieval</b>	<b>( Hours)</b>
	Using naive Bayes text classification for ad hoc retrieval. Improved smoothing for document retrieval.  <b>Text Clustering:</b> Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to web search and information organization.	08
<b>UNIT-VI</b>	<b>Recommender Systems</b>	<b>( Hours)</b>
	Collaborative filtering and content-based recommendation of documents and products.  <b>Information Extraction and Integration:</b>  Extracting data from text; semantic web; collecting and integrating specialized information on the web.	08
<b>Assignment List:</b>		
<b>1)</b>	Study impact of Information retrieval on web	
<b>2)</b>	Write a program to implement TF-IDF to rank data	
<b>3)</b>	Write a program to normalize the data	
<b>4)</b>	Write a program to analyze indexer	
<b>5)</b>	Write a program to analyze recall and F-measure top 3 popular search engines.	
<b>6)</b>	Analyze working of open source crawlers.	
<b>7)</b>	Implement naïve bayes algorithm to retrieve the data	
<b>8)</b>	Write a program to implement k-means algorithm.	
<b>9)</b>	Write a program to design dynamic forms for collaborative filtering	

<b>10)</b>	Write a program to to collect feedback using various recommendation techniques
<b>Text Books:</b>	
1)	Introduction to Information Retrieval, by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2008
<b>Reference Books:</b>	
1)	Search Engines: Information Retrieval in Practice by W. Bruce Croft, Donald Metzler, and Trevor Strohman
2)	Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schutze, Cambridge University Press. 2008
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

<b>M.Tech IT Semester II                      Subject : Real Time Systems</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory     : 04 hrs/week</b>	<b>End Semester Examination     : 60 Marks</b>	<b>Theory        :04</b>
	<b>Continuous assessment             : 40 Marks</b>	
		<b>Total Credits : 04</b>



<b>Course Objectives:</b>		
1) The aim of the course is to introduce the student to the theory of formal verification methods and techniques used for real time systems.		
2) This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in Real Time System.		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1)Basic understanding of C.		
2) Basic understanding of Computer Architectures.		
3) Basic understanding of Operating Systems		
<b>Course Outcome:</b> Real time system is one of class of f complex systems whose performance must be analyzed at the earlier phases of development. The methods and techniques in this course are widely used now a day in industries for these verifications of Real Time System. The students would have then a strong background of modeling, simulation and verification..		
<b>Students will be able to:</b>		
1) Clearly differentiate the different issues that arise in soft and hard real-time systems. Explain the various concepts of time that arise in real-time systems.		
2) Understand basic multi -task scheduling algorithms and approaches for scheduling.		
3) Understand basic for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling.		
4)Able to understand the desired language characteristics of real time programming languages.		
5) Clearly differentiate the Real Time Vs Gerenal – Purpose Databases.		
6)Understand the real time communication.protocols.		
<b>UNIT-I</b>	<b>Introduction</b>	<b>( 08 Hours)</b>
	Real time Applications,Hard Versus Soft Real Time Systems, A reference model of Real Time Systems ,Issues in Real-Time Computing, Structure of real time systems, Task Classes, characterizing Real -Time Systems: Performance Measures for Real Time Systems., Estimating Program Run Times	
<b>UNIT-II</b>	<b>Real Time Scheduling</b>	<b>( 08 Hours)</b>
	<b>Approaches to Real Time Scheduling :</b> Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach <b>Scheduling :</b> Introduction, Classical Uniprocessor Scheduling - Rate Monotonic scheduling Algorithm,Preemptive Earliest Deadline First(EDF) Algorithm <b>Uniprocessor scheduling of IRIS tasks-</b> Identical Linear Reward Functions,Nonidentical Reward Functions,0/1 Reward Functions,Identical	

	Concave Reward Function, Non identical Concave Reward Function,	
<b>UNIT-III</b>	<b>Task Assignment</b>	<b>( 08 Hours)</b>
	Utilization Balancing Algorithm,A Next – Fit Algorithm for RM Scheduling,A Bin – Packing Assignment Algorithm for EDF,A Myopic Offline Scheduling (MOS) Algorithm,The Buddy Strategy,Assignment and Precedence Conditions.	
<b>UNIT-IV</b>	<b>Programming Languages and Tools</b>	<b>( 08 Hours)</b>
	Introduction,Desired language characteristics,Data Typing,Control Structures,Facilitating Hierarchical Decomposition,Packages,Run Time Error Handling,Multitasking,Task Scheduling,Timing specifications,Experimental Languages:Flex,Euclid <b>Run Time Support:</b> Compiler,Linker,Debuuger,Kernel	
<b>UNIT-V</b>	<b>Real Time Databases</b>	<b>(08 Hours)</b>
	Introduction,Real Time Vs Gerenal – Purpose Databases,Main memory databases,Transaction Priorities,Transaction Aborts,Concurrency Control Issues,Disk Scheduling Algorithm,A Two-Phase Approach to improve predictability,Mainaining serilaliation Consistency,Databases for Hard real Time systems.	
<b>UNIT-VI</b>	<b>Real Time Communication</b>	<b>(08 Hours)</b>
	Introduction,Model Of Real Time Communication,Priority based Service Disciplines for switched network,Weighted Round Robin service disciplies,Medium Access control protocols of Broadcast networks,Real Time Protocols,Communication in multicomputer systems	

**Text Books:**

- 1) C.M.Krishna,Kang G.Shin “Real Time Systems”,Tata McGraw Hill Edition
- 2) Jane W.S.Liu,”Real Time Systems” Pearson Educatio

**Reference Books:**

- 1) Real-Time Systems: Theory and Practice Kindle Edition by Rajib Mall

**Syllabus for Unit Test:**

**Unit Test -1** | **Unit I ,II and III**

**Unit Test -2** | **Unit IV, V and VI**

<b>M.Tech IT Semester II            Subject :Information Security</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04</b> Hrs/week	<b>End Semester Examination : 60 Marks</b>	<b>Theory: 04</b>
<b>Practical :02</b> Hrs/week	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work : 25 Marks</b>	<b>Total Credits:05</b>
	<b>Prat/Oral : 25 Marks</b>	
<b>Course Objectives:</b>		
<ul style="list-style-type: none"> <li>• Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management.</li> </ul>		

- Provide hands on approaches will be discussed to better understand and to devise strategies related to security policy.

**Course Prerequisites:**

**Students should have knowledge of**

**1** Fundamentals of Telecommunication and computer networks.

**Course Outcome:**

**Students will be able to:**

**1)** Understand mathematical formulation in security algorithms.

**2)** Understand aspect of information security management including planning, process, policy, procedure and security model as well as hardware and software technologies to safeguard organizational assets.

**3)** develop skills of security management progression within an organization.

**4)** Perform email and graphic image recovery as well as investigations.

**5)** Implement cryptography algorithms.

**6)** Learn business continuity planning concepts.

UNIT-I	MATHEMATICAL FOUNDATIONS OF INFORMATION SECURITY :	(6 Hours)
	<p>Topics in elementary number theory: <math>O</math> and <math>\Omega</math> notations ,Euclidean algorithm ,Congruence's, Euler's phi function , Fermat's Little Theorem , Chinese Remainder Theorem , Applications to factoring ,finite fields , quadratic residues and reciprocity: Quadratic residues ,Legendre symbol , Jacobi symbol. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Block ciphers, Use of Block Ciphers, Multiple Encryption, Stream Ciphers, Affine cipher, Vigenere, Hill, and Permutation Cipher, Secure Cryptosystem.</p>	
UNIT-II	SECURITY ELEMENTS:	( 6 Hours)
	<p>Authorization and Authentication - types, policies and techniques - Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Polices and Procedures, Firewalls, IDS, Log Files, Honey Pots .Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training , Email and Internet use policies, Third Party Development - Intellectual Property Issues .</p>	
UNIT-III	INFORMATION SECURITY POLICIES: INDUSTRIES PERSPECTIVE:	(6 Hours)
	<p>Introduction to Information Security Policies, About Policies, why Policies are Important ,When policies should be developed , How Policy should be developed - Policy needs – Identify what and from</p>	

	whom it is being protected , Data security consideration, Backups, Archival storage and disposal of data - Intellectual Property rights and Policies – Incident Response and Forensics - Management Responsibilities – Role of Information Security Department.	
<b>UNIT-IV</b>	<b>SECURITY THREATS :</b>	<b>( 6 Hours)</b>
	Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning.	
<b>UNIT-V</b>	<b>PUBLIC KEY CRYPTOSYSTEMS:</b>	<b>(6 Hours)</b>
	The idea of public key cryptography, RSA Cryptosystem , Bit security of RSA , ElGamal Encryption , Discrete Logarithm , Knapsack problem , Zero-Knowledge Protocols . Primality and Factoring: Pseudo primes , the rho ( $\gamma$ ) method , Format factorization and factor bases ,the continued fraction method , the quadratic sieve method. Number Theory and Algebraic Geometry: Elliptic curves, basic facts , elliptic curve cryptosystems , elliptic curve primality test ,elliptic curve factorization.	
<b>UNIT-VI</b>	<b>AUDITING AND BUSINESS CONTINUITY PLANNING</b>	<b>( 6 Hours)</b>
	: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware,Security testing tool BackTrack, Audit Tools: NISSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.	
<b>Assignment List:</b>		
<b>1.</b>	Assume a web-based system that has a state-less front-end web server (which just processes requests as it is with no state being tracked), an application engine (such as a Java servlet engine) that receives requests forwarded by the front-end, and a database that is used store/retrieve/manage data by the application engine. The application engine hosts application for a bank. The web-based system allows for a user to carry out online transactions, online viewing of accounts as well as other common tasks. (a) What types of logging mechanisms should be used for the front-end, the application engine, and for the database in order to audit the requests received, their processing, and the privilege modes/user ids in which requests are processed. (b) What auditing should such a system support?	

2.	<p>Pretend you've just seen a new type of malware that places the malicious code in an audio file, by using different frequencies to correspond to different instructions. Existing vulnerabilities are used to get access to the system and install a small interpreter that reads the infected audio files and executes them. Assume that you are unable to detect/prevent the interpreter (and that it doesn't do anything harmful by itself anyway) - your job is to detect or prevent it from executing malicious audio files.</p> <p>(a) List one or more ways you could <i>detect</i> an infected audio file. Provide a brief (one paragraph) description of each approach.</p>
3.	Write a program to perform substitution ciphers to encrypt the explain text to Caesar cipher and to decrypt it back to plain text.
4.	Write a program to generate Symmetric Keys for the following Cipher algorithms DES, AES, Blowfish, TripleDES.
5.	<p>Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption:</p> <p>a.RSA b.AES c.DSA</p>
6.	Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Simple Columnar technique.
7.	Assignment based on the presentation on either of following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools ElGamal Encryption Asymmetric Cryptosystems
8.	Case study on secure configuration of Email Server.
<b>Text Books:</b>	
1)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2 <sup>nd</sup> Edition, Springer, 2002.
2)	Johannes A. Buchman, "Introduction to Cryptography", 2 <sup>nd</sup> Edition, Springer, 2004.
3)	Serge Vaudenay, "Classical Introduction to Cryptography – Applications for Communication Security", Springer, 2006.
4)	Victor Shoup, "A Computational Introduction to Number Theory and Algebra", Cambridge University Press, 2005.
5)	William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
6)	Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.
<b>Reference Books:</b>	
1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective

	Information Security Management (Paperback) Auerbach, 1 <sup>st</sup> edition, 2001
3)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2 <sup>nd</sup> Edition, Springer, 2002.
4)	Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

**Proposed Structure of M.Tech Information Technology  
CBCS Pattern (2015-16)**

**STRUCTURE & EXAMINATION PATTERN**

**MTech - Information Technology**

Semester III											Total Duration : 28 Hrs/Week	
											Total Marks : 475	
											Total Credits : 40	
Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme (Credits)		Total Credits	
	Hrs./Week											
	L	P	Theory	Unit Test	Attendance	Tutorial/assignments	TW	Pract/Oral	T H	TW/PR/OR		
Elective –I	04	02	60	20	10	10	25	25	04	01	05	
Elective –II	04	02	60	20	10	10	25	25	04	01	05	
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21	
Seminar	-	05	-	-	--	--	25	25	-	05	05	
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>12</b>	<b>28</b>	<b>40</b>	

Elective – I	Elective - II
<ul style="list-style-type: none"> <li>• Natural Language Processing &amp; Understanding</li> <li>• Computer Forensics &amp; Cyber Laws</li> <li>• Advanced MIS</li> <li>• Wireless Networks</li> <li>• Data Warehousing &amp; E-Commerce</li> </ul>	<ul style="list-style-type: none"> <li>• Bio-informatics</li> <li>• Advanced Computer Architecture</li> <li>• Usability Engineering</li> <li>• Advanced Database Management</li> <li>• Advanced Operating System</li> </ul>



<b>M.Tech IT Semester III ELECTIVE I: Natural Language Processing And Understanding</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
<b>Practical : 02 Hrs</b>	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work :25 Marks</b>	
	<b>Prat/Oral : 25 Marks</b>	<b>Total Credits : 05</b>
<b>Course Objectives:</b>		
1. To understand natural language processing and to learn how to apply basic algorithms in this field.		
2. To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.		
3. To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language		
<b>Course Prerequisites:</b>		
Students should have knowledge of working of compiler phases		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1. Evaluate language technology components.		
2. Understand various parsing methodologies.		
3. Understand various language models and relate them in probability perspective.		
4. Map and solve the language parsing problem with dynamic programming.		
5. Understand machine learning techniques and can assess which ones are suitable for a given problem.		
<b>UNIT-I</b>	Introduction and Overview:	<b>( 08 Hours)</b>
	Introduction, Overview and Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic analysis and Representation Structures, Natural Language Generation, Natural Language Systems, What is Natural Language Processing ?,Ambiguity and Uncertainty in language.	
<b>UNIT-II</b>	<b>Parsing and CFG:</b>	<b>( 08 Hours)</b>
	<p><b>String Edit Distance and Alignment:</b> Key algorithmic tool: dynamic programming, First a simple example, its use in optimal alignment of sequences. String edit operations, edit distance, examples of use in spelling correction, machine translation.</p> <p><b>Context Free Grammars:</b> Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing; Bottom-Up Parsing, and the Problems with each. Non-probabilistic model.</p> <p><b>Parsing:</b> Efficient CFG parsing with CYK, another dynamic programming algorithm. Designing a little grammar and parsing with it on some test data.</p>	

<b>UNIT-III</b>	<b>Information Theory :</b>	<b>( 08 Hours)</b>
	What is information? Measuring it in bits. Entropy, cross-entropy, information gain. Its application to some language phenomena. <b>Language modeling and Naive Bayes:</b> Probabilistic Language modeling and its applications. Markov models. Estimating the Probability of a Word, and Smoothing. Generative models of language and their Application.	
<b>UNIT-IV</b>	<b>Hidden Markov Models :</b>	<b>( 08 Hours)</b>
	<b>Part of Speech Tagging and Hidden Markov Models :</b> The concept of Parts-of-speech, Examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. <b>Viterbi Algorithm for Finding Most Likely HMM Path :</b> Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese Word Segmentation, Prosody, information extraction, Weighted Context Free Grammars. Weighted CYK. Pruning and Beam Search.	
<b>UNIT-V</b>	<b>Classifiers and Models:</b>	<b>(08 Hours)</b>
	<b>Maximum Entropy:</b> The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks. <b>Maximum Entropy Markov Models &amp; Conditional Random Fields:</b> Part-of-speech tagging, Noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.	
<b>UNIT-VI</b>	<b>Machine Translation:</b>	<b>(08 Hours)</b>
	Probabilistic models for Translating any Language into English. Alignment, translation, Language generation.	
<b>Text Books:</b>		
1.	Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall.	
<b>Reference Books:</b>		
1.	Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.	
2.	Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.	
3.	Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.	

4.	Radford, Andrew et. al., Linguistics, an Introduction, Cambridge University Press, 1999.
	<b>Assignment list :</b>
1.	Implement part of a noisy-channel model for spelling correction.
2.	Write regular expressions that extract phone numbers and regular expressions that extract email addresses.
3.	Using Naïve Bayes algorithm classify selected movie review as positive or negative
4.	Build a maximum entropy Markov model (MEMM) for identifying person names in newswire text.
5.	Implement two translation models, IBM model 1 and IBM model 2, and apply these models to predict English word alignments.
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

<b>M.Tech IT Semester III Subject: Elective - I Advanced MIS</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 04</b>
<b>Practical : 02 Hrs</b>	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work : 25 Marks</b>	
	<b>Prat/Oral : 25 Marks</b>	<b>Total Credits : 05</b>
<b>Course Objectives:</b>		
1) Explain the changing organizational environment and the use of information technology to manage contemporary organizations		
2) Identify the business impacts of business and social networking		
3) Explain the technological foundations of information systems, i.e., hardware, software and telecommunications		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1) <b>Information System Management</b>		
2) <b>System Analysis and design</b>		
3) <b>Management information system</b>		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Explain the organizational context of information systems, including decision making and information processing concepts		
2) Identify, conceptualize, and develop solutions to prepare conceptual design report		
3) Based on conceptual system design the student should able to prepare detailed system design alongwith technological foundations of information systems, i.e., hardware, software,informationprocessing.		
4).To understand implementation evaluation of system and pitfalls in MIS.		
5).Identify applications of MIS in manufacturing sector.		
6)Understand design of business systems using contemporary tools.		
<b>UNIT-I</b>	<b>Introduction:</b>	<b>( 08 Hours)</b>
	<p><b>Foundation of Information System :</b> Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, MIS organization within company, Management information and the systems approach.</p> <p><b>Information Technology:</b> A manager's overview, managerial overviews, computer hardware &amp; software, DBMS, RDBMS and Telecommunication.</p>	
<b>UNIT-II</b>	<b>Conceptual System Design:</b>	<b>( 08 Hours)</b>
	Define the problems, set systems objective, establish system constraints, determine information needs, determine information sources, develop alternative conceptual design and select one document ,the system concept, prepare	

	the conceptual design report.	
<b>UNIT-III</b>	<b>Detailed System Design :</b>	<b>( 08 Hours)</b>
	Inform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose and organization to operate the system, document the detailed design, revisit the manager user.	
<b>UNIT-IV</b>	<b>Implementation Evaluation and Maintenance of the MIS :</b>	<b>( 08 Hours)</b>
	Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files , test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development.	
<b>UNIT-V</b>	<b>Advanced Concepts in Information Systems :</b>	<b>(08 Hours)</b>
	Enterprise Resources Management(ERP), Supply Chain Management, CRM, Procurement Management System. Applications of MIS in Manufacturing sector, Service sector	
<b>UNIT-VI</b>	<b>Designing of business systems :</b>	<b>(08 Hours)</b>
	Design of business systems using contemporary tools and methods such as SQL, CASE tools, OOD tools, etc. Advanced Case Studies in MIS.	
<b>Text Books/Referemnce Books:</b>		
1)	Kenneth C. Laudon , “Management Information Systems”, Eighth Edition, PHI	
2)	James O'Brien and George Marakas, “Management Information Systems	
3)	Effy Oz, “Management Information Systems”, Course TechEffy	
<b>Assignment List :</b>		
1)	<b>Introduction to MIS</b>	
2)	<b>Generating conceptual system design report</b>	
3)	Case study on detailed system design based on <b>conceptual system</b>	
4)	<b>Implementation ,evaluation and maintainance of MIS.</b>	

5)	Analysis of pitfalls in MIS developement
6)	<b>Case study of advanced concepts in information system.</b>
7)	To study applications of MIS in service sector.
8)	<b>Design of business system using contepoorary tools and methods such as SQL.</b>
9)	<b>Study of CASE tools and OOD tools.</b>
10	<b>Case study of Isoftware used for building information system.</b>
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

**M.Tech IT Semester III Subject: Elective-I WIRELESS COMMUNICATION NETWORK**

Teaching Scheme	Examination Scheme	Credit Allotted
<b>Theory : 04 hrs/week</b> <b>Practical : 02 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
	<b>Continuous assessment : 40 Marks</b>	<b>Practical :01</b>
	<b>Term Work :25 Marks</b>	<b>Total Credits : 05</b>
	<b>Prat/Oral : 25 Marks</b>	

**Course Objectives:**

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

**Course Prerequisites:**

**Students should have knowledge of**

...Computer Networking And Communication

**Course Outcome:**

**Students will be able to:**

- 1) Understand mobile cellular architecture.
- 2) Understand the multiple access schemes & Handover, Handoff system.
- 3) Analyze the technology digital cellulare system.
- 4) Understand the technology WLAN ,Bluetooth.
- 5) Understand the GPRS System.
- 6) Understand the technology ADHOC & 802.16 system.

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UNIT-I	INTRODUCTION OF WIRELESS COMMUNICATION	( Hours)
	Challenges in wireless networking, Wireless communications standards Overview, evolution of cellular system, Cellular system architecture & operation, Performance criteria. Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA	08
UNIT-II	WIRELESS NETWORK PLANNING AND OPERATION	( Hours)
	frequencies management, channel assignments, frequency reuse, System capacity& its improvement, Handoffs & its types, roaming, co channel & adjacent channel interference .	08
UNIT-III	DIGITAL CELLULAR NETWORKS	( Hours)
	GSM architecture& interfaces, signal processing in GSM, frame structure of GSM, Channels used in GSM, The European TDMA Digital cellular standard.	08
UNIT-IV	WIRELESS LAN TECHNOLOGY	( Hours)

	Overview, WLAN technologies, infrared LANs, Spread Spectrum LANs Narrowband Microwave LANs IEEE 802.11- Architecture, protocols, MAC layer .MAC frame, MAC management. <b>BLUETOOTH</b> Overview, Radio specification, Base band specification, Link manager specification, logical link control & adaptation protocol.	08
<b>UNIT-V</b>	<b>MOBILE DATA NETWORKS</b>	<b>( Hours)</b>
	Introduction, Data oriented CDPD networks, GPRS <b>WIRELESS ACCESS PROTOCOL</b> WAP architecture , Wireless Datagram ,Wireless Transport layer security, wireless transaction ,Wireless Session ,Wireless Application Environment ,WML	08
<b>UNIT-VI</b>	<b>Emerging Wireless Network Technology</b>	<b>( Hours)</b>
	IEEE 802.11 WLAN, ETSI HIPER LAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMANTechnology, Mobile Adhoc Network, Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology.	08
<b>Text Books:</b>		
1)	William C.Y.Lee, “Mobile cellular Telecommunication” ,2nd Ed. McGraw-Hill ĳ	
2)	Jochen Schiller, “Mobile Communication” Pearson Education ĳ	
3)	V. K. Garg, J. E. Wilkes, “Principle and Application of GSM”, Pearson Education	
<b>Reference Books:</b>		
1)	William Stalling,” Wireless Communication & Networking”	
2)	Rampantly,” Mobile communication”	
3)	Kamilo Feher,” Wireless digital communication”, PHI, 1999	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	



<b>M.Tech IT Semester III Subject: Elective –I DATA WAREHOUSING AND E-COMMERCE</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
<b>Practical : 02</b>	<b>Continuous assessment : 40 Marks</b>	<b>Term Work : 01</b>
	<b>Term Work : 25 Marks</b>	<b>Total Credits : 5</b>
	<b>Oral/Practical : 25 Marks</b>	
<b>Course Objectives:</b>		
1) Techniques for Developing Proper Data Warehouses		
2) Analyze the E-Commerce Payment Mechanism and Risk		
3) Recognize the business impact and potential of e-Commerce		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1) Information Systems		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand the analysis Decision Support System, Types and architecture.		
2) Understand and analyze process for Development of DSS.		
3) To understand Data Warehouse Concept and database.		
4) To understand E-Commerce & Third Parties		
5) To understand Risk and E-Commerce Payment Mechanism		
6) To understand E-Commerce payment mechanism		
<b>UNIT-I</b>		<b>( Hours)</b>
	Types of Decision Support System: The DSS hierarchy, Generalising the categories, Matching the DSS to the Decision type, Individual and group DSS. Matching the DSS to the user Community, Matching DSS to the decision Maker's Psychological type, User modes institutional Vs ad-hoc DSS.  DSS Architecture, Hardware and Operating Systems Platform: Defining the DSS Arch. The major options, the internet and client-server computing in DSS, DSS using shared data on separate system, DSS on stand alone system, Open system and DSS, DSS user interface. DSS Software Tools: DSS software categories, standard packages, Specialized tools and generators, programming languages for DSS, DSS user interfaces	08
<b>UNIT-II</b>		<b>( Hours)</b>
	Building & Implementing Decision Support System: The DSS development process, DSS development project particulars. The implementation stage, system conversion. Overcoming resistance to change, DSS implementation issues, using the list of issues, Ethical issues in DSS.	08

<b>UNIT-III</b>	Data Warehousing & Executive Information System Fundamentals: Definitions uses & necessity of a data warehousing, Data warehouse concepts, Executive information systems. The Data Warehouse Database: Contents of the data warehouse database, database structures, and Getting data into data warehouse, Media.	<b>( Hours)</b>
		08
<b>UNIT-IV</b>	E-Commerce & The Role of Independent Third Parties: Introduction, consulting parties & accountant's independence, CPA version project, New assurance project, New assurance services undefined by the AICTE the Elliot committee 7 the Cohen Committee, three views of E-Commerce. E-commerce integrity & security assurance, internal control framework, competition, risk assessment assurance, impact of e-commerce on the traditional assurance function, continuous auditing, third party assurance of web based e-commerce, security of data, business plitics, transactions processing integrity, privacy of data, web-site seal options, better business bearu. Trustee, veri-sign, ACSA, AICPA/CICA web trust, business practices, transaction integrity, information protection, report issuance, implication for the accounting, professional skill sets, expansion of assurance services, consulting and international services	<b>( Hours)</b>
		08
<b>UNIT-V</b>	E-Commerce & Internet: Introduction, traditional EDI system, the origin of EDI, non-EDI systems, value added network(VANS) and pre-established trading partners, partially integrated EDI systems, benefits of EDI systems, Data transfer and standards, Department of Defense transaction,. Examples, financial EDI, EDI systems and Internets, Security concerns, security of data during transmission, audit trials and acknowledgements, authentication, interact trading relationship; consumer to business, business to business, government to citizen benefits, EDI web browser transaction, software, insights EDI and internet systems. Real time EDI inventory links with suppliers, integrated delivery links with federal express, web based sales, Impact of EDI internet applications on the accounting profession, Increased complexity of auditing through the computer, integrity of reliance in the VANs, Extension of audit to trading partners systems, increased technological skill of smaller accounting firms.	<b>( Hours)</b>
		08
<b>UNIT-VI</b>	Risk of Insecure Systems: Introduction, Overview of risks associated with internet transactions, internet associated risks, risks of customers, false or malicious web sites, stealing visitor's hard id, & passwords, stealing visitor's credit card and information, spying on visitor's hard drive, theft of customer data from selling	<b>( Hours)</b>

	<p>agents and ISPs, Privacy and use of cookies, risk to selling agents, customer impersonation, denial of service attacks, data theft, internet associated risks, sabotage by former employees, sniffers, financial fraud, down loading of data, emails proofing, social engineering, risks associated with business transaction data transferred between trading partners, intranet extranet and internet relationship, data interception, message origin authentication, proof of delivery, message integrity &amp; unauthorized viewing of messages, timely delivery of messages, risk associated with viruses and malicious code overflows, viruses, Trojan Horses, hoaxes, buffer overflows, implication for the accounting profession, intranet internet controls web site assurance.</p> <p>E-Commerce Payment Mechanism:  Introduction, the SET protocol. SET v/s SSI, version 1.0, payment gateway, Certificate Insurance, Certificate trust chain, Cryptography methods, Dual signature, the set logo, Compliance testing, Status of software implementation, version 2.0, and intermediate releases, magnetic strip cards, smart cards, Electronic cheques, The FSTC's electrons cheques, the FSTC's BIPS specification, audit implications, Electronic bill presentation &amp; payment system.</p>	
		08
<b>Assignment List:</b>		
1)	What is Decision Support System? Explain Types of Decision Support System.	
2)	Case Study: DSS Software Tools	
3)	Explain Building & Implementing Decision Support System	
4)	Case Study: Trustee, veri-sign, ACSA, AICPA/CICA web trust	
5)	Explain EDI, non-EDI systems, value added network (VANS) with example.	
6)	What are the types of digital wallets? Explain	
7)	Relationship-Based Smart Credit Cards	
<b>Text Books and References::</b>		
1)	Efrem G. Mallach, "Decision support & data warehouse system", MGH International	
2)	Green Stein, FeinMan , "Electronic Commerce", MGH International	
3)	W.S.Jawadekar, "Management Information System", MGH International	
4)	Daniel Minoli, "Web Commerce technology handbook", MGH International	
5)	Mathews Leon, "The E-biz Primer- Alexis Leon", MGH International	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

<b>M.Tech IT Semester III Subject: Elective I: Computer Forensics and Cyber Laws</b>		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits: 05
	Pract/Oral : 25 Marks	
<b>Course Objectives:</b>		
1) Computer Forensics is a rapidly changing field. Simple things, like stronger encryption introduced into operating systems, create new challenges for forensic examiners every day.		
<b>Course Prerequisites:</b>		
Students should have knowledge of		
1) Practical experience of Computer Network and Network Security		
<b>Course Outcome:</b>		
Students will be able to:		
1) Know the role of computer as forensic investigator		
2) Know techniques for recovering data, tools used for recovery		
3) setting up remote logging in Windows		
4) Apply data recovery mechanism with the help of tools.		
5) Analyze the security audit with the help of logs		
6) Apply copyright protection standard to the innovative network		
<b>UNIT-I</b>	<b>Overview:</b>	<b>(08 Hours)</b>
	Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device.  Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.	
<b>UNIT-II</b>	<b>Evidence:</b>	<b>(08 Hours)</b>
	Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence. Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team. Data Recovery: Definition of data recovery, data recovery mechanism, techniques for recovering data, tools used for recovery.	
<b>UNIT-III</b>	<b>Investigating Logs:</b>	<b>(08 Hours)</b>
	Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event	

	reporter and Application Logs.	
UNIT-IV	Forensic Tools:	(08 Hours)
	WinHex, X-Ways, Index.dat Analyzer, Data Doctor. Disaster Recovery: Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.	
UNIT-V	Battling Cyber Squatters and Copyright Protection in the Cyber World :	( 08 Hours)
	Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy	
UNIT-VI	Digital Signature, Certifying Authorities and E-Governance :	(08 Hours)
	Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India.	

**Assignment List:**

1)	Analyze various types of storage structures
2)	Understand line of investigation in the form of steps
3)	Analyze life cycle of evidence for security
4)	Apply data recovery mechanism with the help of tools.
5)	Analyze the security audit with the help of logs
6)	Analyze WinHex in detail
7)	Apply disaster recovery techniques to preserve data
8)	Apply copyreight protection standard to the innovative network.

**Text Books/References:**

1)	Jay A. Siegel, "Forensic Science: The Basics "
2)	Joe Nickell and John F. Fischer, "Crime Science: Methods of Forensic Detection"
3)	Anthony J. Bertino, "Forensic Science: Fundamentals and Investigations"
4)	Stuart H. James and Ph. D., Jon J. Nordby, "Forensic Science: An Introduction to Scientific and Investigative Techniques", 2nd edition
5)	Colin Evans, "The Casebook of Forensic Detection: How Science Solved 100 of the

	World's Most Baffling Crimes”
6)	Edward Amoroso, “Cyber Security, Computer Network Security and Cyber Ethics”, 2nd edition by Joseph Migga Kizza
7)	Robert McCrie, “Security Operations Management”, Second Edition Andy Jones and Debi Ashenden, “Risk Management for Computer Security:
8)	Andy Jones and Debi Ashenden, “Risk Management for Computer Security
Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

<b>M.Tech IT Semester III Subject: Elective II: BIOINFORMATICS</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
<b>Practical : 02</b>	<b>Continuous assessment : 40 Marks</b>	<b>Term Work : 01</b>
	<b>Term Work : 25 Marks</b>	
	<b>Oral/Practical : 25 Marks</b>	<b>Total Credits : 05</b>
<b>Course Objectives:</b>		
1. Receive an introduction and historical perspective to the field of bioinformatics		
2. Learn the key methods and tools used in bioinformatics		
3. Understand the theoretical basis behind bioinformatics		
4. Analyze protein sequences, identify proteins, and retrieve protein structures from databases. View and interpret these structures.		
...		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1) Advanced Molecular Biology (or equivalent)		
...		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand the Basic concepts of Bioinformatics		
2) Understand and analyze Sequence Alignment and Database Searching		
3) To understand Protein Structure		
4) To understand Protein-protein Interactions and Algorithms.		
5)To understand Protein function and Computer tools for phylogenetic analysis		
...		
<b>UNIT-I</b>	Bioinformatics Basics: Basic concepts, Protein and amino acid , DNA & RNA, Sequence, structure and function. Bioinformatics databases: Introduction, Motivation, Type of databases, Nucleotide sequence databases, Protein sequence databases, Sequence motif databases, Protein structure databases, Other relevant databases.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Sequence Alignment and Database Searching: Single sequence alignments, Biological motivation, Pairwise alignments, Scoring matrix, Gap penalty, Dynamics programming, Needleman- Wunsch, Smith-Waterman, Heuristic methods, FASTA, BLAST, Statistics of sequence alignment score, E-Value, P-Value, Multiple sequence alignments, ClustalW, Profile, Profile-sequence	<b>(08 Hours)</b>

	<p>alignment, Profile-profile alignment, PSI-BLAST, Hidden Markov Models.</p> <p>Protein structure alignments :  Structure superposition, structure alignment, Different structure alignment algorithms.</p>	
<b>UNIT-III</b>	<p>Protein Structure:</p> <p>Protein secondary structure predictions: Protein secondary structure, Hydrogen bond, secondary structure element, Methods for predicting secondary structure.</p> <p>Protein tertiary structure modeling:  Basic concepts Protein folding and dynamic simulation, Comparative modeling, Threading, Ab initio modeling, Combined modeling approaches, CASP: A blind protein structure prediction competition. Experimental methods for protein structure determination:  X-ray crystallography, Nuclear magnetic resonance (NMR).</p>	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<p>Protein-protein Interactions:  Experimental identification of protein-protein interactions, Yeast two- hybrid assay, High-throughput mass spectrometry, Interaction networks and system biology.</p> <p>Protein quaternary structure modeling:  Basic concepts, Degrees of freedom, Presentation of protein conformations, Hydrophobicity factor, Shape complementary, Docking Scoring function, Protein-protein docking algorithms, Protein-ligand docking algorithms, Drug design, Multiple-threading algorithms, Homology modeling of protein-protein interactions, Protein and ligand binding, CAPRI.</p>	<b>(08 Hours)</b>
<b>UNIT-V</b>	<p>Biomolecular Simulations:  Basic concepts, Units and derivatives , Force field and energy landscape, Truncation of nonbonded interactions.</p> <p>Conformational Sampling:  Introduction, Minimization and algorithms, Molecular dynamics, Ensembles (statistical mechanics), Monte Carlo simulations.</p>	<b>(08 Hours)</b>



	Solvation: Introduction, Periodic boundary condition, Ewald summation, Implicit solvent model and continuum electro statics, Monte Carlo simulation on parallel computers. Advanced Techniques: Introduction, Replica-exchange simulations, Restraint potentials, Free energy calculations, Membrane simulations.	
<b>UNIT-VI</b>	<p>Biological Membranes:  Introductions, Biological roles, Structural features, Membrane lipids, General structures, Aggregation states, Polymorphism, Thermal transitions, Electrostatic effects, Molecular dynamics, Membrane proteins, MD simulation of Membrane proteins.</p> <p>Protein function:  Sequence to function, Structure to function, Protein function identification methods and databases. Phylogenetics, Sequence-based taxonomy, Models, assumptions, and interpretations, From multiple alignment to phylogeny, Computer tools for phylogenetic analysis.</p>	<b>(08 Hours)</b>
<b>Assignment List:</b>		
1)	Explain Bioinformatics Basics.	
2)	Explain concept of Sequence Alignment and Database Searching.	
3)	Explain Protein Structure and Protein quaternary structure modeling	
4)	Explain Bio-molecular Simulations.	
5)	Explain Conformational Sampling.	
6)	Explain in detail Biological Membranes.	
7)	Explain Protein function with examples.	
<b>Text Books and References::</b>		
1)	David Mount, "Bioinformatics", Cold Spring Harbor Press"	
2)	James Jisdall, "Beginning Perl for Bioinformatics"	
3)	David W. Mount, "Bioinformatics- Sequence & Genome Analysis"	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

<b>M.Tech IT Semester III Subject: Elective – II Advanced Computing Architecture</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04</b> hrs/week <b>Practical : 02</b> hrs/week	<b>End Semester Examination : 60 Marks</b>	<b>Theory :04</b>
	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work : 25 Marks</b>	<b>Total Credits : 05</b>
	<b>Practical / Oral : 25 Marks</b>	
The aim of the course is to design distributed computing architecture to improve the efficiency of system.		
<b>Course Objectives:</b>		
1) Analyze the structure of distributed computing		
2) Apply the efficient solution with respect to suitable distributed computing Architecture.		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
2) Basic knowledge of distributed system		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand distributed environment.		
2) Analyze performance of distributed Architectures		
3) Analyze the computing parameters.		
4) Understand data and computing measures		
5) Analyze bottlenecks during the enhancement		
6) Apply the suitable architecture to enhance the performance.		
<b>UNIT-I</b>	<b>Introduction to cloud computing</b>	<b>( Hours)</b>
	Introduction to various distributed computing architectures – Grid, cluster, cloud. Structure of cloud, computing parameters of cloud, boost in the performance due to cloud.	06
<b>UNIT-II</b>	<b>Architecture of cloud computing</b>	<b>( Hours)</b>
	Service Models – Infrastructure As a Service (IaaS) , Platform as a Service (PaaS), Software as a Service (SaaS)  Deployment Models – Public cloud, private cloud, Hybrid cloud, community cloud	06
<b>UNIT-III</b>	<b>Big Data</b>	<b>( Hours)</b>
	Concept of Big Data, Challenges to deal with Big Data , solution with respect to big data, data Analytics.	06
<b>UNIT-IV</b>	<b>Data Intensive Computing</b>	<b>( Hours)</b>
	Introduction to hybrid data, concept of Hadoop Distributed	06

	File Structure (HDFS), data node, name node, job tracker, Task Tracker.	
<b>UNIT-V</b>	<b>Architecture of Map Reduce Algorithm</b>	<b>( Hours)</b>
	Concept of unstructured data, Introduction to Map Reduce Algorithm, Implementation with word count example.	06
<b>UNIT-VI</b>	<b>Case Study of advanced computing Architecture</b>	<b>( Hours)</b>
	Cloudstack, Eucalyptus, Azure, big data analytics, Hadoop, Implementation of MapReduce -II	06
<b>Assignment List:</b>		
1)	<b>Design cluster using apache web server</b>	
2)	<b>Design cloud computing environment using public cloud</b>	
3)	<b>Design cloud computing environment using private cloud</b>	
4)	<b>Analyse the Complete data of BVUCOE using big data analytics</b>	
5)	<b>Use HDFS to deal with huge data.</b>	
6)	<b>Implement Map Reduce Algorithm to prove the rise in the efficiency</b>	
7)	<b>Implement Map Reduce II</b>	
8)	<b>Analyze various computing environments like cloudstack , openstack.</b>	
<b>Text Books:</b>		
1)	<b>Architecture the cloud, Michael J. Kevis, Wiley publication</b>	
2)	<b>Microsoft Big Data Solution, Adam Jorgensen, Wiley publication</b>	
3)	<b>Hadoop: The Definitive Guide, Tom White, O'REILLY' publication</b>	
<b>Reference Books:</b>		
1)	<b>Building the Infrastructure for cloud security, Raghu Yelori, Enrique castro-Leon</b>	
2)	<b>Hadoop Operations, Eric Sammer, O'REILLY' publication</b>	
3)	<b>MapReduce Design Patterns: Building Effective Algorithms and Analytics Donald Miner, O'REILLY' publication</b>	
<b>Syllabus for Unit Test:</b>		
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>	
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>	

<b>M.Tech IT Semester III Subject: Elective II: Usability Engineering</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 04</b>
<b>Practical : 02 hrs/week</b>	<b>Continuous assessment : 40 Marks</b>	<b>Term Work : 01</b>
	<b>Term Work : 25 Marks</b>	<b>Total Credits: 05</b>
	<b>Pract/Oral : 25 Marks</b>	
<b>Course Objectives:</b>		
1) To present the basic principles and practical knowledge regarding the design, development and evaluation of human-computer interfaces in the light of usability		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
2) Practical experience of software system analysis and design		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
2) Define and distinguish between the different types of user interface		
2) Develop a more usable interface		
3) To identify techniques and technologies that can satisfy usability and accessibility specifications		
4) To apply usability methods in developing interactive systems		
5) To identify and analyze the various components of the overall context of use of an interactive system		
6) To develop usability and accessibility specifications that can be used in evaluating and developing interactive systems-		
<b>UNIT-I</b>	<b>Introduction</b>	<b>(08 Hours)</b>
	Introduction, Importance, Human computer interface, Characteristics of GUI, Direct manipulation graphical system, Web user interface, Mobile UI, Popularity of graphics  <b>Generations of User Interfaces:</b> Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces	
<b>UNIT-II</b>	<b>Development Processes</b>	<b>(08 Hours)</b>
	<b>Managing Design Processes:</b> Organizational Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues <b>Evaluating Interface Designs:</b> Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	

<b>UNIT-III</b>	<b>User Interface Software and Specifications</b>	<b>(08 Hours)</b>
	Languages and tools for specifying and building interfaces, Dialogue independence, UIMS (user interface management system) approach, Languages and software abstractions for user, interfaces, Programming support tools	
<b>UNIT-IV</b>	<b>Develop System Menus and Navigation Schemes</b>	<b>(08 Hours)</b>
	<b>Menus:</b> Structures, Functions, Content, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of Graphical Menus <b>Windows:</b> Window Characteristics, selection of window, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, Web Systems	
<b>UNIT-V</b>	<b>Interaction Styles, Devices and Techniques</b>	<b>( 08 Hours)</b>
	<b>Interaction Styles:</b> Question and answer, Form-based, Command language Menus, Natural language, direct manipulation  <b>Interaction Devices:</b> Keyboard and function keys, pointing device, speech recognition digitization and generation, image and video displays, drivers  <b>New Interaction Techniques:</b> New modes of human-computer communication, Voice, Gesture, Eye movement, Tangible, user interfaces, Brain-computer interfaces	
<b>UNIT-VI</b>	<b>UI Feedback, Guidance and Assistance</b>	<b>(08 Hours)</b>
	<b>Providing the Proper Feedback:</b> Response Time, Dealing with Time Delays, Blinking for Attention, Use of Sound  <b>UI Guidance and Assistance:</b> Preventing Errors, Problem Management, Providing Guidance and Assistance, Instructions or Prompting, Help Facility	
<b>Assignment List:</b>		
1)	Introduction to fundamentals of Usability Engineering	
2)	Study on User Interface Software and Specifications	
3)	Design a sport watch interface	
4)	Design a web application interface for online grocery shopping	
5)	Design a touch screen interface for an Automatic Teller Machine (ATM) geared towards kids aged 10-15 whose parents have opened a savings account for them	
6)	Design an interface and list user experience for a universal remote to be used in home settings	
<b>Text Books:</b>		
1)	Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, <i>Designing the User Interface:</i>	

	<i>Strategies for Effective Human-Computer Interaction</i> , Addison-Wesley, Reading, Mass. (any recent edition)
2)	Y. Rogers, H. Sharp, and J. Preece, <i>Interaction Design: Beyond Human-Computer Interaction</i> , John Wiley & Sons. (any recent edition)
<b>Reference Books:</b>	
1)	Don Norman, <i>The Design of Everyday Things</i>
2)	Jakob Nielsen, <i>Usability Engineering</i>
3)	Jakob Nielsen and Raluca Budiu, <i>Mobile Usability</i>
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

**M.Tech IT Semester III Subject: Elective II: Advanced Database Management System**

Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Practical : 01
	Term Work : 25 Marks Prat/oral : 25 Marks	Total : 05

**Course Objectives:**

- 1) Introduce principles and foundations of distributed databases and parallel databases
- 2) Understand the operations in Transaction management

**Course Prerequisites:**

**Students should have knowledge of**

- 1) Basic database management system concepts and their operations.

**Course Outcome:**

**Students will be able to:**

- 1) Understand distributed database architecture and design
- 2) Understand the processing and optimization of distributed queries
- 3) Understand the performance issues in high performance databases
- 4) Understand the working of parallel database management system
- 5) Understand the transaction management process
- 6) Understand latest advancement in database management systems

UNIT-I	Distributed databases: Architecture and Design	( Hours)
	Distributed data processing, What is a DDBS; Advantages and disadvantages of DDBS, Problem areas  Distributed DBMS Architecture: Transparencies in a distributed DBMS, Distributed DBMS architecture, Global directory issues,  Distributed Database Design: Alternative design methodologies and strategies, Distributed design issues, Types and role of Fragmentation, Types and role of replication, Data allocation	08
UNIT-II	Distributed query processing and optimization	( Hours)
	Distributed Query processing: Problem of query processing, Distributed query, Query decomposition, Distributed Query Processing Methodology, translation global queries to fragment	08

	<p>queries</p> <p>Distributed Optimization: Objectives of query optimization, Factors governing query optimization, Ordering of fragment queries, optimization of join operation, Load balancing, Distributed query optimization algorithms</p>	
<b>UNIT-III</b>	<b>Issues and Concerns in High Performance Databases</b>	<b>( Hours)</b>
	<p>Database Tuning and Performance: benchmarking, TPC benchmarks, object oriented benchmarks, TP Monitors, TPC and Wisconsin benchmarks, performance measurement, and performance tuning.</p> <p>Semantic data Control : View management, Data security, Semantic Integrity Control</p> <p>Indexing structures: Btrees, hash files, multi-attribute indexing.</p>	08
<b>UNIT-IV</b>	<b>Parallel Database Management System</b>	<b>( Hours)</b>
	<p>Introduction: Types of parallelism in database systems, Parallel Query Processing, multiprocessor architectures, parallel relational operators, parallelism in main-memory DBMS, parallel handling of integrity constraints, Integrated I/O parallelism</p> <p>Parallel Query Processing and Optimization: Inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, objectives of parallel query optimization, parallel query optimization, load balancing, parallelism in join queries, testing the quality of query optimization</p>	08
<b>UNIT-V</b>	<b>Advanced concepts in Transaction Management</b>	<b>( Hours)</b>
	<p>Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management and their algorithms, Recovery Methods</p> <p>Concurrency control and Reliability in Distributed Databases: Concurrency control in centralized database systems vs Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management, Reliability issues in DDBSs; Types of failures, Reliability techniques, Commit protocols, Recovery protocols</p>	08
<b>UNIT-VI</b>	<b>Emerging trends in databases</b>	<b>( Hours)</b>
	<p>Mobile Databases, Distributed Object Management, Multi-databases, Semantic databases, Hadoop Distributed File Systems, MapReduce Overview, NoSQL Databases, Design and Comparison of NoSQL Databases, Active and Deductive databases</p>	08



<b>Assignment List:</b>	
1)	To study and implement different types of Views in SQL
2)	Study and implementation of all types of Joins using SQL
3)	Implementation of hash files
4)	Study of transaction and implementing transaction operations using SQL/PL-SQL
5)	Installation and study of Hadoop.
6)	Installation and study of any NoSQL database
7)	Comparison and Implementation of locking techniques
8)	Case study of the operations of any real time distributed DBMS and parallel DBMS
<b>Text Books:</b>	
1)	Stefano Ceri and Giuseppe Pelagatti, "Distributed databases principles and systems", Tata Hill
2)	Raghu Ramkrishnan, "Database Management System", McGraw-Hill
3)	Silberschatz, Korth and Sudharshan, "Data base System Concepts", Mc-GrawHill
<b>Reference Books:</b>	
1)	M. Tamer Özsu and Patrick Valduriez, "Principles of Distributed Database Systems", Springer Science & Business Media, 2011, 3 <sup>rd</sup> edition
2)	Elmasri and Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2007
3)	Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Pearson Education, LPE
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

<b>M.Tech IT Semester III Subject: Elective-II- Advanced Operating Systems</b>		
<b>Teaching Scheme</b>	<b>Examination Scheme</b>	<b>Credit Allotted</b>
<b>Theory : 04 hrs/week</b>	<b>End Semester Examination : 60 Marks</b>	<b>Theory : 04</b>
<b>Practical :02</b>	<b>Continuous assessment : 40 Marks</b>	<b>Practical : 01</b>
	<b>Term Work :25 Marks</b>	
	<b>Prat/Oral :25 Marks</b>	<b>Total Credits : 05</b>
<b>Course Objectives:</b>		
1) To provide students with an overview of operating systems with change in technologies and use		
<b>Course Prerequisites:</b>		
<b>Students should have knowledge of</b>		
1) Basic concepts of operating systems.		
2) Basic algorithms in operating systems.		
<b>Course Outcome:</b>		
<b>Students will be able to:</b>		
1) Understand core structure of operating systems		
2) Understand distributed operating systems.		
3) Understand distributed resource management.		
4) Understand multiprocessor and database operating systems.		
5) Understand real time and mobile operating systems.		
<b>UNIT-I</b>		
<b>INTRODUCTION</b>		<b>( Hours)</b>
Overview – Functions of an Operating System – Design Approaches – Types of Advanced Operating System – Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs – Process Deadlocks – Preliminaries – Models of Deadlocks, Resources, System State – Necessary and Sufficient conditions for a deadlock – Systems with Single-Unit Requests, Consumable Resources, Reusable Resources.		08
<b>UNIT-II</b>		
<b>DISTRIBUTED OPERATING SYSTEMS</b>		<b>( Hours)</b>
Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport’s Logical Clock; Vector Clock; Casual Ordering Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport’s Algorithm – Token-Based Algorithms – Suzuki-Kasami’s Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock Detection Algorithms – Distributed Deadlock-Detection Algorithms, Agreement Protocols – Classification – Solutions – Applications.		08

<b>UNIT-III</b>	<b>DISTRIBUTED RESOURCE MANAGEMENT</b>	<b>( Hours)</b>
	Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols – Design Issues, Distributed Scheduling – Issues – Components - Algorithms	08
<b>UNIT-IV</b>	<b>FAULT RECOVERY AND FAULT TOLERANCE</b>	<b>( Hours)</b>
	Basic Concepts – Classification of Failures- Basic Approaches to Recovery; Recovery in Concurrent Systems; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues – Two phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.	08
<b>UNIT-V</b>	<b>MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS</b>	<b>( Hours)</b>
	Structures – Design Issues – Threads –Processing Synchronization – Process Scheduling – Memory Management – Reliability / Fault Tolerance; Database Operating Systems –Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms.	08
<b>UNIT-VI</b>	<b>REAL TIME AND MOBILE OPERATING SYSTEMS</b>	<b>( Hours)</b>
	Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.	08
<b>Assignment List:</b>		
1)Study of hardware and software requirements of different operating systems		
2) Implement CPU scheduling policies.		
3)Implement Lamport’s Algorithm – Token-Based Algorithm		
4) Implement Suzuki-Kasami’s Broadcast Algorithm		
5) Study of distributed file systems – architecture		
6)Study of fault recovery and fault tolerance		
7) Implement file storage allocation techniques.		
8) Study of Concurrency Control Algorithms.		

9) Case study of mobile operating systems	
10) Case study of real time operating systems	
<b>Text Books:</b>	
1)	Mukesh Singhal and Niranjana G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2)	Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
<b>Reference Books:</b>	
1)	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2)	Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
3)	Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.
<b>Syllabus for Unit Test:</b>	
<b>Unit Test -1</b>	<b>Unit I ,II and III</b>
<b>Unit Test -2</b>	<b>Unit IV, V and VI</b>

**Proposed Structure of M.Tech Information Technology  
CBCS Pattern (2015-16)**

**STRUCTURE & EXAMINATION PATTERN**

**MTech Information Tecnology**

Semester IV											Total Duration : 14 Hrs/Week	
											Total Marks : 325	
											Total Credits : 34	
Subject	Teaching Scheme (Hrs)		Examination Scheme							Examination Scheme (Credits)		Total Credits
	Hrs./Week											
	L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/P R/OR		
Self-Study Paper-II	04	--	60	20	10	10	-	-	04	-	04	
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>	

## List Of Self Study Subjects

<b>Sr. No.</b>	<b>Self Study Paper I Sem-III</b>	<b>Self Study Paper II Sem-IV</b>
1	Real Time & Fault Tolerant System	Information Storage and Management
2	Ad-hoc Network	Organizational Behavior
3	Computer Oriented Numerical & Statistical Methods	Computer Vision and Digital Image Processing
4	Semantic Networks	Artificial Intelligence & Applications
5	Embedded System and Applications	Design and Analysis of Algorithms
6	Distributed Computing	Compiler Design
7	Information Theory Coding and Cryptography	Computer Oriented Optimization Techniques
8	Soft Computing	Information Security System

**BHARATI VIDYAPEETH UNIVERSITY COLLEGE OF ENGINEERING****CHEMICAL ENGINEERING DEPARTMENT****M.TECH CHEMICAL (CBCS -2015 COURSE)****M.TECH STRUCTURE (CHEMICAL)****Choice Based Credit System****SEMESTER-I**

<b>Semester I</b>												
<b>Total Duration: 20 hrs/week</b>												
<b>Total Marks : 500</b>												
<b>Total Credits: 18</b>												
<b>Subject Code</b>	<b>Subject</b>	<b>Teaching Scheme (Hrs)</b>		<b>Examination Scheme (Marks)</b>						<b>Examination Scheme (Credits)</b>		<b>Total Credits</b>
		<b>Hrs./Week</b>		<b>Theory</b>	<b>Unit Test</b>	<b>Attendance</b>	<b>Tutorial/assignments</b>	<b>TW</b>	<b>Pract/Oral</b>	<b>TH</b>	<b>TW/P R/OR</b>	
K10501	Applied Mathematics for Chemical Engineering	04	02	60	20	10	10	25	25	04	01	05
K10502	Advanced Momentum and Heat Transfer	04	--	60	20	10	10	-	--	04	-	04
K10503	Thermodynamics of Phase Equilibria	04	--	60	20	10	10	-	-	04	-	04
K10504	Multiphase Reactors	04	02	60	20	10	10	25	25	04	01	05
<b>Total</b>		<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>

## SEMESTER-II

Semester II		Total Duration: 20 hrs/week										
		Total Marks : 500										
		Total Credits: 18										
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
		L	P	Theory	Unit Test	Attendance	Tutorial / assignments	TW	Pract/ Oral	TH	TW/ PR/OR	
K10505	Modeling & Simulation of Chemical Processes	04	02	60	20	10	10	25	25	04	01	05
K10506	Chemical Reactor Analysis and Design	04	--	60	20	10	10	--	--	04	--	04
K10507	Synthesis & Design of Chemical Processes	04	--	60	20	10	10	--	--	04	--	04
K10508	Advanced Mass Transfer	04	02	60	20	10	10	25	25	04	01	05
<b>Total</b>		<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>



## SEMESTER-III

Semester III		Total Duration: 28 hrs/week										
		Total Marks : 475										
		Total Credits: 40										
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme						Examination Scheme (Credits)		Total Credits
		L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR	
K10601	Elective –I	04	02	60	20	10	10	25	25	04	01	05
K10602	Elective –II	04	02	60	20	10	10	25	25	04	01	05
	**Self-Study Paper-I	* 04	--	60	20	10	10	-	-	04	-	04
K10604	Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21
K10603	Seminar	-	05	-	-	--	--	25	25	-	05	05
	<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>12</b>	<b>28</b>	<b>40</b>

Elective – I	Elective - II
<ul style="list-style-type: none"> <li>• Advanced Process Control</li> <li>• Non Conventional Energy Sources</li> <li>• Industrial Waste Water Treatment</li> <li>• Heterogeneous Catalysis</li> <li>• Catalyst Materials</li> </ul>	<ul style="list-style-type: none"> <li>• Membrane Separation</li> <li>• Bio-process Engineering</li> <li>• Multicomponent Separation</li> <li>• Food Process Engineering</li> <li>• Fluidization Engineering</li> </ul>

## SEMESTER-IV

Semester IV		Total Duration: 14 hrs/week											
Total Marks : 325													
Total Credits: 34													
Subject Code	Subject	Teaching Scheme (Hrs)		Examination Scheme							Examination Scheme (Credits)		Total Credits
		L	P	Theory	Unit Test	Attendance	Tutorial/ assignments	TW	Pract/ Oral	TH	TW/PR /OR		
	**Self-Study Paper-II	* 04	--	60	20	10	10	-	-	04	-	04	
K10605	Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30	
	<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>	

Sr.No.	SELF STUDY PAPER- I (SEM-III)	SELF STUDY PAPER- II (SEM-IV)
1	Optimization Techniques in Process design	Technology Transfer Practices –Bridge to Industry
2	Non Conventional Energy System	Polymer Engineering
3	Mechanical Aspects in Chemical Engineering	Food Technology
4	Green Chemistry & Technology	Modeling & Simulation of Processes
5	Cavitation Techniques	Nanoscience
6	Safety Engineering in Industries	Petrochemical Engineering
7	Petroleum Engineering	Physical Concepts of Unit Operations
8	Fluid Particle Technology	Multiphase Reactor Engineering

## SEMSETER-I

<b>K10501 APPLIED MATHEMATICS FOR CHEMICAL ENGINEERING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures : 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction:</b> Approximation and round-off errors, significant figures, accuracy and precision, error definitions, truncation errors. Taylor series, error propagation, total numerical error, formulation errors and data uncertainty. Tests of significance. Analysis of variance.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Numerical solution of linear &amp; nonlinear algebraic equations:</b> Linear systems of equations, solutions by Creamer's Rule, Matrix methods, Gaussian, Gauss-Jordan, Jacobean, Gauss-Seidel and Relation methods. Non-linear equations: Bisection, Regula-falsi, Secant and Newton- Raphson methods.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Curve fitting:</b> Least square regression: Linear regression, polynomial regression. Interpolation: Newton's divided-difference interpolating polynomials, Lagrange interpolating polynomials, coefficient of an interpolating polynomial. Fourier approximation.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Numerical integration and differentiation:</b> Newton-cotes integration of equations. Integration of equations: Romberg integration, Gauss Quadrature. <b>Partial differential equations:</b> Finite difference: Elliptic equations, parabolic equations, finite element method. Diffusion/convection form of partial differential equations in chemical engineering. Characteristics and partial differential equation types and their analytical solution.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Numerical solution of ordinary differential equations:</b> Formulation of linear and non-linear first and second order ordinary differential equations, higher order linear, differential equations for systems involving momentum, heat and mass transfer with and without chemical reactions and their analytical solutions. Ordinary differential equations: Runge-Kutta, Euler's and Milne's predictor corrector methods. Boundary-value and eigenvalue problems, general methods of boundary-value problems.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Mathematical analysis and engineering problem-solving:</b> Design and analysis of experiments: data analysis, treatment, generalization and interpretation on engineering data. Formulation of physical problems: mathematical statement of the problem, representation of problems, problem solving with appropriate mathematical method, analysis of results with statical tests.	<b>(08 Hours)</b>

<b>Term Work:</b>	
Oral examination will consist of assessment of the termwork (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following: Minimum 8 practical based on solving numerical methods mentioned in the syllabus using C, C++ language, or TK solver software, or any chemical Engineering Software.	
<b>Assignment: :</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of application of mathematics in chemical engineering, keeping track of the recent technological trends and developments..	
<b>Text Books/References:</b>	
1.	S. C. Chapra and R. P. Canale, Numerical Methods for Engineers, 6th Ed., McGraw Hill, 2010.
2.	S. C. Chapra, Applied Numerical Methods with MATLAB: for Engineers and Scientists, 2nd Ed., Tata McGraw Hill, New Delhi, 2010.
3.	S. K. Gupta, "Numerical Techniques for Engineers", Wiley Eastern, 1995.
4.	M.K. Jain, S.R.K. Iyengar and R. K. Jain, "Numerical Methods for Scientific and Engineering Computations", 1992.
5.	Kreyszig, Erwin: Advanced Engineering Mathematics, 8th Edition, Wiley Eastern, New Delhi, 2002.
6.	H.S.Mickley, T.K. Sherwood and C.E. Reid, "Applied Mathematics in Chemical Engineering", II Edn., Tata McGraw Hill, New Delhi, 1978.
7.	Teukolsky S.A., W.H. Press, "Numerical Recipes in 'C' ", Cambridge University press
8.	Constantinides A., "Applied Numerical Methods with Personal computer", McGraw Hill publishers
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**K10502 ADVANCED MOMENTUM AND HEAT TRANFER**

<b>TEACHING SCHEME:</b>			<b>EXAMINATION SCHEME:</b>			<b>CREDITS ALLOTTED:</b>		
Lectures: 4 Hours/Week			End Semester Examination: 60 Marks			Theory : 04		
Total : 4Hours/Week			Unit Test: 20 Marks			Total credits: 04		
			Assignment: 10 Marks					
			Attendance:10 Marks					
			Total :100 Marks					
<b>Topics covered</b>								
<b>UNIT-I</b>	<p><b>Shear stress in laminar flow:</b> Newtonian and non Newtonian fluids; Rheological models; theories of transport properties of gases and liquids; effect of pressure and temperature.</p> <p><b>One dimensional momentum transport in laminar flow (shell balance):</b> General method of shell balance approach to momentum transfer problems; momentum flux and velocity distribution for flow of Newtonian and non-Newtonian fluids in pipes, planes, slits and annulus; Fluid flow of two immiscible fluids.</p>						<b>(08 Hours)</b>	
<b>UNIT-II</b>	<p><b>Differential equations of fluid flow:</b> Control volume approach; Differential continuity equation; Navier-Stokes Equation and Bernoulli's equation; Applications of differential equations of fluid flow</p> <p><b>Effect of turbulence on momentum transfer:</b> Description of turbulence; Turbulent shearing stresses; The mixing length hypothesis, velocity distribution from the mixing length theory; The universal velocity distribution; The turbulent boundary layer on a flat plate</p>						<b>(08 Hours)</b>	
<b>UNIT-III</b>	<p><b>Fluid flow in closed Conduits:</b> Friction factors for fully developed laminar, turbulent and transition flow in circular conduits; Friction factors for flow in the entrance to a circular conduit; Friction factors for packed columns.</p> <p><b>Macroscopic momentum balances:</b> The macroscopic mass, momentum and mechanical energy balances; Use of macroscopic balances for steady-state problems; Use of macroscopic balances for unsteady-state problems.</p>						<b>(08 Hours)</b>	
<b>UNIT-IV</b>	<p><b>Mechanism of energy transport:</b> Fourier's law of heat conduction; Thermal conductivity of liquids and solids; Effective thermal conductivity of composite solids.</p> <p><b>Temperature distribution in solids and in laminar flow:</b> Heat conduction through composite walls; Heat conduction in a cooling Fin; Forced convection; Free convection.</p>						<b>(08 Hours)</b>	
<b>UNIT-V</b>	<p><b>The equation of change for non isothermal systems:</b> The equation of energy; The equation of motion for forced and free convection; Use of equations of change to solve the steady-state problems</p> <p><b>Unsteady Heat Conduction in Solids:</b> Heating of a semi-infinite slab; Heating of a finite slab; Unsteady heat conduction near the wall with sinusoidal heat flux</p> <p><b>Temperature distribution in turbulent flow:</b> Time smoothed equation of change for incompressible non isothermal flow; Time smoothed temperature profile near a wall; Empirical expressions for the turbulent heat flux; Temperature distribution for turbulent flow in tubes</p>						<b>(08 Hours)</b>	
<b>UNIT-VI</b>	<p><b>Interphase transport in non-isothermal systems:</b> Heat transfer coefficients for forced convection in tubes and through packed beds; Heat transfer coefficients for free and mixed convection; Heat transfer coefficients for condensation of pure vapors</p>						<b>(08 Hours)</b>	

	on solid surfaces. <b>Analogies of momentum and heat transfer:</b> Reynolds and Chilton Colburn analogy	
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**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced momentum and heat transfer, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	W. E. Stewart, E. N. Lightfoot, R. B. Bird, "Transport Phenomena", John Wiley & Sons
2.	J. R. Welty, C. W. Wicks, R. E. Wilson, G. Rorrer, "Fundamentals of momentum, heat and mass transfer, Wiley INDIA
3.	J.C. Slattery, "Advanced transport phenomena", Cambridge University Press
4.	J. G. Knudsen, D. L. Kaz, "Fluid Dynamics and Heat Transfer", McGraw Hill

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10503 THERMODYNAMICS OF PHASE EQUILIBRIA

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Thermodynamics of Multicomponent mixtures:</b> Ideal mixtures and excess mixture properties, Fugacity of species in gaseous, liquid and solid mixtures, Criteria for phase equilibrium in multicomponent systems, Modified Rault's law and its significance, Gibbs Duhem equation, Hydrogen bonding and charge transfer complexing Equilibrium	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Vapor liquid Equilibrium of mixtures</b> Vapor Liquid equilibrium (VLE) of ideal mixtures, Low pressure VLE in non-ideal mixtures, High pressure VLE using equation of states, Solubility of gas in liquid, Liquid-Liquid Equilibrium, Vapor Liquid-Liquid Equilibrium, Models for activity coefficient, UNIFAC method, UNIQUAC equation, Osmotic pressure, osmotic equilibrium	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Mixture phase equilibrium involving solids</b> Solubility of solid in liquid and supercritical fluid, Solid Liquid Equilibrium, Partitioning of solid between two liquid phases, distribution coefficient, Freezing point depression of solvent due to presence of solute, freezing point of liquid mixtures in presence of solid.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Chemical Reaction Equilibria:</b> Chemical equilibrium in single phase system, Heterogeneous chemical reactions, Chemical equilibrium when several reaction occurs in single phase, Combined chemical and phase equilibrium. Phase rule and Duhem's theorem for reacting systems, Degree of freedom analysis for non-reacting and reacting systems	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Surfaces, Interfaces and Adsorption</b> Thermodynamics of interfaces, Gibbs surface model and surface tension, Surface energy of solids, Surface effects on heterogeneous phase equilibrium, effect of particle size on vapor pressure, effect of bubble size on the boiling temperature of pure substances, solubility and nucleation, effect of particle size on melting temperature, Gibbs adsorption equation	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Thermodynamics of acid, alkali interaction, Energy analysis</b> Acidity of solutions, ionization of chemicals, solubilities of weak acids, weak bases, pharmaceuticals as function of pH, Gibbs-Donnan equilibrium. Defining Energy, Control Volume Energy Rate Balance, Exergetic Efficiency, Introduction to Energy Costing .	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of thermodynamics of phase equilibria, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	J. M. Smith & H. C. Van Ness, "Introduction to Chemical Engineering Thermodynamics"
2.	Stanley I. Sandler, "Chemical, Biochemical and Engineering Thermodynamics"
3.	Savein Stolen, Tor Grande, Neil Allan, "Chemical Thermodynamics of Materials"
4.	K.V.Narayanan," Chemical Engineering Thermodynamics"
5.	Kenneth Denbigh, "Principles of Chemical Equilibrium"
6.	Y. V. C. Rao, "Chemical Engineering thermodynamics"
7.	B. F. Dodge, "Chemical Engineering Thermodynamics"
8.	T. E. Daubert, " Chemical Engineering Thermodynamics"
9.	Glasstone S., "Thermodynamics for Chemists"
10.	B. G. Kyle, "Chemical and Process Thermodynamics"

<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI



## K10504 MULTIPHASE REACTORS

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Introduction to Multiphase Reactor Engineering:</b> Types, Classification, Application of Industrial Importance.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Thermodynamics and kinetics:</b> Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Hydrodynamic Characteristics:</b> Hydrodynamic characteristics of different multiphase reactors: Mechanically Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Mixing Studies :</b> Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Heat Transfer and Mass Transfer Studies :</b> Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Design Aspects of Multiphase Reactors:</b> Pressure drop, Fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	<b>(08 Hours)</b>

#### Term Work:

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of multiphase reactors, keeping track of the recent technological trends and developments.

#### Text Books/References:

1.	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 <sup>nd</sup> Edition, Volume I and II.
2.	G. B. Tatterson, "Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 <sup>th</sup> Edition, Academic Press, London, 1994
3.	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000.
4.	DiazoKunji and O. Levenspiel, "Fluidization Engineering", 2 <sup>nd</sup> Edition, Butterworth Heinemann, 1991.
5.	J. F. Devidson and Harrison, "Fluidization", 10 <sup>th</sup> Edition, Academic Press, London, 1994.

<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## SEMESTER-II

### K10505 MODELLING AND SIMULATION OF CHEMICAL PROCESSES

<b>K10505 MODELLING AND SIMULATION OF CHEMICAL PROCESSES</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Basics of phenomenological modelling</b> Introduction to modeling, systematic approach to model building, fundamentals of mathematical modeling-principles of formulations, fundamental laws: continuity equations, energy equation, equation of motion, transport equations, equation of state, equilibrium, chemical kinetics, advantages and limitations of models and applications of process models of stand-alone unit operations and unit processes, classification of models-simple vs. rigorous, lumped parameter vs. distributed parameter, Steady state vs. dynamic, concept of degree of freedom for steady state and unsteady state systems.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Empirical modelling building and analysis</b> Development of steady state and dynamic lumped and distributed parameter models based on first principles, analysis of ill-conditioned systems, development of grey box models, empirical model building, statistical model calibration and validation, population balance models; Examples: simple hydraulic tank, variable hydraulic tank, mixing Vessel, mixing with reaction, steam jacked vessel	<b>(08 Hours)</b>
<b>UNIT-III</b>	Mathematical models of heat-transfer equipments: shell & tube heat exchangers, evaporators, partial condensers; Mathematical models of mass-transfer equipments: batch and continuous distillation columns, reactive distillation columns, packed absorption columns; Mathematical models of reactors: batch reactors, continuous-stirred tank reactors, plug-flow reactors, reactor with axial dispersion, etc.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Basics of simulation</b> Fundamentals of simulations – Ab-initio methods, basis sets, Hartree-Fock theory, density functional theory, geometry optimization, vibrational analysis; elementary, classical statistical mechanics, elementary concepts of temperature, ensembles and fluctuations, partition function, ensemble averaging, ergodicity; molecular dynamics methodology – force field, integrating algorithms, periodic box and minimum image convention, long range forces, non bonded interactions, temperature control, pressure control, estimation of pure component properties, radial distribution function; molecular dynamics packages.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Parameter estimation and sensitivity analysis</b> Parameter estimation, parameter sensitivity analysis, statistical validity, discrimination between two models, solution strategies for lumped parameter models, stiff differential equations, solution methods for initial value and boundary value	<b>(08 Hours)</b>

	problems, solving the problems using <i>MATLAB or other chemical engineering software</i> , solution strategies for distributed parameter models..	
<b>UNIT-VI</b>	<b>Modern approaches</b> Broad overview of tools, deterministic and stochastic approaches, statistical decision theory, Markov processes, queuing theory, renewal theory, reliability theory, Non-traditional techniques: Simulated annealing, ant colony method or ANN, particle swarm method, neural networks, genetic programming, genetic algorithm, fuzzy logic, Wavelet, principal component analysis, etc.	<b>(08 Hours)</b>

**Term Work:** Oral examination will consist of assessment of the termwork (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following:

Minimum 6 practical based on solving numerical methods mentioned in the syllabus using MATLAB/SCILAB, any language, or TK solver software, or any chemical Engineering Software.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of modeling and simulation of chemical processes, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	Franks R. E. G., "Modeling and Simulation in Chemical Engineering", Wiley Interscience, NY
2.	John Ingam, Irving J. Dunn, "Chemical Engineering Dynamic Modeling with PC Simulation", VCH Publishers
3.	William L. Luyben, "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill International Edition Publishing Company
4.	Himmelblau D., K. B. Bischoff, "Process Analysis and Simulation", John Wiley & Sons
5.	Wayne Blackwell, "Chemical Process Design on a Programmable Calculator", McGraw Hill
6.	Wayne Bequette, "Process Dynamics, Modeling, Analysis and Simulation", Prentice Hall
7.	S. S. Tambe, B. D. Kulkarni, P. B. Deshpande, Elements of Artificial Neural Networks with Selected Applications in Chemical Engineering, and Chemical & Biological Sciences, 1 <sup>st</sup> Ed., Louisville: Simulations & Advanced Controls Inc., KY 1996.
8.	C.D.Holland, Fundamentals and Modeling of Separation Processes, Prentice-Hall Internal Publications
9.	Asghar Hussain, Chemical Process Simulation, Wiley Eastern Ltd., New Delhi (1986).
10.	M.E.Davis, Modeling and Numerical Methods in Chemical Engineering, John Wiley & Sons, 1984.
11.	B.Carnahan, H.A. Luther and J.O.Wilkes, Applied Numerical Methods, McGraw-Hill, New York (1969).
12.	K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001.
13.	Singiresu S. Rao, "Applied Numerical Methods for Engineers and Scientists" Prentice Hall, Upper Saddle River, NJ, 2001
14.	W. F. Ramirez, "Computational Methods for Process Simulation", 2 <sup>nd</sup> ed., Butterworths, 1997
15.	Modeling and analysis of dynamic systems, by C.M .Close, D.H. Fredrick and J. C. Newell, John Wiley & Sons, 2002
16.	Bruce A. Finlayson, Introduction to Chemical Engineering Computing, Wiley, 2010.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

## K10506 CHEMICAL REACTOR ANALYSIS AND DESIGN

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

### Topics covered

<b>UNIT-I</b>	Chemical factor affecting the choice of the reactor, Model for batch reactor optimum operation policies and control strategies, optimal batch operation time, optimal temperature policies.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Transient and steady state analysis, Optimal design of reactors, Multiphase reactors: fluidized, trickle bed, slurry etc	<b>(08 Hours)</b>
<b>UNIT-III</b>	Steady state non isothermal reactor design, the energy balance, adiabatic operation, tubular reactor with heat exchange, equilibrium conversion, CSTR with heat effects, multiple steady states.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Unsteady state non isothermal reactor design. Energy balance on batch reactor, Adiabatic operation of batch reactor, Batch reactor with interrupted isothermal operation, Semi batch reactors with a heat exchanger, Unsteady operation of CSTR, Unsteady operation of plug flow reactors	<b>(08 Hours)</b>
<b>UNIT-V</b>	Design of fixed bed catalytic reactors, isothermal ,adiabatic ,non isothermal	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Non ideal flow in reactors, Estimation of dispersion/back mixing, design aspects of reactors with non ideal flow, micro and meso mixing in reactors.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of chemical reactor analysis and design, keeping track of the recent technological trends and developments.

#### Text Books/References:

1.	Froment G. F. and K. B. Bischoff, “ Chemical Reactor Analysis and Design”, John Wiley & Sons
2.	Fogler H. S., “Elements of Chemical Reaction Engineering”, Prentice - Hall, 1986
3.	Smith J. M., " Chemical Engineering Kinetics ", McGraw Hill, 1981
4.	Denbigh K. G. and J. C. Turner, “ Chemical Reactor and Theory – An Introduction”,3rd edition Cambridge University Press.
5.	Bruce Nauman, “ Chemical Reactor Design”, John Wiley & Sons.

#### Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10507 SYNTHESIS AND DESIGN OF CHEMICAL PROCESSES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Introduction to SDCP</b> Significance of SDCP in chemical process industry, Hierarchy of chemical process design: Hierarchy, approach to process design, performance. Preliminary Process Synthesis, Synthesis of reaction: Function of process recycle, vapor cycles and purges, vapor versus liquid cycles, batch processes, process yield	<b>(08 Hours)</b>
<b>UNIT-II</b>	Choice of reactor: Reaction path, types of reaction systems, reactor Continuous or Batch Processing, Chemical state, Process Operations, Synthesis Steps, Synthesis Tree, Heuristics, Algorithmic Methods.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Recycle structure, Recycle material balances, Reactor heat effects, Equilibrium limitations, Reactor design, Separation system, vapor recovery system, Liquid separation system, Distillation column sequencing, azeotropic systems, Residue Curves for Heterogeneous Systems.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Heat exchanger networks</b> Pinch Methodology: Problem representation, temperature enthalpy diagram, simple match matrix. Heat content diagram, Temperature interval diagram. Pinch Design and Optimization: Networks for maximum energy recovery, Pinch design method, Flexibility criteria of the pinch, case studies	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Industrial Safety and risk management</b> Hazards: Chemical hazards classification. site selection and plant layout. Industrial lighting and ventilation. Occupational diseases and prevention methods. Instrumentation and control for safe operation. Personal protective equipments. Management and Risk Analysis: Case studies pertaining to chemical industries. Legislations and economics: Factory Act. Environmental Act. Provisions under various acts.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Introduction to scale-up methods, pilot plants, models and principles of similarity. Industrial applications. Computer–Aided Design application in chemical process industries, complete plant simulation.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of synthesis and design of chemical processes, keeping track of the recent technological trends and developments.

#### **Text Books/References:**

1.	Robin Smith, “Chemical Process Design”, McGraw Hill
2.	Hartmann K., K. Kaplick, “Analysis and Synthesis of Chemical Process System”, Elsevier, Amsterdam
3.	Jordan D.G., “Chemical Process Development – Part I”, Robert K. Krieger Publishing Company
4.	James M.Douglas, “Conceptual Design of Chemical Processes” McGraw Hill.

5.	Warren D.Seider,J.D.Seader,Daniel R. Lewin, “Process Design Principles Synthesis ,Analysis and Evaluation,” John Wiley & Sons Inc.
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<b>Syllabus for Unit Test:</b>	
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Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10508 ADVANCED MASS TRANSFER

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures : 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical : 2 Hour /Week	Unit Test: 20 Marks	Practical: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Diffusion:</b> Steady State diffusion with heterogeneous chemical reaction, Steady state diffusion accompanied by homogeneous Chemical reaction. Unsteady state molecular diffusion in isotropic media, unsteady state diffusion for typical cases of mass transfer in infinite, semi-infinite and finite plane media and in spherical and cylindrical media.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Ionic Separations :</b> Controlling factors, applications, Theory mechanism and equipments for electrophoresis, dielectrophoresis and electro dialysis, commercial applications and design considerations.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Adsorption Techniques :</b> Mechanism, Thermal-Swing Adsorption, Pressure-Swing Adsorption, Continuous, Countercurrent Adsorption Systems, Slurry Adsorption , Fixed-Bed Adsorption (Percolation), Simulated-Moving-Bed Systems, affinity chromatography and immuno chromatography, types of equipment and commercial processes, recent advances and process economics.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Multicomponent Distillation:</b> Tray by Tray calculation, feed plate location, operating reflux and plates, recent advances in column design and operation-Petlyuk, divided wall, kaibel, pre fractionators, post fractinator. Azeotropic distillation, Extractive distillation, Molecular distillation, Reactive distillation.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Membrane Separations :</b> Classification of membrane processes; Liquid permeation membrane processes or dialysis – Series resistance in membrane processes, Dialysis processes, Types of equipment for dialysis; Gas permeation membrane processes – Types of membranes and permeability for separation of gases, Types of equipment for gas permeation membrane processes (flat membranes, spiral-wound membranes, hollow-fibre membranes); Types of flow in gas permeation; Complete-mixing model, cross-flow model and countercurrent flow model for gas separation by membranes; Effect of processing variables on gas separation by membranes.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Novel Separation Techniques :</b> Supercritical fluid extraction, Reactive extraction, Zone melting, separation based on thermal diffusion, separation based on surface science, adductive crystallization.	<b>(08 Hours)</b>

**Term Work :**



Oral examination will consist of assessment of the term work (duly certified by the teacher and HOD) and oral exam based on the term work/practical. The term work shall consist of the following.

Seminar presented and duly report prepared on any topic given from syllabus.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced mass transfer, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	Phillip C. Wankat , Separation Process Engineering (2nd Edition), Printice Hall,2007
2.	Marcel Mulder, Introduction to Membrane Science and Technology, Marcel Dekker, 1992.
3.	Rousseau, R. W., Handbook of Separation Process Technology, John Wiley, New York, 2009.
4.	Humphrey, J and G. Keller, Separation Process Technology, McGraw-Hill, 1997
5.	King, C. J., Separation Processes , Tata McGraw Hill Co., Ltd., 1982.
6.	T.K.Sherwood, R.L.Pigford and C.R.Wilke, Mass Transfer, McGraw-Hill, New York (1975).
7.	R.E.Treybal, Mass-Transfer Operations, McGraw-Hill, New York (1980).
8.	Anthony L Hines , Robert N Maddox , Mass Transfer Fundamentals and Applications.
9.	Sherwood, T. K., Pigford, R. L. & Wilke, C. R, Mass Transfer Mc Graw Hill, 1975
10.	Skelland, A. H. P. : Diffusional Mass Transfer, John Wiley & Sons, 1974.
11.	Crank J, The Mathematics of Diffusion, Oxford University Press London 1956

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## SEM-III

<b>K10601 ELECTIVE - I ADVANCED PROCESS CONTROL</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Response of Control Loop Components and Transfer Functions:</b> Open loop response, most useful forcing functions, step function, sinusoidal function and the pulse function, respective responses of the forcing functions. Response of a more complex system to forcing functions.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Types of Controls:</b> Feed forward control: Advantages and drawbacks, typical examples. Feedback control: Advantages and drawbacks, typical examples.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Adaptive and Inferential Control Systems:</b> Adaptive - Feed forward, feedback Inferential - Need for a model Examples for illustration.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Response Analysis:</b> Stability and Testing Step response analysis Frequency response analysis Bode criterion, Nyquist Diagram, Root-Locus, Routh-Hertzwitz criterion. Pulse function Laplace transforms, transfer function of various system.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Dynamics of Various Systems:</b> Dead time, distance-velocity lag, inverse response systems, dynamic analysis, Qualitative characteristics, Distributed parameter systems.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Control Strategies for various unit operations and processes:</b> Distillation, Drying, Absorption column, Stirred tanks. Processes: Process Design, Product quality control. Computer control: Direct Digital Control (DDC), Supervisory Digital Control, Economic justification for supervisory digital control.	<b>(08 Hours)</b>
<p><b>Term Work:</b> based on the term work/practical. The term work shall consist of the following.</p> <ul style="list-style-type: none"> <li>• Ability of the student to explain the theory and related course material.</li> <li>• The process control modules are now extensively used in industry. The student should demonstrate their working principles and the utility citing at least 4 chemical industries.</li> <li>• The controllers used in chemical industry need careful monitoring.</li> <li>• Students should briefly describe the type of maintenance for controllers.</li> </ul>		
<p><b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of advanced process control, keeping track of the recent technological trends and developments.</p>		

<b>Text Books/References:</b>	
1.	George Stephanopoulos, "Chemical Process Control - An Introduction to Theory and Practice"
2.	Coulson and Richardson, "Chemical Engineering Vol 3"
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>K10601 ELECTIVE – I : NON CONVENTIONAL ENERGY SOURCES</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Renewable Sources of Energy:</b> Solar energy: Thermodynamic and heat transfer aspects of solar collection; Energy storage; Solar distillation; Solar drying; Wind energy; Tidal, Wave and ocean thermal energy; Geothermal energy.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Fuel Cells:</b> Introduction, Principles; Types of fuel cells; phosphoric acid, molten salt, solid oxide and other types of fuel cells; Anodes and cathodes; Fuel cells as alternative energy source.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Biomass and biofuels:</b> Introduction, Biofuel classification; Biomass production for energy farming; Direct combustion for heat; Pyrolysis (destructive distillation); Thermochemical processes; Alcoholic fermentation; Anaerobic digestion for biogas; Vegetable oils and biodiesel; Economics of bio-mass energy systems.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Hydro-power:</b> Introduction, Principles, Assessing the resource for small installations, An impulse turbine, Reaction turbines, Hydroelectric systems, The hydraulic ram pump, Social and environmental aspects	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Tidal power:</b> Introduction, The cause of tides, Enhancement of tides, Tidal current/stream power, Tidal range power, World range power sites 447 <b>Ocean thermal energy conversion (OTEC):</b>	<b>(08 Hours)</b>

	Introduction, Principles, Heat exchangers, Pumping requirements, Practical considerations.	
<b>UNIT-VI</b>	<b>Utilization of Wastes:</b> Utilization of fly ash, blast furnace slag in cement and concrete, Wastes and residues	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of non conventional energy sources, keeping track of the recent technological trends and developments

**Text Books/References:**

1.	John Twidell & Tony Weir, Renewable Energy Resources, Second edition, Taylor & Francis, 2006
2.	Douglas C., Energy Technology Handbook, Tata McGraw Hill Publishers
3.	Rao C. S., Environmental Pollution Control Engineering, Wiley Eastern
4.	Majumdar B., A Textbook of Energy Technology, APH Publications
5.	J. T. McMullan, R. Morgan and R. B. Murray, Energy Resources and Supply, John Wiley & Sons, London, 1976
6.	K.C. Khandelwal, S.S.Mahdi, Biogas Technology, Tata MGH
7.	G.D. Rai, Solar Energy Utilization, Khanna Publishers, Delhi
8.	A.W. Culp, Principles of energy conservation, Tata MGH

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10601 ELECTIVE I:INDUSTRIAL WASTE WATER TREATMENT

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	

### Topics covered

<b>UNIT-I</b>	Introduction, Source of Industrial waste water, Physical, Chemical & Biological characteristics Of Industrial Waste Water. Measurement of polluting strength of Ind.Waste water (physical, chemical & biological)	<b>(08 Hours)</b>
<b>UNIT-II</b>	Physical Unit operations: Sedimentation & Design of Settling Chambers. Filtration & Design of Filters. Coagulation, Flocculatores, Froth Flotation	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Conventional Waste Water Treatment:</b> Primary Treatment (Physical).Design Principles of Grit chambers & screens. Principles of Aeration .Secondary treatments (Biological), Kinetics of Growth & Food utilization, Design Principles of A.S.P. Trickling Filters, oxidation ponds, stabilization ponds, Aerobic, anaerobic Lagoons	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Sludge Treatment &amp; Disposal:</b> Anaerobic digestion, Aerobic Digestion, Sludge disposal, composting	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Advanced Waste Water Treatment:-</b> Carbon adsorption, Ion exchange, membrane processes. Nitrogen removal, Phosphorous removal, Chemical oxidation, Recovery of materials from process effluents	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Solid Waste Management:</b> Characteristics, Solid waste collection & transport, Solid Waste Processing & recovery, Disposal of Solid waste. Hazardous waste management & Risk assessment. Types of hazardous waste, health Effects, Treatment methods & Final disposal	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of industrial waste water treatment, keeping track of the recent technological trends and developments

<b>Text Books/References:</b>	
1.	Metcalf & Eddy, "Waste Water Engineering" Treatment & Reuse, Tata Mc Graw-Hill. Fourth Edition 2003
2.	C.S.Rao., "Environmental Pollution Control Engineering", Wiley Eastern Ltd. New Age International, Second print 1994
3.	A. P. Sincero, G. A. Sincero, "Environmental Engg.", A design approach, Prentice Hall of India Pvt. Ltd. New Delhi 1996
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### K10601 ELECTIVE I: HETEROGENEOUS CATALYSIS

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Adsorption, Desorption:</b> Definition, rates of adsorption and desorption, surface areas for physical adsorption. Experimental aspects of adsorption and allied phenomena on catalyst surfaces	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Significance of Pore Structure and Surface Area in Heterogeneous Catalysis:</b> Importance of pore structure and surface area, experimental methods to determine surface area, methods of ascertaining pore volume and diameter .Kelvin equation, pore size distribution by gas adsorption, pressure porosimeter, density measurement. Pore structure of adsorbents and catalysts: Hysteresis and shape of capillaries, surface area from hysteresis loops, modes for characterizing pore structures. Reaction rates in pores catalysts: Mass transfer, concentration profiles, reaction rates, pressure and temperature gradients, catalyst deactivation	<b>(08 Hours)</b>

<b>UNIT-III</b>	<b>Role of Lattice Imperfections in Heterogeneous Catalysis:</b> Classification of lattice imperfections, role of point dislocations and point defects, lattice imperfections and polymerization catalysts, role of geometric and electronic factors in catalytic activity.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Dynamics of Selective and Poly-functional Catalysis:</b> Catalyst selectivity, selective formation of intermediate products, effect of pore size on electivity, mass transport of intermediate product in non-trivial poly-step reactions, selectivity of poly-functional catalysts Zeolites in catalysis: Structural aspects and synthesis of zeolites, modification of zeolites, diffusion in zeolites, applications.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Fischer-Tropsch synthesis: Synthesis and Decomposition of Ammonia</b> Catalyst cracking: catalyst composition and chemical properties, mechanism of cracking reactions. Catalysis of electrode reactions. Kinetics of catalytic reactions: Rate of chemical reaction, overall reaction rate, mass transfer through gas phase, mass transfer in pores.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Mass and heat transfer in solid catalyst beds. Design calculations: Isothermal conditions, adiabatic conditions, non-adiabatic conditions. Thermal selectivity of packed bed reactors. Fluidized bed reactors. Optimum design: Continuous variation of parameter along the reaction path, temperature profiles for reversible and consecutive reactions, optimum catalyst concentration in bi-functional catalyst systems	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of heterogeneous catalysis, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	Thomas J. M., Thomas W. J., "Introduction to The Principles of Heterogeneous catalysis", Academic Press
2.	Srivastav R. D., "Heterogeneous catalytic Science", CRC Press
3.	Thomas S. J., Webb G., "Heterogeneous Catalysis", Oliver & Boyd Ltd.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV, V,VI

## K10601 ELECTIVE I: CATALYST MATERIALS

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Bimetallic Catalysts:</b> Introduction, nature, method of preparation and characterization, catalytic properties of bimetallic systems. Supported bimetallic catalyst, chemical nature, factors affecting efficiency and uniformity of co clustering, structure, surface composition, catalytic properties.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Perovskite Related Oxides:</b> Solid state properties, Zeolite, crystal structure, non-stoichiometry, magnetic and electrical properties, ferro electric and acoustic properties, applications. Crystal chemistry and catalytic properties of oxides with scheelite structure, crystal chemistry, olefin oxidation, and mechanism. Catalytic properties of synthetic layered silicates and alumino silicate, synthetic mica-montmorillonite and nickel reducibility, layered metalsilicate catalyst.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Biological Catalyst:</b> Enzymes, incentives for using enzymes, methodology, chemical and physical properties, activity, pH-activity behavior, stability, application.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Catalyst Design:</b> Optimization of catalyst distribution in a single pellet, the case of single and multiple reaction, isothermal and non-isothermal conditions, complex reaction system, factors affecting catalytic dispersion, optimal distribution of catalytic loading.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Optimization of Catalyst Distribution in a Reactor:</b> Single reaction and multiple reaction, isothermal and non-isothermal conditions. Catalytic deactivation, non-selective and selective poisoning..	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Membrane Reactor:</b> Membrane reactor with non-uniform catalytic distribution, optimal catalyst distribution in pellets for an inert membrane reactor and catalytic membrane reactor, preparation of catalytic membrane.	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in



the area of catalyst materials, keeping track of the recent technological trends and developments.	
<b>Text Books/References:</b>	
1.	Burton J. J. and Garton R. L., “Advanced materials in catalysis”, Academic press, London, 1977.
2.	Morbideilli M., Gavriilidis A. and Varma A., “Catalyst design: Optimal distribution of catalyst in pellets, reactors and membrane”, Cambridge university press, Cambridge,2001.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>ELECTIVE II: MEMBRANE SEPERATION</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction</b> Separation Processes, Introduction to membrane processes, Definition of Membrane Merits of the Processes. Classification of the membrane separation process.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Materials &amp; Materials Properties</b> Membrane Polymers, Molecular weight, Porous & Porous membrane, Thermal, Chemical & Mechanical Properties of Inorganic membranes, Biological membranes. Retention & rejection co-efficient. Factor affecting the	<b>(08 Hours)</b>

	separation processes. Effect of polymeric structure on Tg Glass transition temperature depression.	
<b>UNIT-III</b>	<b>Preparation of Synthetic Membranes</b> Phase inversion membranes, Preparation by evaporation, Precipitation from the vapour phase. Precipitation by controlled evaporation, Thermal & immersion precipitation. Flat membranes, Tubular membranes, Zeolite membranes, Dense membrane. Preparation Technique for Composite Membrane, Inorganic Membranes	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Characteristics of porous membrane, Bubble Point Method, Mercury intrusion method, Permeability Method, Ultrafiltration, Gas-adsorption desorption, Characterisation of ionic membranes, characterisation of nonporous membrane.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Transport in membrane, Knudsen flow, Friction Model, Transport through non-porous membrane. Determination of diffusion co-efficient & solubility co-efficient. Transport in ion exchange membranes.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Membrane Processes, M.F, U.F, R.O, Nano filtration Dialysis, Electrodialysis, Piezodialysis, Diffusion Dialysis, Membrane reactors & membrane bioreactors, Polarization & Fouling Phenomena in Membranes, C.P in electro dialysis, Temperature Polarization, Membrane Fouling, Method to reduce Fouling.	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of membrane separation, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	Osada Yoshohito, Nakagawa T., "Membrane Science and Technology", Marcel Dekker Inc.
2.	Mulder, "Basic Principles Membrane Technology", Kluwer Academic Marcel of Publishers, Netherlands, 1998
3.	C.J.King, "Separation Processes", Tata Mc Graw-Hill

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10602 ELECTIVE II: BIOPROCESS ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

### Topics covered

<b>UNIT-I</b>	Introduction, Biotechnology & Bioprocess Engineering types & structure of cells ,Growth kinetics, Growth cycle phase, effect of substrate concentration, cell concentration and death rate on growth of M.O.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Simple Enzyme Kinetics, Michaelis-Menten Kinetics, evaluation of M.M equation parameters, line weaver, Burk plot, Eadie-Hofstee plot, factors influencing enzyme activity, immobilized enzyme technology ,immobilized kinetics	<b>(08 Hours)</b>
<b>UNIT-III</b>	Selection, Scale-up & Control of Bioreactors Ideal, on-ideal Bioreactors, Fed Batch reactor, sterilization reactor, Aeration & Agitation & mass transport in cellular system. Scale up difficulties, Bioreactor instrumentation & control.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Recovery & Purification of Product Separation of insoluble products. Cell disruption, separation of soluble products, finishing steps for purification, integration of reaction & separation	<b>(08 Hours)</b>
<b>UNIT-V</b>	Industrial Production of Chemicals Ethanol, Acetic acid, Citric acid, Gluconic acid. Solvents such as Glycerol, acetone, butanol. Anti-biotics such as penicilline, streptomycine, tetracycline. Production of High Fructose Corn Syrup (HFCS), production of Bakers Yeast Single Cell Protein	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Medical & other applications of Bioprocess Engg. introduction, Tissue Engineering, Gene Therapy, Stem cell, Use of microbes in mineral beneficiation & oil recovery, Biofertilizers & Biopesticides, Biopolymer Biological treatment of Industrial Waste	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in

the area of bioprocess engineering, keeping track of the recent technological trends and developments.	
<b>Text Books/References:</b>	
1.	Michael L. Shuler, F. Kargi, "Bioprocess Engineering Basic Concept", Prentice Hall, India, 2nd Edition, 2002
2.	Bailey, James Ollis, Davis F,"Biochemical Engg." Mc Graw-Hill, Publications
3.	Aiba A, Humphry A. E, "Biochemical Engg
4.	Wingard L. B., "Enzyme Engg."
5.	Paulinemdoran, "Bioprocess Engg. Principles", Elsevier Publications
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV ,V,VI

### K10602 ELECTIVE II: MULTICOMPONENT SEPERATION

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

#### Topics covered

<b>UNIT-I</b>	Characteristics and selection of separation process: Importance and variety of separation, economic significance, characteristics, inherent separation factor, selection, factors influencing the choice of separation process, solvent selection, selection of equipment.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Multicomponent separation: General short-cut equation, Edmister method, distillation, absorption, extraction, alternate short-cut method, Fenske and Underwood equation.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Multicomponent separation: Distillation, Rigorous method, Lewis-Matheson method, Thiele-Geddes method, Amundson-Pontinen method.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Azeotropic and extractive distillation: Activity coefficient, equilibrium relationship, binary and ternary azeotropes, selection of solvent, calculations..	<b>(08 Hours)</b>
<b>UNIT-V</b>	Multicomponent separation: Extraction, Rigorous method, stripping factor equation, material balance, single and cross-current multiple contact, calculations.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Multicomponent separation: Absorption, Rigorous method for absorption, calculations.	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.  
 Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the

product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.	
<b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of multicomponent separation, keeping track of the recent technological trends and developments	
<b>Text Books/References:</b>	
1.	Smith B. D., "Design of Equilibrium Stage Processes", McGraw Hill Book Company Ltd.
2.	King C. J., "Separation Processes", McGraw Hill Book Company Ltd.
3.	Treybal R. E., "Mass Transfer Operation", McGraw Hill
4.	Treybal R. E., "Liquid Extraction", McGraw Hill Book Company Ltd.
5.	Phillip C. Wankat, "Equilibrium Staged Separations", Prentice Hall
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>K10602 ELECTIVE II: FOOD PROCESS ENGINEERING</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical:2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance:10 Marks	
	TW :25 Marks	
	Oral:25 Marks	
	Total :150 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	Introduction: Characteristics and nutritional properties of food texture, taste, flavour and aroma. Geometric, physical and functional properties of food material. Preparation for food processing, energy conservation, material and energy balance	<b>(08 Hours)</b>
<b>UNIT-II</b>	Processing Methods: Heating : Balancing and pasteurization, freezing, dehydration, canning, additives. Fermentation: Extrusion cooking, hydrostatic pressure cooking. Dielectric heating microwave processing and asptic processing, infrared radiation processing, concept and equipment used	<b>(08 Hours)</b>

<b>UNIT-III</b>	Drying: Moisture content: Definition, method of determination, direct and indirect methods. Equilibrium moisture content: Hysteresis Effect. Psychometric of air water vapour mixture, Drying mechanism, constant rate period and falling rate period , Method and equipments used, factor affecting rate of drying	
<b>UNIT-IV</b>	Food conservation Operation: Sieve reduction, fibrous foods, dry foods and liquid foods. Theory and equipment, membrane	<b>(08 Hours)</b>
<b>UNIT-V</b>	Material handling: types of candling and conveying system food products, and their design, belt conveyors, screw conveyors, bucket elevator and pneumatic conveyor.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Preservation of food material: Preservation by drying, preservation by low temperature, chemical preservation .Thermal death time curve	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of food process engineering, keeping track of the recent technological trends and developments

**Text Books/References:**

1.	Shivshankar B., "Food Processing and Preservation", Prentice Hall of India Pvt. Ltd., New Delhi 110001, 2002
2.	Sahay and Singh, "Unit Operation in Agricultural Processing
3.	Dennis R. H., " Food Process Engineering"
4.	Rao M. A. & Rizvi S. S. H, " Engineering Properties of Food

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## K10602 ELECTIVE II: FLUIDIZATION ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Practical: 2 Hours/Week	Unit Test: 20 Marks	TW/PR/OR: 01
Total : 6 Hours/Week	Assignment: 10 Marks	Total credits: 05
	Attendance: 10 Marks	
	TW : 25 Marks	
	Oral: 25 Marks	
	Total : 150 Marks	

### Topics covered

<b>UNIT-I</b>	Introduction and Application : Phenomenon of Fluidisation, Liquid like behavior of a fluidized bed, comparison with other methods , Advantages and Disadvantages, Types of Fluidisation. Gas behavior Of Fluidised bed : Fixed beds, minimum fluidisation velocity, Terminal velocity, and pressure drop, importance of distributor, voidage, TDH, viscosity and fluidity of fluidized beds.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Bubbles and Emulsion phase in Dense bubbling beds: Single rising bubble, Stream of bubbles from single source, Ordinary Bubbling bed. Experimental findings. Bubbling bed model for Emulsion phase	<b>(08 Hours)</b>
<b>UNIT-III</b>	Flow pattern of gas through fluidized bed: Experimental findings , Bubbling bed model for gas interchange. Evaluation of inter change coefficient. Radial and Axial dispersion of gas. Mass and heat transfer b/w fluid and solid.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Conversion of gas in bubbling beds: Two region model, Model using distribution. Catalytic conversion, reaction rate, contacting efficiency, application to successive reactions, control of bubble size, baffling and scale-up.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Entrainment and Elutriation : Entrainment at or above TDH, Entrainment below TDH. Model for entrainment from dense fluidized bed and its applications	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Application in physical operations: Synthesis reactions, cracking and reforming of hydrocarbons, carbonization and gasification. Gas solid reactions	<b>(08 Hours)</b>

**Term Work:** The term work shall consist of the following.

Research survey, literature review and analysis, synthesis, design and development, experimental work, testing on the product or system, generation of new ideas and concept, modification in the existing process/system, development of computer programs, solutions, modeling and simulation related to the subject. The student is required to choose the topic in consultation with the subject teacher. The student is expected to submit a report on the work carried out throughout the semester.

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of fluidization engineering, keeping track of the recent technological trends and developments.

### Text Books/References:

1.	Smith B. D., "Design of Equilibrium Stage Processes", McGraw Hill Book Company Ltd.
2.	King C. J., "Separation Processes", McGraw Hill Book Company Ltd.
3.	Treybal R. E., "Mass Transfer Operation", McGraw Hill
4.	Treybal R. E., "Liquid Extraction", McGraw Hill Book Company Ltd.

5.	Phillip C. Wankat, "Equilibrium Staged Separations", Prentice Hall
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

<b>K 10604 DISSERTATION STAGE –I</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Practical:7 Hours/Week	TW :25 Marks	TW: 21
Total : 7Hours/Week	Total :25 Marks	Total credits: 21
<p>This stage will include comprehensive report on literature survey, design and fabrication of experimental set up and/or development of model, relevant computer programs and the plan for stage II.</p>		

<b>K 10603 SEMINAR</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Practical:5 Hours/Week	TW :25 Marks	TW: 5
Total : 5Hours/Week	Oral:25Marks	Total credits: 5
	Total :50 Marks	
<p>The students will be required to select advanced research topics for the seminar and present the seminar during the semester. A detailed report should also be submitted and assessment will be based on the quality in terms of the research and development.</p>		



## SELF STUDY PAPER-I

<b>SELF STUDY PAPER -I : OPTIMIZATION TECHNIQUES IN PROCESS DESIGN</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total: 4 Hours/Week	Internal assessment: 40 Marks	Total credits:04
	Unit Test: 20 Marks	
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction to optimization</b> Scope and Hierarchy of optimization, Essential features of optimization Problems, General Procedure for solving optimization problems, obstacles to optimization, Developing Models for optimization, Classification of Models, How to build Model, Selecting functions to fit empirical data, degree of Freedom, Formulation of objective function .	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Classification of Optimization Techniques</b> , Single variable, Multivariable optimization with no constraints ,equality constraints ,inequality constraints	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Linear Programming</b> Simplex method, Geometry of LPP, solution to linear simultaneous equations, Pivotal reduction of a general system of equations, sensitivity Analysis	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Non Linear Programming</b> One dimensional minimization method, unimodal function, Dichotomous search, Fibonacci Method, Golden section Method, Interpolation Method, Scanning and bracketing Method	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Non linear Programming unconstrained optimization &amp; constrained Optimization</b> Direct Search Method, Random Search method, Descent Method, Conjugate Gradient Method , Introduction to NLP constrained optimization Direct and Indirect Methods .	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Examples and case study for different engineering applications..</b>	<b>(08 Hours)</b>
<b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of optimization techniques in process design, keeping track of the recent technological trends and developments.		
<b>Text Books/References:</b>		
1.	Edgar T F , Himmelblau D N , “Optimization of Chemical Processes”, MC Graw Hill Publication .	
2.	S S Rao, Optimization theory and Application, Wiley Eastern Publication	

<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER -I: NON CONVENTIONAL ENERGY SYSTEMS

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	

#### Topics covered

<b>UNIT-I</b>	<b>Renewable Sources Of Energy</b> Renewable sources of energy such as hydro, solar, wind, biomass, tidal and geothermal – their availability and limitation. Energy crisis and energy demand projection.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Solar Energy</b> Solar radiation, photovoltaic cell, pyranometer, solar thermal collectors, solar air heaters, solar constant, solar cell, applications of solar energy.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Wind Energy</b> Wind map of India, mean wind speed and wind density during different months in specific areas. Types of wind mills, their assembly and application as electric converters, pumping motors. Concept of wind farms, its applications.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Bio-Mass Energy</b> Bio-mass as a source of energy, energy plantation, pyrolysis classification and anaerobic fermentation, types of biogas plant, their comparative status, design and application.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Other Alternate Sources Of Energy</b> Tidal power, sites for tidal power plants in India, micro-hydel power station, geothermal energy, limitations and applications of such power plants.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Energy Conservation And Auditing</b> Conservation of energy in – domestic application and industries, use of fuel efficiently in vehicles, waste recycling fuel gas and heat recovery, energy demand management, energy accounting and auditing.	<b>(08 Hours)</b>

#### Text Books/References:

1.	John Twidell & Tony Weir, Renewable Energy Resources, Second edition, Taylor & Francis, 2006
2.	Douglas C., Energy Technology Handbook, Tata McGraw Hill Publishers
3.	Rao C. S., Environmental Pollution Control Engineering, Wiley Eastern

4.	Majumdar B., A Textbook of Energy Technology, APH Publications
5.	J. T. McMullan, R. Morgan and R. B. Murray, Energy Resources and Supply, John Wiley & Sons, London, 1976
6.	G.D. Rai, Solar Energy Utilization, Khanna Publishers, Delhi
7.	A.W. Culp, Principles of energy conservation, Tata MGH

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of non conventional energy systems, keeping track of the recent technological trends and developments.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

**SELF STUDY PAPER -I: MECHANICAL ASPECTS IN CHEMICAL ENGINEERING**

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	
	Total :100 Marks	

**Topics covered**

<b>UNIT-I</b>	Mechanical aspects of piping design and layout, Pipe and its representation, pipe fittings, methods of pipe joining, piping insulation, Piping insulation, piping symbols, design of piping systems, piping isometrics, plot plan and Pipe racks.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Chemical equipment design - mechanical aspects, Design of Support for process vessels, basic theory for vertical vessels, design of skirt support, Bracket or lug support, leg support, ring support, horizontal support, saddle support, leg support, Ring support, engineering materials, classification and commercial applications.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Principles of mechanical engineering in chemical engineering, Power conversion devices such as steam turbines, IC engines, different types of pumps, Air conditioning and refrigeration, ON-OFF valves, Non return and other type of valves.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Energy conservation and heat pumps, Energy conservation in India and World, mechanical vapor compression , heat pumps, various thermodynamic cycles, actual vapor compression heat pumps with liquid sub cooling, various types of heat pumps.	<b>(08 Hours)</b>

<b>UNIT-V</b>	Mechanical aspects in chemical process engineering, Alternative routes in process engineering , general approach to plant design, process research and pilot studies, process design and development , preparation of operating manual instructions, cost cutting machines, trouble shooting , green engineering and process intensification.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Mechanical engineering aspects in chemical engineering and technology, Study of general purpose tools and special purposes tools and machines, lathes, milling, drilling and accessories. EDM , TWEDM, hobbling, electroplating, ,ECM, arc welding, gas welding, brazing, soldering, riveting, TIC, MIG welding processes, equipment used and applications, drop forging, press forging , role forging, and industrial applications.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of mechanical aspects in chemical engineering, keeping track of the recent technological trends and developments.

**Text Books/References:**

1.	Coulson and Richardson , Chemical Engineering , Volume 2, Paragon press Oxford , New York.
2.	Treybal R.E., Mass transfer Operation Operations, third edition, Mc Hill International Publishers.
3.	Smith R, Chemical Process Design , McGraw Hill International Publishers
4.	Dodge B. F., Chemical Engineering Thermodynamics, McGraw Hill International Publishers.
5.	Thakori S B and Bhatt B I, Introduction to Process engineering and Design, Mcgraw Hill Companies
6.	Brownwell L,E, and Young E H, Process equipment design, John Willey and Sons, Inc. New York.
7.	Shingles ,J and MischkaC, Mechanical Engineering Design, McGraw Hill Edition
8.	Vijayrangan S, and Rajendran I, Materials and Mechanical Engineering Narosa Publishing Company New Delhi, Chennai, Mumbai and Kolkata
9.	Arora C P, Refrigeration and Air-conditioning, TataMcgraw Publishing Companies Ltd. New-Delhi.
10.	Agarawal B, Agarawal C, M, Basic Mechanical Engineering, Wiley India Publishers and Editions.
11.	Myer Kutz ,Mechanical Engineers Hand Book John Willey and Sons (New York)
12.	Perry R, and Green D, Perrys Chemical Engineers Hand Book Sixth Edition, International Students Edition

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## SELF STUDY PAPER -I: GREEN CHEMISTRY AND TECHNOLOGY

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	
	Total:100 Marks	

### Topics covered

<b>UNIT-I</b>	Introduction: Definition, the twelve basic principles of green chemistry. Use of Renewable Feedstock, Reduction of Derivatives, Catalysis, Design for Degradation, Real-time Analysis for Pollution Prevention, Inherently Safer Chemistry for Accident Prevention.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Green synthetic methods: Microwave synthesis, electro-organic synthesis, Design and development of environmentally friendly chemical pathways: challenges and opportunities. Materials for green chemistry and technology: Catalysis, environmental friendly catalysts, Bio-catalysis, biodegradable polymers, alternative solvents.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Biochemical conversion: anaerobic digestion, alcohol production from biomass; Chemical conversion process: hydrolysis and hydrogenation; Biophotolysis: Hydrogen generation from algae biological pathways; Storage and transportation; Applications.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Green innovation & sustainability: Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends – process/product innovation-, Eco/green technologies for addressing the problems of Water, Energy, Health, Agriculture and Biodiversity- WEHAB (eco-restoration/ phyto-remediation, ecological sanitation, renewable energy technologies.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Global warming; greenhouse gas emissions, impacts, mitigation and adaptation; future energy Systems- clean/green energy technologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCCC); sustainable development.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Environmental reporting and ISO 14001; climate change business and ISO 14064; green financing; financial initiative by United Nations Environment Programme (UNEP); green energy management; green product management , green tax incentives and rebates (to green projects and companies); green project management in action; business redesign; eco-commerce models.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of green chemistry and technology, keeping track of the recent technological trends and developments.

### Text Books/References:

- Philip G. Jessop, Chao-Jun Li ,Peter Wasserscheid , Annegret Stark, Handbook of Green Chemistry,

	3 Volume Set, Green Solvents, Wiley-VCH.
2.	Paul T. Anastas, Istvan T. Horvath, Green Chemistry for a Sustainable Future.
3.	V. K. Ahluwalia, M. Kidwai, New Trends in Green Chemistry, Kulwer Academic Publisher.
4.	Paul T, John C., Green Chemistry: Theory and Practice, Oxford University Press, USA.
5.	Baird, C. and Cann, M., Environmental Chemistry, 4 <sup>th</sup> Edition, W.H. Freeman and Company, New York, 2008.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER I- CAVITATION TECHNIQUES

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4 Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance: 10 Marks	
	Total : 100 Marks	

#### Topics covered

<b>UNIT-I</b>	<b>Introduction</b> The physical phenomenon , Definition, Vapor pressure, The main forms of vapor cavities, Cavitation regimes, Typical situations favorable to cavitation , The main effects of cavitation in hydraulics , Specific features of cavitating flow, Pressure and pressure gradient, Liquid-vapor interfaces, Thermal effects, some typical orders of magnitude, Non-dimensional parameters: Cavitation number, Cavitation number at inception, Relative under pressure of a cavity.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Acoustic Cavitation</b> Cavitation Bubble Temperature, Classification of Acoustic Cavitation, Sonoluminescence, Sonochemistry, Experimental Factors that Control Sonochemistry, Sites where Sonochemical Reactions Occur, The Classification of Sonochemical Reactions.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Synthesis of Inorganic Materials</b> Ultrafine powders and nanostructured materials, metal oxides, metal powders, supported nano powders etc.	<b>(08 Hours)</b>

<b>UNIT-IV</b>	<b>Synthesis of organic Materials</b> Homogeneous reactions, heterogeneous sono chemistry, Synthesis using alkylation reactions, addition reactions, reduction and oxidation reactions etc.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Environmental protection and remediation</b> Degradation of organic pollutants, Water purification, application of cavitation alone, combined application of cavitation and ozone, combined application of cavitation and ultraviolet light, combined application of cavitation and advanced oxidation processes(AOPs)	<b>(08 Hours)</b>
<b>UNIT-VI</b>	<b>Other applications of cavitation</b> <u>Polymers:</u> Degradation of polymers, factors affecting polymer degradation, polymer synthesis, ultrasonic processing of polymers. <u>Sonoelectrochemistry:</u> Electroplating in presence of ultrasound, zinc, iron, copper, nickel etc. Sonoelectro - organic synthesis.	<b>(08 Hours)</b>
<b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of Cavitation techniques, keeping track of the recent technological trends and developments.		
<b>Text Books/References:</b>		
1.	Jean-Pierre Franc, Jean-Marie Michel, "Fundamentals of Cavitation", Kluwer Academic Publishers, Dordrecht.	
2.	"Sonochemistry- Kirk-Othmer Encyclopedia of Chemical Technology", John Wiley & Sons, Inc.	
3.	T. J. Mason and J. P. Lorimer, "Applied sonochemistry: Uses of power ultrasound in chemistry and processing", Wiley-VCH publishers.	
<b>Syllabus for Unit Test:</b>		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV,V,VI	

## SELF STUDY PAPER-I: SAFETY ENGINEERING IN INDUSTRIES

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

### Topics covered

<b>UNIT-I</b>	Types of chemical Process Industries, various hazards in industries, handling of Hazardous chemicals, case study (one or two), chemical composition of hazards, case Study (one or two), first aid measures, fire fighting measures, accidental release Measures, personal protection and storage.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Process Selection, plant operation, plant selection, construction, process system Engineering.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Industrial pollution, pollution control aspects, pollution control acts, various Toxic materials, handling of toxic materials, and industrial gases.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Safety program, engineering ethics, accident and loss statistics, acceptable Risk, nature of accidental process, one or two case studies	<b>(08 Hours)</b>
<b>UNIT-V</b>	Government regulations, identification, MSD sheets, evaluation and control.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Relief concept, definitions, location of relief, relief types, relief scenario, Data for sizing relief, relief systems, design considerations and recommendations	<b>(08 Hours)</b>

### Text Books/References:

1.	Environmental Engineering, Howard S Peavy, Donald R Rowe and George Tchobanogloglons, Mc Graw Hill Book company.
2.	Shreve s Chemical Process Industries, George T Austin, Mc Graw Hill International Edition
3.	Pollution Control in Chemical Process Industries, Mahajan S B, Tata Mc Graw Hill edition (P) Ltd.
4.	Introduction to process Engineering and Design ,Thakore S.B and Bhatt B. I. Mc Graw Hill Publishing Company Ltd. New Delhi

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of safety engineering in industries, keeping track of the recent technological trends and developments.

### Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI



## SELF STUDY PAPER -I: PETROLEUM ENGINEERING

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

### Topics covered

<b>UNIT-I</b>	Distribution of Reserves Worldwide distribution of oil and gas reserves, Subsurface data sampling and data interpretation, Measurement scaling	<b>(08 Hours)</b>
<b>UNIT-II</b>	Origin of Hydrocarbons , accumulation and migration of hydrocarbons, Reservoir traps.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Properties of reservoir rocks and fluids, Rock – fluid interface, Reservoir description by direct and indirect methods, Oil and Gas in place. Chemical, physical and thermodynamic properties of petroleum and reservoir fluids	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Drilling of oil and gas wells, Classification of wells, Drilling operating systems, Drilling fluids.New trends in drilling engineering.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Hazard and safety measures in handling of natural gas, transportation and storage of oil and gas ,Storage of oil and gas , Types of storage tanks, underground storage of natural gas Catalytic cracking, Catalytic reforming, Hydrodesulfurization, Hydrocracking	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Recent developments in Hydrocarbon production techniques, Hydrocarbon recovery mechanisms, Non-conventional hydrocarbon energy sources, International trading in oil and gas.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of petroleum engineering, keeping track of the recent technological trends and developments.

### Text Books/References:

1.	Bradley, “Petroleum Engineering Handbook”, SPE
2.	Mian, M. A., “Petroleum Engineering Handbook for Practicing Engineer”, Vol. I and II, Pennwell Publication.
3.	Deshpande, B.G., “World of Petroleum”, Wiley.
4.	John, F., Cook, M., and Graham, M., “Hydrocarbon Exploration and Production”, Elsevier.

### Syllabus for Unit Test:

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## SELF STUDY PAPER- I: FLUID PARTICLE TECHNOLOGY

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

### Topics covered

<b>UNIT-I</b>	<b>Applications of fluidized beds</b> Introduction. Industrial application of fluidized beds. Physical operations and reactions.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Fluidization and analysis of phases</b> Fluidization and analysis of phases for gas-solid, liquid-solid, and gas-liquid-solid fluidized beds. Hydrodynamic characteristics: pressure drop, velocity mapping, and fractional hold- up.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Mixing studies in fluidized beds</b> Effect of geometrical, system, and operating parameters on phase mixing in fluidized beds. Quantification of phase mixing. Development of a mathematical model.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Heat and mass transfer in fluidized beds</b> Mass and heat transfer between fluid and particles. Effect of geometrical, system, and operating parameters on heat and mass transfer coefficients. Application of correlations available for estimating heat and mass transfer coefficients	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Circulating Fluidized Beds</b> Fluid and particle distribution in a fluidized bed. Introduction to circulating fluidized bed and its application. Hydrodynamic aspects of circulating fluidized beds. Standardization of circulating fluidized beds.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Design of fluidization system for physical operations, catalytic and non-catalytic reactions, three phase fluidization and its standardization with regards to pressure drop, fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of fluid particle technology, keeping track of the recent technological trends and developments.

#### **Text Books/References:**

1.	Diazo Kunji and O. Levenspiel, "Fluidization Engineering", 2 <sup>nd</sup> Edition, Butterworth Heinemann, 1991.
2.	J. F. Devidson and Harrison, " Fluidization", 10 <sup>th</sup> Edition, Academic Press, London, 1994.

3.	Jackson, R., “The Dynamics of Fluidized Particles”, Cambridge University Press, New York, 2000.
4.	Fan, L. S. And C. Zhu, “Principles of Gas- Solid Flows”, Cambridge University Press, New York, 1998.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SEM –IV

<b>K 10605 DISSERTATION STAGE –II</b>		
<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Practical: 10 Hours/Week	TW :150 Marks	TW & Oral:30
	Oral:75 Marks	
Total : 10Hours/Week	Total :225 Marks	Total credits: 30
<p>This is the final stage in the dissertation work. This stage will include comprehensive report on the work carried out at this stage and relevant portions from stage I, including experimental studies, analysis and/or verification of theoretical model, conclusions. The student is required to publish at least one national/international paper based on the dissertation work. The publication/ accepted paper for publication shall be included in the report</p>		

## SELF STUDY PAPER-II

<b>SELF STUDY PAPER-II-TECHNOLOGY TRANSFER PRACTICES –BRIDGE TO INDUSTRY</b>		
<b>TEACHING SCHEME:</b>		
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total:100 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	Innovation and the dynamics of technological change. The interactive and non-linear nature of Innovation, Defining the Innovation Need, Dynamics of Technological Change and Systems of Innovation	<b>(08 Hours)</b>
<b>UNIT-II</b>	Theory and practice of processes of technology transfer and diffusion: Commercialization of technology; intellectual property rights. Product innovation: impact of product innovation, Product Innovation within OEM (case studies)	<b>(08 Hours)</b>
<b>UNIT-III</b>	success factors for product innovation; developing a product innovation strategy: Interactive learning and networks of innovation: technology Platforms; firms taxonomy	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Systems of Innovation and the corporate value chain: fostering clustering effects. Regional innovation strategies	<b>(08 Hours)</b>
<b>UNIT-V</b>	SWOT Analyses of company and product, Product Portfolio Analyses: Product Life Cycle (PLC) Product Innovation and Design consultancies (case studies), New Product-Service-System development	<b>(08 Hours)</b>
<b>UNIT-VI</b>	External trends (PESTED) and company core competences, Strategic Gap, Selection of ideas, Market implementation	<b>(08 Hours)</b>
<p><b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of technology transfer practices-bridge to industry, keeping track of the recent technological trends and developments.</p>		
<b>Text Books/References:</b>		
1.	Mytelk, L. K. and Smith, K. (2003), “Interactions Between Policy Learning and Innovation Theory”, in “Innovation, Competence Building, And Social Cohesion In Europe: Towards a Learning Society”, Editors: Pedro Conceição, Manuel V. Heitor and Bengt-Åke Lundvall, Edward Elgar	
2.	Lundval, B.-A., and Christensen, J.L. (2003), “Broadening the Analysis of Innovation Systems – Competition, Organisational Change and Employment Dynamics in the Danish System”, in “Innovation, Competence Building, and Social Cohesion In Europe: Towards a Learning Society”, Editors: Pedro Conceição, Manuel V. Heitor and Bengt-Åke Lundvall, Edward Elgar	
3.	Edquist, C. (1997). “Systems of innovation a introduction” (Chapter 1), in: “Systems of Innovation”, ed. C. Edquist, pp. 1-35	

<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER-II: -POLYMER ENGINEERING

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hrs/week	End Semester Examination: 60 Marks	Theory : 04
Total: 4 Hrs/week	Internal assessment: 40 Marks	Total Credits:04
	Total :100 Marks	

#### Topics covered

<b>UNIT-I</b>	<b>Introduction to polymer technology</b> Types of polymerization, effect of temperature and pressure on polymerization, degree of polymerization, molecular weight determination.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Polymerization process</b> Manufacturing process of phthalic anhydride, propylene, acrylonitrile, adipic acid, tetraphthalic acid, LDPE, HDPE, PVC, PP, PC, polystyrene, polyurethanes, PTFE, polyester via terephthalic acid, nylon-6.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Polymerization reactors</b> Batch, continuous, plugflow, CSTR, Design consideration of batch reactor, design consideration in high pressure LDPE reactors LLDPE & HDPE Fluid bed reactor. Types of agitators for polymerization reactors, polymer drying.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Polymer characterization & rheology. Mechanical properties of polymer, crystallinity, glass transition temperature (T <sub>g</sub> ), heat distribution temperature, mathematical models of viscoelastic behaviour of plastic, viscosity determination of polymer.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Plastic processing – injection moulding , compression moulding , rotational moulding , transfer moulding , coating polymer blends , & composites – polymer alloys , reinforced plastics.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Polymer adhesives technology - Different types of adhesive , polyvinyl alcohol , rubber cement , polymer applications , identification and waste management.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of polymer engineering, keeping track of the recent technological trends and developments.

#### **Text Books/References:**

1.	“Introduction to polymer science & technology” by Dr S.D Dawande , Denett & co 1 <sup>st</sup> edition 2006.
2.	Gawarikar V.R , Vishvanathan N.V , Sridhar j, polymer science , new age international p ltd,

	dariyaganj , New delhi.
3.	Bhatnagar M.S Text book of polymer vol I , II ,III. S.chand & co.ltd New delhi – 55.
4.	Rao natti S , Design formula for plastic engineering Hanser publication, Munich Viemna, New York (1991).
5.	Pattan Wj, plastic technology , theory , design , and manufacture, Ruston publishing Co Mumbai – 01.
6.	Athalye A.s plastic material handbook Vol 1 & 2 Multitech publishing Co. Ghatkopar Mumbai – 77.

<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER -II: FOOD TECHNOLOGY

<b><u>TEACHING SCHEME:</u></b>	<b><u>EXAMINATION SCHEME:</u></b>	<b><u>CREDITS ALLOTTED:</u></b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test : 20 Marks	Total credits: 04
	Assignment : 10 Marks	
	Attendance :10 Marks	

#### Topics covered

<b>UNIT-I</b>	Principle of food processing: Rheology of solid, semi-solid and liquid foods. Heat transfer and thermal death times, Schmidt plot procedure.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Canning of food: Thermal processing, determining time of heat sterilization process. Conductive and convective foods.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Balancing and freezing of foods: Balancing processes, freezing, Ultra-high temperature thermal processing, food sterilization, probability of non-sterile unit, Convective drying of food, rate of drying, time of drying.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Membrane processing of liquid foods: Principles, membrane configuration, types, evaporation concentration of liquid food, evaporator load calculation.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Osmotic dehydration of food: Mechanism of osmotic dehydration, kinetics. Microwave heating of food, Frying of food, heat and mass transfer in frying.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Extrusion cooking of foods: extrusion process, role of moisture content. Packaging of foods, packaging materials, shelf life, water transmission rate, prediction of packaging	<b>(08 Hours)</b>

	time. Process control in food manufacturing.	
<b>Assignment:</b> Each student will submit assignments based on different topics in consultation with faculty, in the area of food technology, keeping track of the recent technological trends and developments		
<b>Text Books/References:</b>		
1.	Frazier, W.C., and Westhoff, D.C., (1995). Food Microbiology. 4th ed. New Delhi: Tata McGraw-Hill publishing Company Limited.	
2.	Basic Food Microbiology; Bannett, Chapman and Hall	
3.	Potter, Norman N., Hotchkiss, Joseph H., Food Science, fifth edition.	
4.	Frazier, Food Microbiology, Tata McGraw Hill, (2007).	
5.	Norman W. Desrosier, James N. Desrosier, The technology of food preservation, 4th ed. Westport, Conn. : AVI Pub. Co., c1977.	
6.	Fennema Karrel, Principles of Food Science, Vol-I, Marcel Dekker publisher.	
7.	Food Science by Mudambi Robinson RK; 1996; Modern Dairy Technology, Vol 1 & 2; Elsevier Applied Science Pub.	
8.	Charm SE, The Fundamentals of Food Engineering; 1963, AVI Pub.	
9.	Sharan K., Mulvaney S. J., Rizvi S. H., Food process engineering, Wiley Interscience Publication	
<b>Syllabus for Unit Test:</b>		
Unit Test -I	UNIT – I ,II,III	
Unit Test -II	UNIT – IV, V, VI	

<b>SELF STUDY PAPER-II- MODELING AND SIMULATION OF PROCESSES</b>		
<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4 Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total :100 Marks	
<b>Topics covered</b>		
<b>UNIT-I</b>	<b>Introduction:</b> Models, Open loop systems, Feedback controls, cascade controls, System analysis from models, The control engineers role.	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Modeling of dynamic systems:</b>	<b>(08 Hours)</b>

	Modeling principles, Modeling physical components, Obtaining a transfer function for Analysis or Simulation with SIMULINK. Modeling of various systems.	
<b>UNIT-III</b>	<b>Frequency response analysis:</b> Mathematical basis, Application of frequency response diagram, using MATLAB to obtain gain margin (GM) and phase margin (PM).using MATLAB to produce a Nichols Chart, comparison of various methods.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Process identification:</b> Purpose, Direct methods, time domain fitting of step test data, direct sine wave testing, digital evaluation of Fourier transformation, auto tuning, approximate transfer functions.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Building blocks of feed forward neural network:</b> Building blocks of ANN, processing elements, connections, weights, activation and transfer functions, learning rules	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Computer Simulation for various industrial applications.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of modeling and simulation of processes, keeping track of the recent technological trends and developments

**Text Books/References:**

1.	Franks R. E. G., "Modeling and Simulation in Chemical Engineering", Wiley Interscience, NY
2.	John Ingam, Irving J. Dunn, "Chemical Engineering Dynamic Modeling with PC Simulation", VCH Publishers
3.	William L. Luyben, "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill International Edition Publishing Company
4.	Himmelblau D., K. B. Bischoff, "Process Analysis and Simulation", John Wiley & Sons
5.	Wayne Bequette, "Process Dynamics, Modeling, Analysis and Simulation", Prentice Hall
6.	K. M. Hangos and I. T. Cameron, "Process Modeling and Model Analysis", Academic Press, 2001.
7.	Singiresu S. Rao, "Applied Numerical Methods for Engineers and Scientists" Prentice Hall, Upper Saddle River, NJ, 2001
8.	W. F. Ramirez, "Computational Methods for Process Simulation", 2 <sup>nd</sup> ed., Butterworths, 1997
9.	Modeling and analysis of dynamic systems, by C.M .Close, D.H. Fredrick and J. C. Newell, John Wiley & Sons, 2002

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI



## SELF STUDY PAPER -II: NANOSCIENCE

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

### Topics covered

<b>UNIT-I</b>	Introduction, Scientific Revolutions – Types of nanomachines and nanotechnology-periodic table-Atomic structure molecules and phase Energy - Molecular and Atomic size -surfaces and dimensional space -Top down and bottom up.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Nano material synthesis methods, Introduction to Nano scale materials - Synthesis and processing, method of nano structured materials preparation – mechanical grinding, wet chemical synthesis – sol-gel processing, gas phase synthesis, gas condensation processing, chemical vapor condensation – nano composite synthesis – processing.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Nanomaterials properties Opportunity at the nano scale - Length and time scale in structures -energy landscapes-Inter dynamic aspects of inter molecular forces	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Quantum dots - Nano wires-Nano tubes; 2D and 3D films; Nano and mesopores, micelles, nano machines-biological membranes.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Physical properties of nanostructured materials, Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties – gramsize effects on strength of metals optical properties of quantum dots and quantum wires carbon nano tubes -magnetic behavior	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Nanostructures-surface chemistry of tailored monolayer -self assembling; Characterization Techniques: X-ray Diffraction, Scanning Electron Microscopy (SEM), Transmission Electron microscopy (TEM), Optical spectroscopy, Atomic Force Micrograph (AFM), Partical Size Analyzer.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of Nanoscience, keeping track of the recent technological trends and developments

### Text Books/References:

1.	Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience
2.	B S Murty, P Shankar, Baldev Raj, B B Rath, James Murday, “Textbook of Nanoscience and Nanotechnology” Universities Press (India) Private Limited
3.	Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall, 1 <sup>st</sup> Edition
4.	Yury Gogotsi, “Nanomaterials Handbook”, CRC Press, Taylor & Francis Group
5.	Gu`nter Schmid, “Nanoparticles From Theory to Application”, Wiley-VCH Verlag GmbH & Co
6.	C. Br`echignac P. Houdy M. Lahmani, “Nanomaterials and Nanochemistry”, Springer Berlin Heidelberg

	New York
7.	Kenneth J. Klabunde, “Nanoscale Materials in Chemistry”, John Wiley & Sons, Inc
8.	Alain Nouailhat, “An Introduction to Nanoscience and Nanotechnology”, Wiley-ISTE; 1 <sup>st</sup> Edition
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER -II: PETROCHEMICAL ENGINEERING

<u>TEACHING SCHEME:</u>	<u>EXAMINATION SCHEME:</u>	<u>CREDITS ALLOTTED:</u>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total:100 Marks	

#### Topics covered

<b>UNIT-I</b>	Existing Feedstock Scenario Fossil fuel feedstock, Coal, Natural Gas and Petroleum, Reserves, Present and Future ,Production Trends, Statics for India and World, Distribution and utilization pattern of existing fossil reserves, Demand supply scenario, Cycle of oil prices, Need for alternative feedstocks	<b>(08 Hours)</b>
<b>UNIT-II</b>	Non conventional Fossil Fuels ,Coal Bed Methane, Coal Gasification, Shale Oil, Hydrates, Reserves, Potential, and Technologies for exploitation of these resources, Cost factor	<b>(08 Hours)</b>
<b>UNIT-III</b>	Coal Gasification Chemistry and Technology for coal gasification and Syngas production, Fischer TropschSynthesis, Chemistry, Catalyst and Process Technology, Other outlets for Syngas	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Alco Chemicals -Pathways and technologies for chemicals from ethanol, isopropyl alcohol, n-butanol,isobutanol, Lube oil additives, Octane boosters	<b>(08 Hours)</b>
<b>UNIT-V</b>	Fundamentals of natural gas engineering, chemical composition of natural gas, Processing of Petroleum and Hydrocarbons.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	Industrial Applications in Petrochemical Industry	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of Petrochemical Engineering, keeping track of the recent technological trends and developments

#### **Text Books/References:**

1.	Satterfield C. N., “Heterogeneous Catalysis in Industrial Practice”, Second Edition, McGraw Hill, 1993
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2.	Smith J. M., "Chemical Engineering Kinetics", Third Edition, McGraw Hill.
3.	Froment G. F. and Bischoff, K. B. "Chemical Reactor Analysis and Design", John Wiley & Sons.
4.	John, F., Cook, M., and Graham, M., "Hydrocarbon Exploration and Production", Elsevier.
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER -II: PHYSICAL CONCEPTS OF UNIT OPERATIONS

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

#### Topics covered

<b>UNIT-I</b>	Vapor-Liquid Equilibrium, relative volatility, boiling point diagram,Raolts law, Mc Cabe-Thiele method, Lewis-Sorel method, reflux ratio, partial condenser, H-X diagram,Azeotropes, steam distillation, different types of columns and analysis.	<b>(08 Hours)</b>
<b>UNIT-II</b>	Applications of liquid-liquid extraction, difference between distillation and extraction,Distribution coefficient,ternary systems, selection of solvent, different stages of operation,Various types of extraction equipments.	<b>(08 Hours)</b>
<b>UNIT-III</b>	Equilibrium data, solubility curves, crystallization theory, classification of crystallizationEquipments, types of crystallizers, mechanism of crystallisation.	<b>(08 Hours)</b>
<b>UNIT-IV</b>	Application of adsorption, nature of adsorption, types of adsorption, adsorption Isotherms, different stages of adsorption, breakthrough curves.	<b>(08 Hours)</b>
<b>UNIT-V</b>	Introduction to leaching operation, equilibrium diagram, various stages of operation, Countercurrent leaching operation, leaching of fine solids, dorr agitator.	<b>(08 Hours)</b>
<b>UNIT-VI</b>	General definitions of drying, equilibrium in drying, rate of drying curve, General classification and types of dryers.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of physical concepts of unit operations, keeping track of the recent technological trends and

developments	
<b>Text Books/References:</b>	
1.	Coulson J,M. and Richardson Chemical Engineering Volume 2
2.	Pergaon Press, Oxford, New York (USA) King C, J.Separation ProcessesMc Graw – Hill Publications
<b>Syllabus for Unit Test:</b>	
Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

### SELF STUDY PAPER- II: MULTIPHASE REACTOR ENGINEERING

<b>TEACHING SCHEME:</b>	<b>EXAMINATION SCHEME:</b>	<b>CREDITS ALLOTTED:</b>
Lectures: 4 Hours/Week	End Semester Examination: 60 Marks	Theory : 04
Total : 4Hours/Week	Unit Test: 20 Marks	Total credits: 04
	Assignment: 10 Marks	
	Attendance:10 Marks	
	Total: 100 Marks	

#### Topics covered

<b>UNIT-I</b>	<b>Introduction to Multiphase Reactor Engineering</b> Types, Classification, Application of Industrial Importance	<b>(08 Hours)</b>
<b>UNIT-II</b>	<b>Thermodynamics and kinetics</b> Notable industrial heterogeneous systems and thermodynamic role. Application of equilibrium criteria to chemical reactions. The Gibbs energy change and equilibrium constant. Estimation of equilibrium constant for heterogeneous system by defining standard state of the phases involved. Determination of rate controlling step: intrinsic kinetics for heterogeneous systems.	<b>(08 Hours)</b>
<b>UNIT-III</b>	<b>Hydrodynamic Characteristics</b> Hydrodynamic characteristics of different multiphase reactors: Mechanically Agitated Contactors (MAC), Bubble Columns, Slurry Reactors, Fluidized Beds, Loop Reactors and Modified Versions	<b>(08 Hours)</b>
<b>UNIT-IV</b>	<b>Mixing Studies</b> Effect of geometrical, system, and operating parameters on phase mixing in multiphase reactors. Quantification of phase mixing. Development of a mathematical model.	<b>(08 Hours)</b>
<b>UNIT-V</b>	<b>Heat Transfer and Mass Transfer Studies</b> Effect of geometrical, system, and operating parameters on heat transfer coefficient in multiphase reactors. Quantification of heat transfer coefficient. Application of	<b>(08 Hours)</b>

	correlations available to different multiphase reactors. Experimental techniques used for estimation of mass transfer coefficient and selection of suitable technique for a multiphase reactor. Effect of geometrical, system, and operating parameters on mass transfer coefficient in multiphase reactors. Quantification of mass transfer coefficient. Application of correlations available to different multiphase reactors.	
<b>UNIT-VI</b>	<b>Design Aspects of Multiphase Reactors</b> Pressure drop, Fractional phase hold- up, mass and heat transfer coefficient, extent of mixing, etc.	<b>(08 Hours)</b>

**Assignment:** Each student will submit assignments based on different topics in consultation with faculty, in the area of multiphase reactor engineering, keeping track of the recent technological trends and developments

**Text Books/References:**

1.	L. K. Doraiswamy and M. M. Sharma, "Heterogeneous Reactions", 2 <sup>nd</sup> Edition, Volume I and II.
2.	G. B. Tatterson, " Fluid Mixing and Gas Dispersion in Stirred Reactors", 10 <sup>th</sup> Edition, Academic Press, London, 1994
3	W. D. Deckwer, "Bubble Column Reactors", Cambridge University Press, New York, 2000.
4	Diazo Kunji and O. Levenspiel, "Fluidization Engineering", 2 <sup>nd</sup> Edition, Butterworth Heinemann, 1991.
5	J. F. Devidson and Harrison, " Fluidization", 10 <sup>th</sup> Edition, Academic Press, London, 1994.

**Syllabus for Unit Test:**

Unit Test -I	UNIT – I ,II,III
Unit Test -II	UNIT – IV,V,VI

## Structure of M.Tech (Nano Technology)

Based on Credit Pattern

### STRUCTURE & EXAMINATION PATTERN

<b>Semester I</b>										<b>Total Duration : 20hrs/week</b>	
										<b>Total Marks : 500</b>	
										<b>Total Credits : 18</b>	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract/Oral	TH	TW/PR/OR	
Nanoscience& Nanotechnology	04	02	60	20	10	10	25	25	04	01	05
Nano-Physics	04	--	60	20	10	10	--	--	04	--	04
Nano-Chemistry	04	--	60	20	10	10	--	--	04	--	04
Nano-Biology	04	02	60	20	10	10	25	25	04	01	05
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>

<b>Semester II</b>										<b>Total Duration : 20hrs/week</b>		<b>Total Marks : 500</b>		<b>Total Credits : 18</b>	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits				
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract/Oral	TH	TW/PR/OR					
Nano-Computing	04	--	60	20	10	10	--	--	04	--	04				
Nano Fabrication and Advanced Synthesis Technology	04	02	60	20	10	10	25	25	04	01	05				
Nano Characterization	04	02	60	20	10	10	25	25	04	01	05				
Energy, Environment, Safety and Commercialization for Nanotechnology	04	--	60	20	10	10	--	--	04	--	04				
<b>Total</b>	<b>16</b>	<b>04</b>	<b>240</b>	<b>80</b>	<b>40</b>	<b>40</b>	<b>50</b>	<b>50</b>	<b>16</b>	<b>02</b>	<b>18</b>				

<b>Semester III</b>									<b>Total Duration : 28hrs/week</b>			<b>Total Marks : 475</b>	<b>Total Credits : 40</b>
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme						Examination Scheme (Credits)		Total Credits		
	L	P	Theory	Unit Test	Attendance	Tutorial/Assignments	TW	Pract/Oral	TH	TW/PR/OR			
Elective –I	04	02	60	20	10	10	25	25	04	01	05		
Elective –II	04	02	60	20	10	10	25	25	04	01	05		
**Self Study Paper – I	*04	--	60	20	10	10	--	--	04	--	04		
Dissertation Stage - I	--	07	--	--	--	--	25	--	--	21	21		
Seminar	--	05	--	--	--	--	25	25	--	05	05		
<b>Total</b>	<b>12</b>	<b>16</b>	<b>180</b>	<b>60</b>	<b>30</b>	<b>30</b>	<b>100</b>	<b>75</b>	<b>12</b>	<b>28</b>	<b>40</b>		

<b><u>ELECTIVE I:</u></b>	<b><u>ELECTIVE II:</u></b>
<ul style="list-style-type: none"> <li>• Computational Nanoscience</li> <li>• Nano Electronics</li> <li>• Nano Medicine</li> <li>• Nano Engineered Devices</li> </ul>	<ul style="list-style-type: none"> <li>• Nano Photonics</li> <li>• Industrial Nanotechnology</li> <li>• Nano Material Science</li> <li>• Nano Composites</li> </ul>



<b>Semester IV</b>										<b>Total Duration : 14 hrs/week</b>	
										<b>Total Marks : 325</b>	
										<b>Total Credits : 34</b>	
Subjects	Teaching Scheme (Hrs) Hrs./Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ Assignments	TW	Pract/ Oral	TH	TW/PR/ OR	
**Self Study Paper – II	*04	--	60	20	10	10	--	--	04	--	04
Dissertation Stage-II	00	10	--	--	--	--	150	75	--	30	30
<b>Total</b>	<b>04</b>	<b>10</b>	<b>60</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>150</b>	<b>75</b>	<b>04</b>	<b>30</b>	<b>34</b>

<b>Sr.No.</b>	<b>SELF STUDY PAPER- I (SEM-III)</b>	<b>SELF STUDY PAPER- II (SEM-IV)</b>
1	Modeling and Simulation of Nanosystems	Silicon Nanostructures & Carbon Nanotubes Based Nanoelectronics
2	Synthesis and Design Nanoscale Products	Nanobioelectronics
3.	Applications of Nanotechnology in Food and Agriculture	Compound Semiconductor Materials And Devices
4	Finite Element Methods for Nanoscale Structures	Nanoprocessing
5	MEMES/NEMES	Introduction To Nano-modelling

## NANOSCIENCE AND NANOTECHNOLOGY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Introduction

Scientific Revolutions – Types of nanomachines and nanotechnology-periodic table-Atomic structure molecules and phase Energy -Molecular and Atomic size -surfaces and dimensional space -Top down and bottom up. Misnomers and misconception of Nanotechnology.

### Unit-II

(08 Hours)

#### Title: Nanomaterial Synthesis Methods

Introduction to Nano scale materials - Synthesis and processing, method of nano structured material preparation – mechanical grinding, wet chemical synthesis – sol-gel processing, gas phase synthesis, gas condensation processing, chemical vapor condensation – nano composite synthesis – processing.

### Unit-III

(08Hours)

#### Title: NanoStructures

Introduction, length scale of different structures, definition of nanoscience and nanotechnology, fullerenes, CNTs, graphenes and inorganic nanostructures, the evolution of Nanoscience, quantum dots and electronic structure of various nanophase materials. Clusters of metals and semiconductors, rare gas and molecular clusters, nanowires and nanorods, size dependent properties, size dependent absorption, phonons in nanostructures. Quantum dots - Nano wires-Nano tubes 2D and 3D films Nano and mesopores, micelles, bilayers, vesicles, bio-nano machines-biological membranes. Dendritic and supramolecular structures, metal nanocluster composites, glasses. Biological building blocks, bionanopolymers, self-assembly by Nature. Polypeptide nanowire and protein nanoparticles, nucleic acids, DNA helix. Examples of biological nanostructures, proteins, micelles and vesicles, proteins, Amphiphilicity as a driving force in synthesis of biological structures. Multilayers. Bio-nano interface.

**Unit-IV****(08 Hours)****Title: Nanomaterial Properties**

Opportunity at the nano scale - Length and time scale in structures -energy landscapes-Inter dynamic aspects of inter molecular forces -Evolution of band structure and Fermi surface.

**Unit-V****(08hours)****Title: Physical Properties Of Nanostructured Materials**

Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties –grainsize effects on strength of metals optical properties of quantum dots and quantum wires –electronic transport in quantum wires and carbon nano tubes -magnetic behavior of single domain particles and nanostructures-surface chemistry of tailored monolayer -self assembling. Nano Characterization, mechanical characterization, structural characterization

**Unit-VI****(08 Hours)****Title: Applications of Nanotechnology**

Industrial applications of nanomaterials, in the areas of electronics, photonics, biology, health and environment, medicine, defence, chemicals, catalysts, textiles, etc. Application of nanotechnology in remediation of pollution, photocatalysis and other nanocatalysts, greenhouse gases, global warming. Monitoring nanoparticles at work place and sensors used for this. Toxicity of nanoparticles, exposure to nanoparticles and CNTs and influence on respiratory systems.

**Termwork**

At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. Mick Wilson, Kamali Kannargare., Geoff Smith, “Nano technology: Basic Science and Emerging technologies”, Overseas Press, 2005.
- 2 Charles P. Poole, Frank J. Owens, “Introduction to Nanotechnology”, Wiley Interscience, 2003.
3. Mark A. Ratner, Daniel Ratner, “Nanotechnology: A gentle introduction to the next Big Idea”, Prentice Hall P7R:1st Edition, 2002.
4. Nanostructures and Nanomaterials: synthesis, properties and applications, G. Cao and Y. Wang, World Scientific, 2nd edition, 2011
5. Encyclopedia of nanoscience and nanotechnology, Edited by H.S. Nalwa, American Scientific Publishers, 2007
6. Nanotechnology book by Prof. (Ms) Sulabha Kulkarni

## REFERENCES

1. Nanoelectronics and nanosystems: from transistors to molecular and quantum devices, K. Gosser, P. Glosekotter and J. Dienstuhl, Springer 2005
2. Handbook of Thin Film Materials, volume 5, edited by H.S Nalwa, American Scientific Publishers, 2002
3. Nanoelectronics- principles and devices, M. Dragoman and D. Dragoman, Artech House publishers, 2005
4. Overview of Nanoelectronic Devices, D. Goldhaber Gordon, Proceedings of IEEE, volume 85, 1997
5. Nanoelectronics and Information Technology, W. Rainer, Wiley, 2003
6. Nanosystems, K.E. Drexler, Wiley, 1992
7. Science of fullerenes and carbon nanotubes, M.S. Dresselhaus and G. Dresselhaus, Academic press, 1996

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## NANO PHYSICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

### Unit-I

(08 Hours)

#### Atomic and Molecular Physics:

Rutherford atom model, Electron orbits, Bohr atom, Energy levels and spectra, Atomic excitation and atomic spectra, Rotational & Vibrational energy levels, Rotational and Vibrational spectra. Electronic spectra of molecules. Bohr and Sommerfeld atom models - Vector atom model - Pauli's exclusion principle - various quantum numbers - angular momentum and magnetic moment - coupling schemes - LS and JJ coupling - Bohr magneton, Hund's rule, Stern and Gerlach experiment, Zeeman Effect and Stark Effect. Molecular bonding in homo and hetero nuclear molecules, polyatomic molecules, vibration and rotational levels, vibrations and Group frequencies.

### Unit-II

(08 Hours)

#### Quantum Mechanics:

Wave-particle duality, Schrodinger equation and expectation values, Uncertainty principle. Solutions of the one-dimensional Schrodinger equation for free particle, particle in a box, particle in a finite well. Reflection and transmission by a potential step and by a rectangular barrier. Theory of radiation, transition probability for absorption and emission, forbidden transitions, decays, lifetime concepts. Solution of Time independent Schrödinger equation at higher dimensions. Particle in a three dimensional box, linear harmonic oscillator and its solution, density of states, free electron theory of metals. The angular momentum problem. The spin half problem and properties of Pauli spin matrices.

### Unit-III

(08Hours)

#### Solid State Physics:

Amorphous, crystalline, crystals, polycrystals, symmetry. Unit Cells, Crystal Structures (Bravais Lattices), Crystallographic Directions, Crystallographic Planes, Miller Indices, Bragg's Law, X-ray Diffraction. Imperfections of crystal structure: point defects, Grain boundaries, phase boundaries, Dislocations: Screw, Edge and Mixed Dislocations. Free electron theory, Bloch theorem. Motion of electrons in solids, effective mass of electron and hole, reduced, periodic and extended zone scheme, Fermi surfaces, Direct and indirect band gaps in semiconductors, temperature dependence.

Electronic, ionic and orientational polarizabilities, Clausius-Mossotti relation, static and frequency dependence of dielectric constant, Kramers-Kronig relation. Mean field theory, Heisenberg interaction, magnons, origin of domains in magnetic materials.

#### **Unit-IV**

**(08 Hours)**

##### **Electronics:**

Semi conducting materials, p-n junction, space charge and electric field distribution at junctions, forward & reverse biased condition, minority & majority carrier currents, Zener and avalanche break downs, Schottky barrier, Shockley diode & silicon control rectifier, Zener diodes, tunnel diodes, photo diodes. Operational amplifier and Applications– Ideal op-amp, equivalent circuit of op-amp, open loop op-amp configurations – inverting, non-inverting and differential amplifiers, lock-in-amplifier. Active filters – types, first and second order active low and high pass filter. Oscillators – basic principles, types- phase shift oscillator, Wien bridge oscillator, triangular wave generator.

#### **Unit-V**

**(08Hours)**

##### **Laser Technology:**

Basic principles of lasers, properties of laser beams, population inversion in three and four level lasers, resonance frequencies, modifications of the laser output, single mode operation, Q-switching. Laser materials and types of lasers, solid state lasers, characteristics of dye lasers, semiconductor lasers. Laser applications.

#### **Unit-VI**

**(08 Hours)**

##### **Electrodynamics:**

Coulomb's law, Gauss's law, Electrostatic Potential Energy. Biot-Sevart law and Ampere Laws, faraday's law, Maxwell's Equations, Poynting Theorem, Conservation Laws.

#### **Termwork**

- At least Eight Assignment based on above syllabus

#### **Oral**

Term work and oral will be based on above syllabus.

#### **Books /Text References**

1. Herzberg (D. van Nostrand Co., Inc)
2. Berkley Series, Vol. II (Tata McGraw Hill)
3. Modern Quantum Mechanics, J. J. sakurai (Addison Wiley)
4. Quantum Mechanics, L. I. Schiff (McGraw Hill)
5. Quantum Physics, Robert Eisberg and Robert Resnick
6. Classical Electrodynamics, J. D. Jackson (John Wiley)
7. Introduction to Electrodynamics, D. Griffiths
8. Electricity and Magnetism, Reiz, Millford, Christy
9. Introduction to Solids State Physics, C. Kittel (Wiley Estern Ltd.)
10. Elementary Solid State Physics, M. Ali Omar (Addison Wesely)
11. The Art of Electronics, P. Horowitz and W. Hill (Cambridge University Press)

12. Electronic Principle, A. P. Malvino (McGrw Hill)
13. Principles of Quantum Mechanics 2nd ed. - R. Shankar
14. Thermodynamics and Statistical Mechanics - A N Tikhonov, Peter T Landberg, Peter Theodore Landsberg
15. Thermodynamics and Statistical Mechanics by John M. Seddon , J. D. Gale
16. Statistical Physics by K. Huang
17. Statistical Mechanics-Landau &Lifshitz
18. Statistical Mechanics – Sonntag.
19. Statistical Mechanics – Mc Le Leland

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI





## NANO CHEMISTRY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

#### Unit-I

(08 Hours)

##### Title:

Atomic Bonding in solids, Types of bond: Metallic, Ionic, Covalent and vanderwaals bond; Hybridisation; H- bonding Molecular orbital theory for simple molecules such as diatomic molecule etc. Chemical bonding & theories (e.g. Valence band & Molecular Orbital), atomic structure– energy – molecular and atomic size and their properties, Ionic bond, covalent bond, coordination bond,

#### Unit-II

(08 Hours)

##### Title: Types of Material

Metals, Semiconductors, Composite materials, Ceramics, Alloys, Polymers, Their Failure Mechanisms, Properties and Application Areas, Solid state chemistry, Chemistry of surfactants, Polymer chemistry, metal complexes, Inorganic Chemistry, Alkoxide and sol-gel Chemistry, Organometallic chemistry, and their fundamentals for synthesis of oxides & other inorganic Nano composites.

#### Unit-III

(08Hours)

##### Title: Overview to Thermodynamics

The first and second laws of thermodynamics. Thermodynamic, functions, heat capacity, enthalpy, entropy. Phase equilibrium in one component system, real gases, the interactions between gases. Ehrenfest classification of phase transition, the physical liquid surface; surface tension, curved surfaces, capillary action. Theory of Solution and related topics: Liquid mixtures: free energy as a function of composition, ideal solutions and excess functions.

#### Unit-IV

(08 Hours)

##### Title: Chemical Equilibrium

Equilibrium Electrochemistry; electrochemical cells, Methods for calculation of thermodynamic equilibrium. Electrochemical processes, Inorganic complexes, Ionic Equilibria and spectroscopy (UV, IR, Raman), Atomic structure and properties, Organometallic chemistry, Thermodynamics of solids,.

**Unit-V****(08Hours)****Title: Diffusion Kinetics**

Diffusion-Fick's Law, mechanisms of diffusion; generation of point defects; self-diffusion; the influence of the pressure and pressure gradient; Kirkendall effect; fast diffusion; influence of isotropic state; experimental methods of investigation of diffusion, Chemical kinetics, Chemistry of surfactants, Basic polymer chemistry, Solid state chemistry, Reactivity of solids, Quantum chemistry

**Unit-VI****(08 Hours)****Title: Reaction Kinetics and Photochemistry**

Zero, First & Second order reactions. Dependence of k on Temperature. An overview of collision and activated complex theory. Steady State approximation. Laws of Photochemistry, Fluorescence, Phosphorescence, Chemiluminescence, Jablonski diagram and quenching, Photochemistry of nanomaterials.

**Termwork**

- At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. Physical Chemistry, 1st Edition –Ball.
2. Thermodynamics-Glasston.
3. Principals of Physical Chemistry-Marron-Pruton.
4. Advanced Physical Chemistry – Atkins Peter, Paula Julio
5. Inorganic chemistry-Cotton-Wilkinson.
6. Introduction to Theoretical Chemistry – Jack Simons.

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI



## NANO BIOLOGY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I (08 Hours)

The Cell: the basic unit of life, Molecular components (DNA, protein, lipids, carbohydrates), Expression of genetic information (Transcription, translation), Types of cells: plants, animals, bacteria, viruses and fungi, DNA: Structure, components, physical and chemical properties,

### Unit-II (08 Hours)

Amino acids and proteins: structure and reactions of amino acids (hydrophilic and hydrophobic), structure of proteins (primary, secondary, tertiary and quaternary), Enzyme chemistry : kinetics of enzyme catalysis,

### Unit-III (08Hours)

Lipids and carbohydrates: Structure and types of lipids, biological membranes, structure and types of carbohydrates, Basic immunology: Adaptive and innate immunity, cells of immune system, Antigens and antibodies structure and functions

### Unit-IV (08 Hours)

Cytoskeleton: microtubules, intermediate filaments and microfilaments; cell motility Protein motors: ATP synthase F1 motor, Bacterial Flagellar motor, Proton motive forces, ion channels, chimeric kinesin and myosin motors, Cell signaling, G-protein transmembrane receptors, DNA nanostructures for mechanics and computing, DNA-Protein nanostructures, Biomimetic fabrication of DNA-based metallic nanowires, conjugates and networks.

### Unit-V (08Hours)

Biological methods of synthesis: Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Magnetotactic bacteria for natural synthesis of magnetic nanoparticles; S-layer proteins, Viruses as components for the formation of nanostructured materials; Synthesis process and application, Role of plants in nanoparticle synthesis

### Unit-VI (08 Hours)

Nano-biotechnology: Interaction between biomolecules and nanoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Nanosensors,

Nanomedicine: Nanotechnology in Diagnostics applications, materials used in Diagnostics and Therapeutic, Environmental and Agricultural Applications of nanotechnology.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Practicals (Any Five):**

1. Microscopic observation of bacterial, plant, fungi and animal cells
2. Temporary preparation of cell / tissues
3. Demonstration of Cytotoxicity/cell viability- Tryphan blue dye exclusion
4. Absorbance spectra of biomolecules (DNA, proteins)
5. Immunodiffusion techniques
6. Isolation and purification of genomic DNA- 2
7. Isolation and purification of plasmid DNA -2
8. Estimation and purification of proteins -2
9. Biological Synthesis of nanoparticles (bacteria, fungi and plants)- 4
10. Demonstration of nanoparticles based drug delivery in cell line-3

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. Alberts, "Molecular Biology of the cell" Garland Science.
2. Lodish, "Molecular cell biology" FREEMAN
3. Watson, James, T.Baker, S.Bell, A.Gann, M.Levine, And R.Losick. "Molecular Biology of the gene", san francisco: Addison-Wesley,
4. Janis Kuby "Immunology" W H Freeman,
5. Nelson, D.L., Fox.M.M., "Lehninger Principles of Biochemistry", W.H.Freeman,
6. B.Lewin, "Genes IX", International Edition. Sudbury: Jones & Bartlett
7. R. Cantor, P.R.Samuel, "Biophysical Chemistry", W.H., Freeman & Co., 1985.
8. Watson, James, T.Baker, S.Bell, A.Gann, M.Levine, and R.Losick. "Molecular Biology of the Gene", 5th ed., San Francisco: Addison-Wesley, 2000.
9. Alberts, Bruce, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. Molecular Biology of the Cell. 4th ed. New York: Garland Science, 2002.
10. Branden, Carl-Ivar, and John Tooze. Introduction to Protein Structure. 2nd ed. New York: Garland Pub., 1991.
11. Creighton, E, Thomas, "Proteins: Structures and Molecular Properties", 2nd Ed. New York: W.H. Freeman, 1992.
12. Bionanotechnology: Lessons from Nature by David S. Goodsell
13. Nanomedicine, Vol. IIA: Biocompatibility by Robert A. Freitas
14. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari SinghNalwa
15. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
16. Nanocomposite Science & Technology Ajayan, Schadler & Braun
17. BioMEMS (Microsystems) - Gerald A. Urban

18. Introduction to Nanoscale Science and Technology (Nanostructure Science and Technology)  
Massimiliano Di Ventra
19. Nanosystems: Molecular Machinery, Manufacturing, and Computation - K. Eric Drexler
20. Springer Handbook of Nanotechnology - Bharat Bhushan
21. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
22. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
23. Nanomedicine, Vol. I: Basic Capabilities
24. Nanomedicine, Vol. IIA: Biocompatibility - Robert A. Freitas
25. Dendrimers I, II, III, Ed. F. Vogtle

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## NANO COMPUTING

### TEACHING SCHEME

Lectures : 04 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Unit Test –I : 20 Marks  
Unit Test –II : 20 Marks  
Theory Credits : 04

#### Unit-I

(08 Hours)

##### Title: Fundamental Principles Of Numerical Methods

Root finding, interpolation and approximation, numerical integration and differentiation, solution of systems of linear equations, least squares data fitting, eigenvalue problems, numerical methods for ODEs - initial value problems and boundary value problems, Scientific Modeling - Numerical data and Numerical operations -Numerical Algorithms -Numerical Programs - Numerical Software - Approximations in Mathematical Model building- Numerical integration - Differentiation -Variational finite element methods-Rayleigh's method-Ritz method.

#### Unit-II

(08 Hours)

##### Title: Mathematical Modeling

Introduction to mathematical modeling, review of basic calculus - physical simulation - advantages and limitations - Concept of physical domain and computational domain - assumptions and limitations in numerical solutions – Finite element method and Finite difference method.

#### Unit-III

(08Hours)

##### Title: Differential Equations & Applications

Equations of first order, linear differential equations of second order, power series solutions, Laplace transforms, nonlinear differential equations, Fourier series and boundary value problems. Euler method, Runge-Kutta method, boundary values- partial differential equations - separation of variables-wave equation-Laplace equation-nonlinear partial differential equations - Parabolic (Heat/Diffusion) Equation, Derivation, separation of variables, transformation of boundary conditions, Fourier series and transforms.

#### Unit-IV

(08 Hours)

##### Title: Simulation

Basic concepts of simulation- data manipulation, data exchange of the structure, properties and processing of materials- Molecular dynamics simulation, Derivation, D'Alembert principle, vibrating string/beam, finite Fourier transforms, method of characteristics, wave equation in 2D.

#### Unit-V

(08Hours)

##### Title: Monte Carlo Methods

Basics of the Monte Carlo method-Algorithms for Monte Carlo simulation-Applications to systems of classical particles-modified Monte Carlo techniques-percolation system-variation



Monte Carlo method-diffusion Monte Carlo method - Quantum Monte Carlo method, Finite difference methods - implicit and explicit schemes, truncation error, single step and multi-step schemes. Finite element methods - Galerkin approximation and solution.

## **Unit-VI**

**(08 Hours)**

### **Title: Nanoscale Modeling and Simulations**

Introduction to Matlab OR Mathematica (and their open source counterparts-Scilab and Octave); examples from nano-optics and nano-electronics, Molecular dynamics, computing and simulations, Simulations from ab initio to multiscale Modeling, Nanodesign Nano-CAD.

### **Termwork**

- At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. S.C. Chapra and R.P.Canale, "Numerical methods for Engineers", Tata McGraw Hill, New Delhi, 2002.
2. Erwin Kreyzig, "Advanced Engineering Mathematics", John Wiley & Sons, 2004.
3. R.J. Schilling and S.L. Harris, "Applied Numerical Methods for Engineers using MATLAB and C", Thomson publishers, New Delhi, 2004..
4. D. Frenkel and B. Smith, "Understanding molecular simulation from algorithm to applications", Kluwar Academic Press, 1999.
5. K. Ohno, K. Esfarjani and Y. Kawazoe, "Introduction to Computational Materials Science from ab initio to Monte Carlo Methods", Springer-Verlag, 1999.
6. Partial Differential Equations for Scientists and Engineers, S. J. Farlow
7. Partial Differential Equations - Analytical and Numerical Methods, M. S. Gockenbach
8. Linear Partial Differential Equations for Scientists and Engineers, T. Myint-U and L. Debnath
9. An Introduction to Partial Differential Equations with MATLAB, M. P. Coleman

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI



## NANO FABRICATION AND ADVANCED SYNTHESIS TECHNOLOGY

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Bulk synthesis

Synthesis of bulk nano-structured materials –sol gel processing –Mechanical alloying and mechanical milling- Inert gas condensation technique – Nanopolymers – Bulk and nano composite materials

### Unit-II

(08 Hours)

#### Title: Chemical Approaches

Self-assembly, self-assembled monolayers (SAMs). Langmuir-Blodgett (LB) films, clusters, colloids, zeolites, organic block copolymers, emulsion polymerization, templated synthesis, and confined nucleation and/or growth. Biomimetic Approaches: polymer matrix isolation, and surface-templated nucleation and/or crystallization. Electrochemical Approaches: anodic oxidation of alumina films, porous silicon, and pulsed electrochemical deposition.

### Unit-III

(08Hours)

#### Title: Physical Approaches

Vapor deposition and different types of epitaxial growth techniques- pulsed laser deposition, Magnetron sputtering - Micro lithography (photolithography, soft lithography, micromachining, e-beam writing, and scanning probe patterning). Inert gas condensation, Arc discharge, RFplasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Ball Milling, Molecular beam epitaxy, Chemical Vapour Deposition method and Electro deposition.

### Unit-IV

(08 Hours)

#### Title: Nanoporous Materials

Nanoporous Materials – Silicon - Zeolites, mesoporous materials - nanomembranes and carbon nanotubes - AgX photography, smart sunglasses, and transparent conducting oxides –molecular sieves – nanosponges.

**Unit-V****(08Hours)****Title: Application of Nanomaterials**

Molecular Electronics and Nanoelectronics – Nanobots- Biological Applications – Quantum Devices – Nanomechanics - Carbon Nanotube – Photonics- Nano structures as single electron transistor –principle and design.

**Unit-VI****(08 Hours)****Title: Lithography Techniques**

M based nanolithography and nanomanipulation, E beam lithography and SEM based nanolithography and nanomanipulation, Ion beam lithography, oxidation and metallization. Mask and its application. Deep UV lithography, X-ray based lithography.

**Termwork**

At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. S.P. Gaponenko, Optical Properties of semiconductor nanocrystals, Cambridge University Press, 1980.
2. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate(Eds.), Handbook of NanoScience, Engg. and Technology, CRC Press, 2002.
3. K. Barriham, D.D. Vvedensky, Low dimensional semiconductor structures: fundamental and device applications, Cambridge University Press, 2001.
4. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties &Applications , Imperial College Press, 2004.
- J.George, Preparation of Thin Films, Marcel Dekker, Inc., New York. 2005.
5. Microfabrication and Nanomanufacturing- Mark James Jackson

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## NANO CHARACTERIZATION

### TEACHING SCHEME

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Unit Test –I : 20 Marks  
Unit Test –II : 20 Marks  
TW/Pract./Oral : 50 Marks  
Theory Credits : 04  
Practical Credits : 01

#### Unit-I

(08 Hours)

##### Title: MICROSCOPY

Optical absorption and emission spectroscopy – Basics - AAS – ICP OES – Electron Microscopy: Scanning electron microscopy – Transmission electron microscopy – Scanning tunneling electron microscopy – Image collection in electron microscopes – Environmental transmission electron microscopy – Electron energy loss spectroscopy at the nanometer scale – In-situ nano measurements.- Qualitative approach. Electron Energy Loss Spectroscopy; High Resolution Imaging Techniques- HREM, Atom probe field ion microscopy

#### Unit-II

(08 Hours)

##### Title: THERMAL ANALYSIS METHODS

Principle and Instrumentation of Thermogravimetry; Differential Thermal Analysis and Differential scanning calorimetry-Importance of thermal analysis for nanostructures.

#### Unit-III

(08Hours)

##### Title: SCANNING PROBE MICROSCOPY

Scanning Probe microscopy – Atomic manipulations – Atomic force microscopy – Scanning probe lithography – Optical microscopy – Confocal microscopy – Scanning near field optical microscopy – Secondary ion mass (SIMS) spectrometry – Matrix assisted laser desorption ionization mass spectrometry (MALDIMS).

#### Unit-IV

(08 Hours)

##### Title: SPECTROSCOPIC TECHNIQUES

Introduction to Molecular Spectroscopy and Differences-With Atomic Spectroscopy-Infrared (IR) Spectroscopy and Applications- Microwave Spectroscopy- Raman Spectroscopy and CARS Applications-Electron Spin Resonance Spectroscopy; New Applications of NMR Spectroscopy; Dynamic Nuclear Magnetic Resonance; Double Resonance Technique. Spectroscopy of semiconductors – Excitons – Infrared surface spectroscopy – Raman spectroscopy – Brillouin spectroscopy – Dynamic Light Scattering (DLS) – NMR Spectroscopy – ESR spectroscopy – Mossbauer spectroscopy

**Unit-V****(08Hours)****Title: Nanoindentation Mechanical Characterisation**

Nanoindentation principles- elastic and plastic deformation -mechanical properties of materials in small dimensions- models for interpretation of nanoindentation load-displacement curves- Nanoindentation data analysis methods-Hardness testing of thin films and coatings- MD simulation of nanoindentation. Mechanical Characterization – Modulus and load carrying capability of nano region/ compression - microhardness – Fatigue – Abrasion and wear resistance – Super plasticity – Nano indentation – Nano tribology – Nano tribometre – Surface Force apparatus – Quartz crystal microbalance – Friction force microscope.

**Unit-VI****(08 Hours)****Title: Structural Characterization**

Neutron and X- ray diffraction – Debye Scherrer formula – Dislocation density – Micro strain macromolecular crystallography using synchrotron radiation – Role for neutron scattering in nano science - Photoluminescence - Thermo luminescence – X-ray absorption Fine Structure (XAFS) – Extended X- ray absorption fine structure (EXAFS) – Electron scattering for chemical Analysis (ESCA). X-ray diffraction (XRD), X-Ray Photoelectron Spectroscopy, X-ray powder diffraction – single crystal diffraction techniques - Determination of accurate lattice parameters – structure analysis - profile analysis - particle size analysis using Scherer formula. X-Ray Characterization of Nanomaterials – EDAX and WDA analysis – EPMA – ZAP corrections.

**Termwork**

At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. B. D.Cullity, “Elements of X-ray Diffraction”, 4th Edition, Addison Wiley, 1978.
2. M. H.Loretto, “Electron Beam Analysis of Materials”, Chapman and Hall, 1984.
3. R.M.Rose, L.A.Shepard and J.Wulff, “The Structure and Properties of Materials”, Wiley Eastern Ltd,
4. B.W.Mott, “Micro-Indentation Hardness Testing”, Butterworths, London, 1956.
5. Charles P Poole Jr and Frank J Ownes, “Introduction to Nanotechnology”, John Wiley Sons, 2003.
6. Mick Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkar Raguse, “Nanotechnology:Basic sciences and emerging technologies”, Overseas Press, 2005.
7. Willard, “Instrumental Methods of Analysis”, 2000.
8. Ewing. Etal, “Instrumental Methods for Chemical Analysis”, 2000.

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## **ENERGY, ENVIRONMENT, SAFETY AND COMMERCIALIZATION FOR NANOTECHNOLOGY**

### **TEACHING SCHEME**

Lectures : 04 Hrs/Week

### **EXAMINATION SCHEME**

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
Theory Credits	: 04

### **Unit-I**

**(08 Hours)**

#### **Title: Renewable Energy Technology**

Energy challenges, development and implementation of renewable energy technologies - nanotechnology enabled renewable energy technologies - Energy transport, conversion and storage, Nano, micro and meso scale phenomena and devices.

### **Unit-II**

**(08 Hours)**

#### **Title: Micro Fuel Cell Technology**

Micro-fuel cell technologies, integration and performance for micro-fuel cell systems - thin film and microfabrication methods - design methodologies - micro-fuel cell power sources,

### **Unit-III**

**(08Hours)**

#### **Title: Microfluidic Systems**

Nano-electromechanical systems and novel microfluidic devices - nano engines - driving mechanisms - power generation - microchannel battery - micro heat engine (MHE) fabrication - thermocapillary forces - Thermocapillary pumping (TCP) - piezoelectric membrane.

### **Unit-IV**

**(08 Hours)**

#### **Title: Hydrogen Storage Methods**

Hydrogen storage methods - metal hydrides - size effects - hydrogen storage capacity - hydrogen reaction kinetics - carbon-free cycle- gravimetric and volumetric storage capacities - hydriding/dehydriding kinetics - high enthalpy of formation - and thermal management during the hydriding reaction - distinctive chemical and physical properties - multiple catalytic effects - degradation of the sorption properties - hydride storage materials for automotive applications.

### **Unit-V**

**(08Hours)**

#### **Title: Environmental Concerns of Nanomaterials**

Identification of Nano - Specific Risks- Responding to the Challenge -Human health hazard – Risk reduction – Standards – Safety – transportation of NP– Emergency responders. Risk

assessment –Environmental Impact – Predicting hazard – Materials Characterization. Risk Assessment related to nanotechnology – Environmental and policy making - Ecotoxicity measurement of Polychlorinated biphenyl and intermediates in their degradation Vacuum Packaging under inert gas atmosphere, Methodology for Stabilization, Human safety in Nonmaterial processing area.

## **Unit-VI**

**(08 Hours)**

### **Title: Product Development with Nanomaterials**

Criteria for selection of product- Product development process- Design for Manufacture - Estimate the manufacturing cost- Reduce the support cost- Prototyping- Economics of Product development projects - Elements of Economic analysis- financial models - Sensitive analysis and influence of the quantitative factors.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. J. Twidell and T. Weir, Renewable Energy Resources, E & F N Spon Ltd, London, 1986.
2. Hydrogen from Renewable Energy Sources by D. Infield,
3. Fuel Storage on Board Hydrogen Storage in Carbon Nanostructures by R.A. Shatwell,
4. Fuel cell technology handbook. Hoogers. CRC Press, 2003.
5. Handbook of fuel cells: Fuel cell technology and applications by Vielstich. Wiley, CRC Press, 2003.
6. P.P. Simeonova, N. Opopol and M.I. Lus ter, “Nanotechnology - Toxicological Issues and Environmental Safety”, Springer 2006.

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2 -Units IV,V and VI



## Elective I: COMPUTATIONAL NANOSCIENCE

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Fundamental Principles Of Numerical Methods

Scientific Modeling - Numerical data and Numerical operations -Numerical Algorithms - Numerical Programs -Numerical Software - Approximations in Mathematical Model building- Numerical integration -Differentiation -Variational finite element methods-Rayleigh's method-Ritz method.

### Unit-II

(08 Hours)

#### Title: Mathematical Modeling

Mathematical modeling - physical simulation - advantages and limitations - process control - Transport phenomena- concept of physical domain and computational domain - assumptions and limitations in numerical solutions – Finite element method and Finite difference method.

### Unit-III

(08Hours)

#### Title: Differential Equations & Applications

Euler method, Runge-Kutta method, Multi step-differential equations-boundary values- Elliptic equations-one dimensional parabolic equation-hyperbolic equation- partial differential equations -separation of variables-wave equation-Laplace equation-nonlinear partial differential equations - approximation methods of nonlinear differential equations.

### Unit-IV

(08 Hours)

#### Title: Simulation

Basic concepts of simulation- data manipulation, data exchange of the structure, properties and processing of materials-Three dimensional model for capillary nanobridges and capillary forces. Molecular dynamics simulation.

### Unit-V

(08Hours)

#### Title: Monte Carlo Methods

Basics of the Monte Carlo method-Algorithms for Monte Carlo simulation-Applications to systems of classical particles-modified Monte Carlo techniques-percolation system-variation Monte Carlo method-diffusion Monte Carlo method - Quantum Monte Carlo method.

## **Unit-VI**

**(08 Hours)**

### **Title: Nanoscale Modeling and Simulations**

Introduction to Matlab and Mathematics (and their open source counterparts-Scilab and Octave); examples from nano-optics and nano-electronics, Molecular dynamics, computing and simulations, Simulations from ab initio to multiscale Modeling, Nanodesign Nano-CAD.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. S.C. Chapra and R.P.Canale, "Numerical methods for Engineers", Tata McGraw Hill, New Delhi, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 2004.
3. R.J. Schilling and S.L. Harris, "Applied Numerical Methods for Engineers using MATLAB and C", Thomson publishers, New Delhi, 2004..
4. D. Frenkel and B. Smith, "Understanding molecular simulation from algorithm to applications", Kluwar Academic Press, 1999.
5. K. Ohno, K. Esfarjani and Y. Kawazoe, "Introduction to Computational Materials Science from ab initio to Monte Carlo Methods", Springer-Verlag, 1999.

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## Elective I: NANO ELECTRONICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Semiconductor Nanodevices

Single-Electron Devices; Nano scale MOSFET – Resonant Tunneling Transistor - Single-Electron Transistors; Single-Electron Dynamics; Nanorobotics and Nanomanipulation; Mechanical Molecular Nanodevices; Nanocomputers: Theoretical Models; Optical Fibers for Nanodevices; Photochemical Molecular Devices; DNA-Based Nanodevices; Gas-Based Nanodevices; Micro and Nanomechanics.

### Unit-II

(08 Hours)

#### Title: Electronic And Photonic Molecular Materials

Preparation –Electroluminescent Organic materials - Laser Diodes - Quantum well lasers:- Quantum cascade lasers- Cascade surface-emitting photonic crystal laser- Quantum dot lasers- Quantum wire lasers:- White LEDs - LEDs based on nanowires - LEDs based on nanotubes- LEDs based on nanorods High Efficiency Materials for OLEDs- High Efficiency Materials for OLEDs - Quantum well infrared photo detectors.

### Unit-III

(08Hours)

#### Title: Thermal Sensors

Thermal energy sensors -temperature sensors, heat sensors- Electromagnetic sensors- electrical resistance sensors, electrical current sensors, electrical voltage sensors, electrical power sensors, magnetism sensors - Mechanical sensors -pressure sensors, gas and liquid flow sensors, position sensors - Chemical sensors - Optical and radiation sensors.

### Unit-IV

(08 Hours)

#### Title: Gas Sensor Materials

Criteria for the choice of materials, Experimental aspects – materials, properties, measurement of gas sensing property, sensitivity; Discussion of sensors for various gases, Gas sensors based on semiconductor devices.

### Unit-V

(08Hours)

#### Title: Biosensors

Principles- DNA based biosensors – Protein based biosensors – materials for biosensor applications- fabrication of biosensors—future potential

**Unit-VI**

**(08 Hours)**

**Title: NanoBio Electronic Systems**

Nano Bio Sensors, Bio-Characterization

**Termwork**

At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. W. Ranier, “Nano Electronics and Information Technology”, Wiley, (2003).
2. K.E. Drexler, “Nano systems”, Wiley, (1992).
3. M.C. Pettey, “Introduction to Molecular Electronics”.

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2 -Units IV,V and VI

## Elective I: NANO MEDICINE

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

Applications of nano-medicine: Bio- Pharmaceuticals, biological implants, diagnostic tools, Genetic testing – imaging – nanoparticles probe

### Unit-II

(08 Hours)

Microfabricated drug delivery systems: microneedles- micropumps-microvalves-implantable microchips,

### Unit-III

(08Hours)

Nanocarriers : drug delivery : sustained / controlled/ targeted

### Unit-IV

(08 Hours)

Polymeric nanoparticulate systems: polymeric micelles as drug carriers – dendrimers as nanoparticulate drug carriers - nanocapsules preparation, characterization and therapeutic applications

### Unit-V

(08Hours)

Liposomes for genetic vaccines and cancer therapy - recent advances in microemulsions as drug delivery vehicles, lipoproteins as pharmaceutical carriers, solid lipid nanoparticles as drug carriers Tumor detection and targeting in vivo, Gene Therapy using nanoparticles

### Unit-VI

(08 Hours)

Diagnosis, Characterization and Testing of Nano-Bio Systems.

### Termwork

At least Eight Assignment based on above syllabus

### Oral

Term work and oral will be based on above syllabus.

**Practicals:**

1. Liposome based delivery of DNA (GFP based vector) in cells and their detection under fluorescence microscope-4
2. Delivery of nanoparticles based drugs in cells-3
3. Isolation of protein, estimation and running of gel, western blotting to detect a particular protein (e.g. p53)- 5

**Books /Text References**

1. Dr.Parag Diwan and Ashish Bharadwaj (eds) Nano Medicines, Pentagon Press
2. Vladimir P.Torchilin (Ed.) Nanoparticulates as Drug Carriers, Imperial College Press, North Eastern University, USA
3. Drug Delivery: Engineering Principles for Drug Therapy, M. Salzman.
4. Drug Delivery and Targeting, A.M. Hillery, CRC Press.
5. Drug Delivery: Principles and Applications, B. Wang, Wiley Interscience

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## **Elective I: NANO ENGINEERED DEVICES**

### **TEACHING SCHEME**

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

### **EXAMINATION SCHEME**

Theory	: 60 Marks
Duration	: 03 Hours
Unit Test –I	: 20 Marks
Unit Test –II	: 20 Marks
TW/Pract./Oral	: 50 Marks
Theory Credits	: 04
Practical Credits	: 01

### **Unit-I**

**(08 Hours)**

#### **Title: Quantum Devices**

Quantum Electronic devices – upcoming electronic devices – Electrons in mesoscopic structures – Shortchannel MOS Transistor – Split gate transistor – Electron wave transistor – Electron spin transistor –Quantum cellular Automata – Quantum Dot array – Quantum computer- Bit and Qubit – Coherence and Entanglement – Quantum Parallelism.

### **Unit-II**

**(08 Hours)**

#### **Title: Tunneling Devices**

Tunneling element – Tunnel Effect and Tunneling Elements -Tunneling Diode – Resonant Tunneling Diode – Three -Terminal Resonate Tunneling Devices -Technology of RTD-Digital circuits design based on RTDs –Memory Applications – Basics Logic Circuits – Dynamic Logic Gates - Digital circuits design based on RTBT –RTBT Mobile – RTBT Threshold Gate – RTBT Multiplexer – Single Electron Transistor(SET) – Principle –Coulomb Blockade- Performance – Technology- Circuit Design- Writing and Drivers – Logic and Memory Circuits – SET adder as an Example of a Distributed Circuit – Comparison between FET and SET.

### **Unit-III**

**(08Hours)**

#### **Title: Superconducting Devices And Photonics**

Basics - Macroscopic characteristics – Macroscopic model- Super conducting switching De vices – Cryotron-Josephson Tunneling Devices - Elementary circuits – Associative or Content – Addressable Memory - SQUID– Flux Quantum device –LC –Gate – Magnetic Flux Quantum – Quantum cellular Automata – Quantum computer with Single Flux devices – SFQD- RSFQD – Application of superconducting devices – Intergrated Electronics – Comparison of FET Electronics. Introduction to Photonics - Principle- Fabrication –application.

### **Unit-IV**

**(08 Hours)**

#### **Title: Uncertainty Of Nanodevices**

Limits of Integrated Electronics - Survey of Limits – Replacement of Technologies – Energy Supply and Heat Dissipation – Parameter Spread as Limiting Effect – Limits due to Thermal

Particle motion - Debye Length –Thermal Noise- Reliability of as Limiting Factor – Physical limits – Thermodynamic Limits - Relativistic Limits– Equal Failure Rates by Tunneling and Thermal Noise – Final Objectives of Integrated Electronic Systems -Removal of uncertainty by Nanomachines – Uncertainties in Nanosystems - Uncertainties in the Development of Nanoelectronics.

### **Unit-V**

**(08Hours)**

#### **Title: Molecular And Bioelectronics**

Bioelectronics – molecular processor – DNA Analyser molecular electronics – switches based on fullerenes and nanotubes – polymer electronic – self Assembling circuits – optical molecular memories – DNA computer – Information Processing with chemical reaction – Nanomachines – Parallel Processing - Drexler – Smalley debate – realistic projection- Synergy of Nano-Bio-Info.

### **Unit-VI**

**(08 Hours)**

#### **Title: Nanobio Systems**

#### **Reference(s) :**

#### **1Termwork**

At least Eight Assignment based on above syllabus

#### **Oral**

Term work and oral will be based on above syllabus.

#### **Books /Text References**

1. K. Goser, P. Glosekotter and J. Diens tuhl, “Nanoelectronics and Nanosystems -From Transistors to Molecular Quantum Devices” , Springer, 2004.
- 2 Herve Rigneault, Jean-Michel Lourtioz, Claude Delalande, Ariel Levenson, “Nanophotonics”, ISTE.
3. W.R.Fahrner, “Nanotechnology and Nanoelectronics – Materials, Devices and Measurement Techniques” Springer, 2006.

#### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI



## Elective II: NANO PHOTONICS

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Quantum Confined Materials

Quantum dots – optical transitions – absorption-inter-band transitions-quantum confinement intraband transitions-fluorescence/ luminescence–photoluminescence /fluorescence optically excited emission – electroluminescence emission.

### Unit-II

(08 Hours)

#### Title: Plasmonics

Internal reflection and evanescent waves- plasmons and surface plasmon resonance (SPR)- Attenuated total reflection- Grating SPR coupling- Optical waveguide SPR coupling- SPR dependencies and materials- plasmonics and nanoparticles.

### Unit-III

(08Hours)

#### Title: New Approaches in Nanophotonics

Near-Field Optics- Aperture near-field optics- Apertureless near-field optics- Near-field scanning optical microscopy (NSOM or SNOM)- SNOM based detection of plasmonic energy transport- SNOM based visualization of waveguide structures- SNOM in nanolithography- SNOM based optical data storage and recovery.

### Unit-IV

(08 Hours)

#### Title: Biophotonics

Interaction of light with cells- tissues- nonlinear optical processes with intense laser beams- photoinduced effects in biological systems-generation of optical forces-optical trapping and manipulation of single molecules and cells in optical confinement-laser trapping and dissection for biological systems-single molecule biophysics- DNA protein interactions.

**Unit-V****(08Hours)****Title: Photonic Crystals**

Important features of photonic crystals- Presence of photonic bandgap- Anomalous Group Velocity Dispersion- Microcavity-Effects in Photonic Crystals- Fabrication of photonic crystals- Dielectric mirrors and interference filters- Photonic Crystal Laser- PC based LEDs- Photonic crystal fibers (PCFs)- Photonic crystal sensing.

**Unit-VI****(08 Hours)****Title: Nanobio Systems****Termwork**

At least Eight Assignment based on above syllabus

**Oral**

Term work and oral will be based on above syllabus.

**Books /Text References**

1. H.Masuhara, S.Kawata and F.Tokunaga, Nano Biophotonics, Elsevier Science, 2007.
2. V.M. Shalaev and S.Kawata, Nanophotonics with Surface Plasmons (Advances in Nano-Optics and Nano-Photonics), 2007.
3. B.E.A. Saleh and A.C.Teich, Fundamentals of Photonics, John-Weiley & Sons, New York, 1993.
4. M.Ohtsu, K.Kobayashi, T.Kawazoe, and T.Yatsui, Principles of Nanophotonics (Optics and Optoelectronics), University of Tokyo, Japan, 2003.
5. P.N. Prasad, Introduction to Biophotonics, John Wiley & Sons, 2003.
6. J.D.Joannopoulos, R.D.Meade and J.N.Winn, Photonic Crystals, Princeton University Press, Princeton, 1995.

**Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## **Elective II: INDUSTRIAL NANOTECHNOLOGY**

### **TEACHING SCHEME**

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

### **EXAMINATION SCHEME**

Theory : 60 Marks  
Duration : 03 Hours  
Unit Test –I : 20 Marks  
Unit Test –II : 20 Marks  
TW/Pract./Oral : 50 Marks  
Theory Credits : 04  
Practical Credits : 01

#### **Unit – I**

**(08 Hours)**

##### **Title:Product Design**

Concept generation- Product Architecture- Industrial Design Process- Management of Industrial design Process and Assessing the quality of Industrial Design - Establishing the product specification

#### **Unit – II**

**(08 Hours)**

##### **Title: Product Development**

Criteria for selection of product- Product development process- Design for Manufacture - Estimate the manufacturing cost- Reduce the support cost- Prototyping- Economics of Product development projects - Elements of Economic analysis- financial models - Sensitive analysis and influence of the quantitative factors.

#### **Unit – III**

**(08 Hours)**

##### **Title:Management Techniques**

Technology Management - Scientific Management - Development of management Thought-Principles of Management- Functions of management-planning- organization- Directing, Staffing and Controlling- Management by objective- SWOT analysis- Enterprise Resource planning and supply chain management.

#### **Unit – IV**

**(08 Hours)**

##### **Title: Entrepreneurial Competence & Environment**

Concept of Entrepreneurship- Entrepreneurship as a career- Personality Characteristic a successful Entrepreneur- Knowledge and skill required for an Entrepreneur- Business environment- Entrepreneurship Development Training - Center and State government policies and Regulations - International Business.

## **Unit–V Management Of Small Business (08 Hours)**

Pre-feasibility study - Ownership - budgeting - project profile preparation - Feasibility Report preparation - Evaluation Criteria- Market and channel selection- Product launching - Monitoring and Evaluation of Business- Effective Management of Small business.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Reference Books:**

1. Karal, T. Ulrich Steven, D. Eppinger, “Product Design and Development”, McGraw- Hill International, editions, 2003.
2. H. Koontz and H. Weihrich, “Essentials of management”, McGraw Hill Publishing company, Singapore international edition, 1980.
3. S. Rosenthal, “Effective Product Design and Development”, Irwin, 1992.
4. Nanotechnology Standards (Nanostructure Science and Technology) by Vladimir Murashov and John Howard (Feb 3, 2011)
5. Introduction to Nanoscience and Nanotechnology by Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta and John J. Moore (Dec 22, 2008)

### **Text Books:**

1. J.J. Massie, “Essentials of Management” Prentice Hall of India Pvt. Ltd., 1985.
2. Hisrich, “Entrepreneurship” Tata Mc Graw Hill, New Delhi, 2001.
3. Nanotechnology: The Business (Perspectives in Nanotechnology) by Michael T. Burke (Sep 29, 2008)
4. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
5. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)

### **Syllabus for Unit Test**

Unit Test 1-- Units I ,II and III

Unit Test 2- Units IV,V and VI



## Elective II: NANO MATERIAL SCIENCE

### TEACHING SCHEME

Lectures : 04 Hrs/Week  
Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks  
Duration : 03 Hours  
Unit Test –I : 20 Marks  
Unit Test –II : 20 Marks  
TW/Pract./Oral : 50 Marks  
Theory Credits : 04  
Practical Credits : 01

#### Unit-I

(08 Hours)

##### Title: Physical Properties

Melting point and phase transition processes- quantum-size-effect (QSE). Size-induced metal-insulator-transition (SIMIT)- nano-scale magnets, transparent magnetic materials, and ultrahigh-density magnetic recording materials-chemical physics of atomic and molecular clusters.

#### Unit-II

(08 Hours)

##### Title: Physical Chemistry of Solid Surfaces

Surface energy – chemical potential as a function of surface curvature-Electrostatic stabilization-surface charge density-electric potential at the proximity of solid surface-Van der Waals attraction potential.

#### Unit-III

(08Hours)

##### Title: Chemistry Aspects

Photochemistry; Photoconductivity; Electrochemistry of Nanomaterials-Diffusion in Nanomaterials; Nanoscale Heat Transfer; Catalysis by gGold Nanoparticles; Transport in Semiconductor Nanostructures; Transition Metal Atoms on Nanocarbon Surfaces; Nanodeposition of Soft Materials; Nanocatalysis.

#### Unit-IV

(08 Hours)

##### Title: NanoStructures

Electronic Structure of Nanoparticles- Kinetics in Nanostructured Materials- Zero dimensional, one-dimensional and two dimensional nanostructures- clusters of metals and semiconductors, nanowires, nanostructured beams, and nanocomposites-artificial atomic clusters-Size dependent properties-size dependent absorption spectra-phonons in nanostructures.

#### Unit-V

(08Hours)

##### Title: Nanosystems

Nanoparticles through homogeneous nucleation-Growth controlled by diffusion-growth controlled by surface process-influences of reduction reagents-solid state phase segregation-kinetically confined synthesis of nanoparticles-template based synthesis.

## **Unit-VI**

**(08 Hours)**

### **Title: Nano Electronics**

Quantization of action, charge and flux – electrons in potential well – photons interacting with electrons in solids – diffusion processes – basic information theory – data & bits – data processing - Size Effects on structure and Morphology of free or Supported Nanoparticles – Size and confinement Effects – Fraction of surface atoms – Specific surface energy and surface stress.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. K.W. Kolasinski, “Surface Science: Foundations of Catalysis and Nanoscience”, Wiley, 2002.
2. Joel I. Gersten, “The Physics and Chemistry of Materials”, Wiley, 2001.
3. A. S. Edelstein and R. C. Cammarata, “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Pub., 1998.
4. S.Yang and P.Shen: “Physics and Chemistry of Nanostructured Materials”, Taylor & Francis, 2000.
5. G.A. Ozin and A.C. Arsenault, “Nanotechnology : A chemical approach to nanomaterials”, Royal Society of Chemistry, 2005.
6. The Physics and Chemistry of Solids - Stephen Elliott & S. R. Elliott

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## Elective II: NANO COMPOSITES

### TEACHING SCHEME

Lectures : 04 Hrs/Week

Practical : 02 Hrs/Week

### EXAMINATION SCHEME

Theory : 60 Marks

Duration : 03 Hours

Unit Test –I : 20 Marks

Unit Test –II : 20 Marks

TW/Pract./Oral : 50 Marks

Theory Credits : 04

Practical Credits : 01

### Unit-I

(08 Hours)

#### Title: Metal Based Nanocomposites

Metal Oxide or Metal Ceramic Composites, Different aspects of their preparation techniques, their final properties and functionality.

### Unit-II

(08 Hours)

#### Title: Polymer Based Nanocomposites

Preparation and Characterization of Diblock Copolymer based nanocomposites; Polymer – Carbon Nanotubes based composites, Their electrical, magnetic and mechanical properties. Polymer Dendrimer based composite .Percolation theory for CNT polymer based nanocomposite. Nanoscale reinforcement:Nanoclays:Carbon Nanomaterials,Polymer Matrix Nanocomposite. Lamellar nanocomposite.Application of different nanocomposite in industries:polymer:textile:automotive etc.,

### Unit-III

(08Hours)

#### Title: Properties and Characterization of Nanocomposites

### Unit-IV

(08 Hours)

#### Title: Bionano Composites for Tissue Engineering

Major Physiological systems of current interest to Biomedical Engineers: Cardiovascular, endocrine, nervous, visual, gastrointestinal systems. Tissue Engineering for specific organs such as, Bone marrow, skeletal muscles and cartilage, Cell biological fundamentals of tissue engineering. Application of nanomaterials in biomedical Transplant: architecture , assembly, transportation, nutrients. Concept of transplant and its rejection. Xenotransplantation. Imaging of cancer cells, Tissue imaging by QD, Nanoparticles: principles process, application .MRI.

### Unit-V

(08Hours)

#### Title Manufacturing of Bionanomaterials

Natural and artificial (Microbial Nanoparticles production,Viral Nanoparticles production, Plant and diatoms Nanoparticles production), DNA, peptide, Protein ,enzyme based manufacturing: Application: architecture: electronics, (Topdown, Bottom up):Devices, Nano particles with



biosystems ,Natural biocomposite :spider silk:Bone :shells,CNT based biomaterials: using cnt as a template, Biosensors:using Nano materials with bio systems(Plant and animal cell,DNA,microtubules,antibodies,antigens etc..).Cellular imaging. Bionanoarrays: DNA, Protein, nucleotide based, viruses . DNA based computation . DNA as functional template for nanocircuitry. Nanomotors. Cellular nanosystem interaction :concept, process ,application,Biochip. Magnetic Nanoparticle by bacteria:mechanism of formation, application.

## **Unit-VI**

**(08 Hours)**

### **Title: Properties and Characterization of Bionanomaterials**

Use of AFM, SEM , TEM, XRD based bionanomaterial characterization, Properties of DNA structure as nanotechnology aspects, Surface modification properties of Cell, antibodies, antigens, proteins, enzymes.

### **Termwork**

At least Eight Assignment based on above syllabus

### **Oral**

Term work and oral will be based on above syllabus.

### **Books /Text References**

1. Nanocomposite Science & Technology Ajayan, Schadler & Braun
2. Nanocomposites, By Challa S. S. R. Kumar, John Wiley & Sons.
3. Nanostructured Materials: Selected Synthesis Methods, Properties, and Applications, Philippe Knauth, Joop Schoonman
4. Polymeric Nanocomposites: Theory and Practice, By Sati N. Bhattacharya, Musa Rasim Kamal, Rahul K. Gupta, Hanser Verlag
5. Polymer Nanocomposites: Processing, Characterization, And Application, McGraw-Hill Prof Med/Tech
6. Introduction to Nanocomposite Materials: Properties, Processing, By Thomas E. Twardowski, Thomas Twardowski, DEStech Publications, Inc.
7. Nanobiotechnology II more concept and application chad A. Mirkin and christof M.niemeyer Publi WILY WH.
8. **Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology** - Hari Singh Nalwa.
9. **Bionanotechnology: Lessons from Nature** by David S. Goodsell.

### **Syllabus for Unit Test**

Unit Test 1- Units I ,II and III

Unit Test 2- Units IV,V and VI

## **SELF STUDY-I**

### **MODELING AND SIMULATION OF NANOSYSTEMS**

#### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

#### **EXAMINATION SCHEME**

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

#### **Unit I:**

##### **Introduction to modeling and simulation**

Abstract, what is modeling? ,What is simulation?, How to develop a simulation model, How to design a simulation experiment, how to perform simulation analysis, what makes a problem suitable for simulation modeling and analysis, How to select simulation software, benefits of simulation modeling and analysis, what are some pitfalls to guard against in simulation.

#### **Unit II:**

##### **Computer Modeling of Nanostructured material**

Introduction, Modeling Methods: Molecular dynamics and Monte Carlo Modeling, atomic potential energies and Forces, Multiscale Modeling, Nanostructured Materials: Nanoparticle properties

#### **Unit III:**

##### **Microstructure Modeling**

Microstructure Modeling, Sintering and grain growth dynamics, mechanical deformation and fracture, shock loading, irrational properties, Nan alloys, Prospects for future modeling

#### **Unit IV:**

##### **Molecular Dynamics:**

Overview, Nano statistical mechanics, Fundamentals of Molecular Dynamics

#### **Unit V:**

##### **Software's for Molecular Dynamics Modeling**

Principles of Nano Modeling, PES revisited, accuracy requirements, conclusions

#### **Unit VI:**

##### **Application: Nanorobot modeling and simulation**

Abstract, introduction, blood components, nanorobot modeling and design, nanorobot simulation

### **Books /Text References**

1. Nanostructure material by Carl C. Koch
2. Nanosystems by K.Eric Drexler

### **Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

# SYNTHESIS AND DESIGN OF NANOSCALE PRODUCTS

## TEACHING SCHEME

Lectures: 04 Hrs/Week

## EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

### Unit I:

Fundamental concepts of Nanoscale materials, various types of nanomaterials used in Nanotechnology such as CNTs, fullerenes, nanorods, metal oxides, quantum dots, etc.

### Unit II:

Approaches such as top-down approach, bottom up approach, biomimetic and functional approach to construct nanomaterials

### Unit III:

Nanomaterials related to nanoionics and nanoelectronics, Reticular synthesis and the design of new materials, Synthesis of highly ordered mesoporous materials from layered polysilicates, Flexible Synthesis of Composite Aerogels

### Unit IV:

Nanoscale integrated three dimensional circuits

### Unit V:

Nanoscale materials for bulk applications

### Unit VI:

Toxicological aspects of nanoscaled materials

**Books /Text References**

1. Mick Wilson, Kamali Kannargare., Geoff Smith, “Nano technology: Basic Science and Emerging technologies”, Overseas Press, 2005.
2. Nanostructures and Nanomaterials: synthesis, properties and applications, G. Cao and Y. Wang, World Scientific, 2nd edition, 2011
3. W.Gaddand, D.Brenner, S.Lysherski and G.J.Infrate (Eds.), Handbook of NanoScience, Engg. and Technology, CRC Press, 2002.
4. K. Barriham, D.D. Vvedensky, Low dimensional semiconductor structures: fundamental and device applications, Cambridge University Press, 2001.
5. G. Cao, Nanostructures & Nanomaterials: Synthesis, Properties &Applications, Imperial College Press, 2004.

**Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV, V and VI

# **APPLICATIONS OF NANOTECHNOLOGY IN FOOD AND AGRICULTURE**

## **TEACHING SCHEME**

Lectures: 04 Hrs/Week

## **EXAMINATION SCHEME**

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

### **Unit I:**

#### **Use of nanotechnologies in the agriculture sector**

Precision farming for basic agriculture, real time monitoring of soil conditions, combating the crop pathogens and the treatment of waste

### **Unit II:**

#### **Strategic applications of Nanotechnology in agriculture**

Development of innovative products in food production, processing, preservation and packaging and applications in agriculture, animal feed and agrochemicals, disease detection tools, targeted treatments

### **Unit III:**

#### **Impact of nanotechnologies in the food sector**

Nanotechnology-based food and health food products and food packaging materials, Nano-enabled food contact materials (FCMs) and packaging, Polymer composites with various nanomaterials, coatings containing nanoparticles

### **Unit IV:**

#### **Nanosensors in food sector**

Intelligent packaging concepts based on nanosensors, use of nanodiagnostic tools for detection and monitoring in food production, sensing applications, biosensors for detection of herbicides, pesticides and pathogens

### **Unit V:**

## **Encapsulation technology for nanodelivery systems**

Use of micelles, liposomes or biopolymer-based carrier systems, processed nanostructures, inorganic and organic nanomaterials in health food products, surface functionalized nanomaterials

### **Unit VI:**

#### **Health aspects**

Assessment of human health risks associated with the use of nanotechnologies and nanomaterials in the food and agriculture sectors, safety, current risk assessment approaches used by FAO/WHO, environmental, ethical, policy and regulatory issues

#### **Books /Text References:**

1. Nanotechnology in the Agri-food Sector, Lynn J. Frewer , Willem Norde, Arnout Fischer and Frans Kampers, 2011
2. Bionanotechnology: Lessons from Nature by David S. Goodsell
3. Nanomedicine, Vol. IIA: Biocompatibility by Robert A. Freitas
4. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari Singh Nalwa
5. Nanobiotechnology; ed. C.M. Niemeyer, C.A. Mirkin.

#### **Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

# FINITE ELEMENT METHODS FOR NANOSCALE STRUCTURES

## TEACHING SCHEME

Lectures: 04 Hrs/Week

## EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

### UNIT I:

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principle of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis

### UNIT II:

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates

### UNIT III:

Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equations by Galerkin's method, Solving cantilever beam problem by Galerkin's approach Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrilateral elements.

### UNIT IV:

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super -parametric elements, Concept of Jacobin matrix.  
Numerical Integration: Numerical Integration, one point formula and two point formulas

### UNIT V:

Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermite shape functions



## **UNIT VI:**

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy Invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, direct method for deriving shape functions using Langrage's formula, Plane stress problems

### **Books /Text References:**

1. J.J. Massie, “Essentials of Management” Prentice Hall of India Pvt. Ltd., 1985.
2. Hisrich, “Entrepreneurship” Tata Mc Graw Hill, New Delhi, 2001.
3. Nanotechnology: The Business (Perspectives in Nanotechnology) by Michael T. Burke (Sep 29, 2008)
4. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
5. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)

### **Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

# MEMS & NEMS

## TEACHING SCHEME

Lectures: 04 Hrs/Week

## EXAMINATION SCHEME

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

### UNIT I:

#### Introduction

Basic Electronics, Application of Electronics to Mechanical Systems, Various Micro Mechano-Electronic Systems, Various Nano Mechano-Electronic Systems, Components and Applications

### UNIT II:

#### Micro-electromechanical Systems (MEMS)

What is MEMS? Definitions and Classifications, History, Applications, Established MEMS Applications New MEMS Applications, MEMS Market Miniaturization Issues

### UNIT III:

#### MEMS Fabrication Methods

Photolithography, Materials for Micromachining Substrate, Additive Films and Materials, Bulk Micro machining, Wet Etching, Dry Etching, Surface Micro machining, Fusion Bonding, High-Aspect-Ratio-Micromachining,

### UNIT IV:

#### NEMS Fabrication Methods

LIGA, self assembling system, Molecular Manipulation, Laser Micromachining, 3Computer Aided Design, Assembly and System Integration, Packaging, Multi-Chip Modules, Passivation and Encapsulation, Foundry Services

### UNIT V:

#### Applications

MEMS Transducers, Piezoelectric MEMS, Interstitial MEMS, Biochemical analysis, Power MEMS, Acoustical MEMS, Microreactors, Optical MEMS

### UNIT VI:

#### Future of MEMS

Industry Challenges, the Way Ahead, NEMS

**Books /Text References/Web Site:**

1. An Introduction to MEMS (Micro-electromechanical Systems) – By PRIME Faraday Partnership

<http://www.amazon.co.uk/exec/obidos/ASIN/1844020207>

2. MEMS and NEMS: Systems, Devices, and Structures. Sergey Edward Lyshevski, Rochester Institute of Technology, New York, USA. CRC Press, 2002.
3. Development of micro-diesel injector nozzles via MEMS technology and effects on spray characteristics Seunghyun Baik, James P. Blanchard and Michael L. Corradini (Pdf files)

**Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV, V and VI

# **SELF STUDY-II**

## **SILICON NANOSTRUCTURES & CARBON NANOTUBES BASED NANOELECTRONICS**

### **TEACHING SCHEME**

Lectures: 04 Hrs/Week

### **EXAMINATION SCHEME**

Duration	: 03 Hours
Theory	: 60 Marks
Internal Assessment	: 40 marks
Theory Credits	: 04

#### **Unit I:**

#### **Semiconductor Nanostructures & Nanomaterials**

Semiconductor Nanostructures & Nanomaterials: Introduction, Importance of Semiconductor Nanomaterials in Electronic Industry, Various Silicon Nanostructures, Silicon Nanowires

Silicon Quantum Dots, Silicon Nanotubes, Hybrid Silicon-Carbon Nanotubes

Silicon Carbide Nanotubes

#### **Unit II:**

#### **Carbon Nanotubes Nanoelectronics**

Carbon Nanotubes: Introduction, Synthesis of Carbon Nanotubes, Properties of Carbon Nanotubes, Specific Applications in Electronics, Carbon Nanotube based Field Emission Devices, Carbon Nanotube Transistors, Single Electron Transistor, Ballistic Carbon Nanotube Field Effect Transistor with Palladium Contact

#### **Unit III:**

#### **Carbon Nanotubes: Nanoelectronics**

Overview of Carbon Nanotube Field Effect Transistor Technology

#### **Unit IV:**

#### **Notable Achievements in Nanoelectronics**

Single-Molecule Electronics: Molecular electronics, Molecular logic gate, Molecular wires

Solid State Nanoelectronics: Nanocircuitry, Nanolithography, Nanosensors

**Unit V:**

**Silicon Nanotechnology**

Silicon Nanotechnology: CMOS Nanotechnology, Ballistic Properties, Memory

**Unit VI:**

**Display Devices**

Nano Emissive Display Devices, Quantum Dots, Nano Chips

Nano Electro Mechanical System (NEMS)

**Books /Text References:**

1. Nanotechnology Demystified by Linda Williams and Wade Adams (Aug 29, 2006)
2. Microsystems and Nanotechnology by Zhaoying Zhou, Zhonglin Wang and Liwei Lin (Nov 28, 2011)
3. Polymeric Nanocomposites: Theory and Practice, By Sati N. Bhattacharya, Musa Rasim Kamal, Rahul K. Gupta, Hanser Verlag
4. Polymer Nanocomposites: Processing, Characterization, And Application, McGraw-Hill.

**Syllabus for Unit Test**

Unit Test-1	Units- I ,II and III
Unit Test-2	Units -IV,V and VI

## **SELF STUDY II**

**Subject: Nanobioelectronics**

### **Unit I**

Semiconductor Fabrication – Top-down techniques

### **Unit II**

Introduction to Semiconductor and Carbon-based nanostructures

Introduction to Carbon-based electronic devices

### **Unit III**

Electrical transport at nanoscale

Coupling of biology and nanoelectronics

### **Unit IV**

Biorecognition and transduction events

Biosensors - Electrochemical and Impedance-based methods

### **Unit V**

DNA bioelectronics

Protein (biomimetic) based nanodevices

### **Unit VI**

Current applications in cancer, regenerative medicine, neuroscience,

## **SELF STUDY II**

### **Subject: Compound Semiconductor Materials and Devices**

#### **Unit I**

Introduction to the Compound semiconductor materials and devices

Miller Indices, Reciprocal lattice vector-1, Reciprocal vector -2.

#### **Unit II**

Bragg Diffraction-1, Bragg Diffraction-2.

Brillouin Zone, Bandstructure, Effective Mass, Infinite Quantum Well.

#### **Unit III**

DOS of Nanostructure-1, DOS of Nanostructure-2, Finite Quantum Well-1.

Finite Quantum Well-2, Triangular Well-1, Triangular well-2,

Double Quantum well-1, Double Quantum Well-2.

#### **Unit IV**

Bloch Theorem, Superlattice-1, Superlattice-2.

Heterostructure strain, Band gap engineering.

#### **Unit V**

Band alignment, anion rule, Auger recombination.

#### **Unit VI**

Long wavelength infrared photodetectors, Quantum cascaded lasers

## **SELF STUDY II**

### **Subject: Nanoprocessing**

#### **Unit I**

Introduction, Characterization and manipulation at nano-scale

Scanning electron microscope (SEM)

Transmission electron microscope (TEM)

#### **Unit II**

Scanning probe microscope (SPM)

Scanning tunneling microscope (STM)

Atomic force microscope (AFM)

#### **Unit III**

X-ray diffraction

Synthesis and processing 0D nanostructures – nanoparticles

#### **Unit IV**

Homogeneous nucleation

Synthesis of metallic nanoparticles

Synthesis of nonoxide semiconductor nanoparticles

Synthesis of oxide nanoparticles

Vapor phase synthesis

Solid-state synthesis

#### **Unit V**

Heterogeneous nucleation

Spatially confined growth

Core-shell nanoparticles

#### **Unit VI**

Synthesis and processing 1D nanostructures – nanowires/nanorods/nanotubes/nanofibers

Bottom-up approaches: Anisotropic growth

Top-down approach – electrospinning

Synthesis and processing 2D nanostructures – thin films

Vapor phase deposition

Liquid phase growth



## **SELF STUDY PAPER II: SEM IV**

### **Subject: Introduction to Nano-modelling**

#### **Unit I**

**Computational Modelling** – Process, Model, Mathematical Model, Methods of Computational Modelling, application to nano-engineering

#### **Unit II**

**Molecular Dynamic** – Modelling & Simulation, Analysis background, Potential Energy Function, Naoscale phenomena, approach to technique

**Molecular mechanic** – basic aspect, Mechanics of systems of particles, General co-ordinate system, Least Action Principle

#### **Unit III**

**Energy Minimization** - Concept, Methods - First order minimization, Second Order Minimization, Simplex Minimization. Application to molecular dynamic

#### **Unit IV**

**Statistical Mechanics in Molecular Dynamics** – Definition, Ensemble – Micro canonical, Canonical, Isobaric-Isothermal, MD and Time average, Ensemble average

#### **Unit V**

**Boundary in MD** – Periodic Boundary Condition – Fixed simulation cell, semi rigid atomistic boundary

#### **Unit VI**

**MD Packages** - GROMACS – Flow Chart, Computational Lab practical to use of this package






**Revised Rules  
Structure and contents of  
Detailed Syllabus**

**For**

**Bachelor of Architecture (B. Arch) 2015 CBCS COURSE  
(Amended in 2018)**

To be implemented from 2018-19

Bharati Vidyapeeth (Deemed to be University)  
College of Architecture, Pune

**Bharati Vidyapeeth**  
(Deemed to be University)  
Pune, India.  
Founder-Chancellor: Dr. Patangrao Kadam

Prof. Dr. Shivalinga Kadam  
Chancellor  
Prof. Dr. M. M. Salunkhe  
Vice-Chancellor

→ Registered with AICTE (MCA 21) as B.A.U.C. →  
→ Category: University State by UGC →  
→ NSF Ranking - 33 →

Dr. Vishwajit Kadam  
Pro Vice-Chancellor  
G. Jayakumar  
Registrar

"Social Transformation Through Dynamic Education"

**NOTIFICATION NO. 925**

It is hereby notified for the information of all concerned that the University authorities have decided to approve the revised syllabus of M.Arch. programme and B.Arch. programme by adopting the Council of Architecture's amendments in the existing B.Arch. 2015 CBCS syllabus (Sem VII-X) to be implemented from the academic year 2018-19.

All the concerned are requested to make a note of this.


Ref. No. BVDU/2018-19/ 906  
Date: July 20, 2018

*G. Jayakumar*  
Registrar

To,

1. The Dean, Faculty of Engineering & Technology, College of Engineering, Pune-43.
2. The Principal, College of Architecture, Pune-43.
3. The Controller of Examinations, BVDU.

*Exam Section cat*  
*Lib. note*  
*Academic coord*  
*PG. Wa.*  
*office file*

  
Bharati Vidyapeeth  
(Deemed to be University)  
College of Architecture, Pune-43.  
Inward No. 153  
Date 21/7/18  
Sign:


Changes in the contents of syllabus as per MOM of BOS meeting conducted on 24/12/2018

A meeting of Board of Studies in architecture was conducted on 24<sup>th</sup> December 2018 to discuss the feed by faculty members for implemented course of B.Arch CBCS 2015 and M.Arch CBCS 2018. Both the courses are approved through university notification 925 and in academic council meeting conducted on 4<sup>th</sup> December 2018. It is decided by the BOS in the meeting that the feedback should be carefully considered for next revision of syllabus in the syllabus formation meetings after detailed discussion. The specific suggestions for immediate action are follows for **B.Arch (CBCS 2015 course)**.

1. **Working Drawing I (B.Arch CBCS 2015 amended in 2018)**- 'Municipal Drawing' needs to be included over and above the contents of the syllabus.
2. **Elective V-Sustainable architecture (B.Arch CBCS 2015 amended in 2018)**, the contents are revised as follows:

Aim: To understand the principles and practices of sustainable architecture.

- Concept of sustainable development and its relation to built environment
- Understanding relationship between climate and human comfort
- Understanding sustainable building design principles and practices

 21/11/2019

Prof Archana Gaikwad

Chairperson BOS in Architecture

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## **Rules of Structure for First To Fifth Year B. Arch**

### **Rule No.1: Eligibility for Admission**

*Eligibility Criteria:* Students seeking admission to First year of Bachelors Degree Course in Architecture must fulfill the eligibility criteria laid down by Council of Architecture and the University as applicable from time to time.

### **Rule No.2: Duration and stages of the course (as per Council of Architecture)**

- The architecture course shall be of minimum duration of 5 academic years/ 10 semesters of approximately 18 working weeks each inclusive of 90 days of practical training in IX semester in a professional's office.
- The 5 years Bachelors Degree Course in Architecture shall be conducted in two stages.
- The First stage of the course shall be the first 3 academic years or 6 semesters of institutional academic studies. The First stage shall be completed within the stipulated time as prescribed by the Council of Architecture.
- The Second stage of the course shall be of 2 academic years/ 4 semesters including 90 days (15-18 weeks) of practical training.
- A candidate will be eligible to register as an architect under the Architects Act, 1972 only after successful completion of both the stages.

### **Rule No.3: Scheme of Assessment**

A candidate to be eligible for the degree of Bachelor of Architecture will be required to appear for and pass all examinations as under:

#### Stage I

- Semester I Examination in Architecture (First Year Sem I)
- Semester II Examination in Architecture (First Year Sem II)
- Semester III Examination in Architecture (Second Year Sem III)
- Semester IV Examination in Architecture (Second Year Sem IV)
- Semester V Examination in Architecture (Third Year Sem V)
- Semester VI Examination in Architecture (Third Year Sem VI)

#### Stage II

- Semester VII Examination in Architecture (Fourth Year Sem VII)
- Semester VIII Examination in Architecture (Fourth Year Sem VIII)
- Semester IX Examination in Architecture (Final Year Sem IX)
- Semester X Examination in Architecture (Final Year Sem X)

-

#### **Rule No. 4: Granting of Academic Term**

Each semester shall comprise of Eighteen weeks (Minimum 90 working days).

The candidate will be permitted to appear for semester examination only if he/she has,

- 75% attendance in each course that constitute a head of passing, prescribed by the university.
- Satisfactory completion of the 100% term work prescribed for each course.
- Satisfactory conduct as a bonafide student

The Principal/ Director of the institution shall have the right to withhold the student from appearing for examination of a specific course if the above requirements are not fulfilled.

#### **Rule No. 5: Progression Requisite**

As general rule a student shall be allowed to keep the next year of study of the course if he/she has a backlog of not more than “**Six heads of passing**” in the preceding year.

Furthermore,

- A student shall be allowed to get admitted to Second Year B. Arch. course if he/she has a backlog of not more than **six heads** of passing at First year B. Arch (semester I and II considered together).
- A student shall be allowed to get admitted to Third Year B. Arch course, if he/she has cleared all the subjects of passing at First year B.Arch and if he/she has a backlog of not more than **six heads** of passing at Second Year B.Arch (semester III and IV considered together).
- A student shall be allowed to get admitted to Fourth Year B.Arch course if he/she has cleared all the subjects of passing at Second Year B.Arch (Semester III and IV considered together.) and if he/she has a backlog of not more than **six heads** of passing at Third Year B.Arch (semester V and VI considered together)
- A student shall be allowed to get admitted to Final Year B.Arch course if he/she has cleared all the subjects of passing at Third Year B. Arch (Semester V and VI considered together), and if he/she has a backlog of not more than **six heads** of passing at fourth Year B.Arch (semester VII and VIII considered together)

#### **Rule No 6: Examinations**

##### **6.1. Conduct of Examinations**

The university examinations for all the 10 semesters shall be conducted at the end of each semester by the University.

##### **6.2. Pattern of Examination:** The evaluation scheme for B.Arch comprises of;

University Examination (UE)

Internal Assessment (IA)

6.2.1: ***University Examination***

UE will be conducted by the University and will be based on the entire syllabus. Assessment would be undertaken by internal examiner and external examiner jointly in equal weightage. Oral will be based on sessional work produced by the student covering entire syllabus.

The nature of assessment will vary depending upon the subject and its delivery and whether it is studio-based or theory based. Refer to detailed syllabus on the format of UE for individual subjects.

6.2.2: ***Internal Assessment***

IA will be conducted by the Institution imparting B.Arch course. IA will be done by the teacher teaching the course through a continuous assessment system that is spread through the duration of course. The attendance will have weight age of 10 marks and 25 marks for IA of 40 marks and 100 marks respectively. For remaining at least **two** and a maximum **four** of the below components can be used for continuous assessment.

Individual faculty member shall have the flexibility to design the continuous assessment in a manner so as to evaluate students' capabilities across knowledge, skills and attitudes. IA may be undertaken through any or combination of the methods stated below:

- Seminar presentation
- Written Test /Open Book
- Reviews
- Essays
- Short answer questions
- Study of best practices /precedent study/field study
- Multiple choice questions/Quiz
- Projects/group projects/Dissertation
- Reflective Practical assignments
- Drawing Portfolios
- Report writings
- Learning logs/diaries

The faculty shall announce in advance the units based on which continuous assessment shall be conducted. This progressive assessment for the IA must be communicated by the Institute to the university as per the schedule declared by the university. Detailed records of continuous

assessment shall be maintained by the Institute. The student does not have facility of grade improvement, if he/she passes at IA in a course.

### **6.3: Assessment of Term work**

- In respect of term work “due date” shall be fixed for the completion of each assignment and the same shall be collected on the due date.
- At the end of the semester term work shall be assessed jointly by the internal and external examiners from amongst the panel approved by the University.
- Performance of a candidate in viva-voce shall be assessed on basis of the depth of understanding of the principles involved.
- Students may use computers for preparing term work where nature of work is unique to an individual and stress is on content rather than skill. For common form of work, drawing and reports/notes shall be manually prepared.
- An examiner for any of the subjects of examinations shall have a minimum of 3 years teaching/ professional experience in his/her field of study.

### **Rule No. 7: Credits**

- The credits are defined in terms of the student-time spent in hours which are divided into two parts such as face to face instruction and Notional (lectures and studio).
- The total credits to be earned by the student to achieve B.Arch degree will be 300credits.

Semester	I	II	III	IV	V	VI	VII	VIII	IX	X
Credits	30	30	30	30	30	30	30	30	30	30

- Where, one credit is equal to 1hour of Lectures and 1 hour of Studio.
- Note: If a student secure D grade in either or both IA and UE for a particular course credits earned by the student for that courses shall be zero

### **Rule No.8: Criteria for Passing**

To pass in every semester examination and earn the assigned credits, a candidate must obtain minimum 40% marks in each head of passing.

- a) For all courses, Both UE and IA constitute separate heads of passing. In order to pass in such courses and earn the assigned credits

The student must obtain minimum grade point of 5.0(40% marks) at UE and also minimum grade point of 5.0 (40%) marks at IA.

Or

If he/she fails in IA, the student passes in the course provided he/she obtains a minimum of 25% in IA and grade point average(GPA) for course is at least 6.0(50%in aggregate).the GPA for a course will be calculated only if student passes at UE.

- b) A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog and clear heads of passing.
- c) Students with backlog in IA will have to present themselves and their work for progressive marking throughout the semester for which they intend to appear.

## **Rule No.9: Grading system**

### **9.1: Conversion of Marks to Grade points and Grades.**

The marks shall be converted to grade points and grades as given in table below.

Range of marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
$40 \leq \text{Marks} < 50$	5	C
Marks < 40	0	D

### **9.2: Performance**

The performance of a student will be evaluated in terms of two indices, viz

- a) Semester Grade Point average (SGPA) which is grade point average for all the semester
- b) Cumulative Grade point average (CGPA) which is the grade point average for all the completed semesters at any point.

### **9.3: Semester Grade point average (SGPA)**

SGPA measures the cumulative performance of a learner in all courses in a particular semester. SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$$

Where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is a GPA obtained by the learner in the course.

The SGPA shall be calculated up to two decimal place accuracy.

### **9.4: Cumulative Grade point average (CGPA)**

CGPA measures the cumulative performance of a learner in all courses since his/her enrolment. CGPA is calculated by the formula

$$CGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where  $C_k$  is the credit-value assigned to a course and  $GP_K$  is a GPA obtained by the learner in the course.

The CGPA shall be calculated up to two decimal place accuracy.

The CGPA calculated after the minimum credits specified for the programme are earned will be the final result.

### **9.5: Award of Honours**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are as given in table below

Range of CGPA	Final Grade	Letter Grade
$9.50 \leq CGPA \leq 10.00$	O	Outstanding
$9.00 \leq CGPA \leq 9.49$	A+	Excellent
$8.00 \leq CGPA \leq 8.99$	A	Very Good
$7.00 \leq CGPA \leq 7.99$	B+	Good
$6.00 \leq CGPA \leq 6.99$	B	Average
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory
CGPA Below 5.00	F	Fail

### **Rule No.10: Introduction of this Curriculum**

The new curriculum for the degree course in architecture B.Arch will be introduced from Academic Session 2015 -2016

- First year B.Arch Course from June 2015
- Second year B.Arch Course from June 2016
- Third year B.Arch Course from June 2017
- Fourth year B.Arch Course from June 2018
- Final year B.Arch Course From June 2019

### **Rule No 11: Completion**

Completion of only Stage-I, shall not qualify the candidates for registration as an architect. Degree of Bachelors in architecture shall be awarded only after successful completion of stage II.

Registration as an architect by council of architecture will only be given as per the prevailing rule of Council of Architecture, India.

#### ***Degree Requirements***

**Earned credits:** A candidate who has successfully completed all the Core courses and elective courses, not less than minimum number of credits prescribed shall be eligible to receive the degree.

### **Rule No.12: Subject Code**

Code used for serial numbers of the subjects in the structure for B.Arch course shall be as follows (from left, five digit/alphabet code)

- First alphabet for faculty of engineering-K
- Second digit for Board of Studies of architecture
- Third digit representing the year of the course in architecture
- Fourth and Fifth digits representing number of that subject in the course structure of that particular year





**Structure and Contents**  
**For**  
**B.Arch 2015 CBCS course (Amended in 2018)**

Bharati Vidyapeeth (Deemed to be University)  
College of Architecture, Pune

## Structure & Examination Pattern of First Year B.Arch

Semester-I								Total Duration-30hrs /week Total Credits-30			
Subject code	Subject	Teaching Scheme (in hours/week)			Examination Scheme (marks)			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Paper	Oral				
K8101	Architectural Design-I	2	4	6	40	-	60	100	2	4	6
K8102	Building construction and Material-I	2	4	6	40	-	60	100	2	4	6
K8103	Theory of structures-I	3	-	3	40		60	100	3	-	3
K8104	Creativity and Communication-I	2	2	4	40	-	60	100	2	2	4
K8104	Architecture drawings and graphics-I	2	4	6	40	60	-	100	2	4	6
K8106	Workshop - Model making	1	4	5	100	-	-	100	1	4	5
	<b>Total</b>	<b>12</b>	<b>18</b>	<b>30</b>	<b>300</b>	<b>60</b>	<b>240</b>	<b>600</b>	<b>12</b>	<b>18</b>	<b>30</b>

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-II								Total Duration-30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme (in hours/week)			Examination Scheme (marks)			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Paper	Oral				
K8107	Architectural Design-II	2	4	6	40	-	60	100	2	4	6
K8108	Building construction and Material-II	2	3	5	40	-	60	100	2	3	5
K8109	Theory of structures-II	2	-	2	40	-	60	100	2	-	2
K8110	Creativity and Communication-II	1	3	4	40	-	60	100	1	3	4
K8111	Architecture drawings and graphics-II	1	4	5	40	60	-	100	1	4	5
K8112	History of Architecture -I	3	-	3	40	60	-	100	3	-	3
K8113	Climatology and Climate Responsive Architecture	1	2	3	40	-	60	100	1	2	3
K8114	Workshop - Model making and Building Appraisal	-	2	2	100	-	-	100	-	2	2
	<b>Total</b>	<b>12</b>	<b>18</b>	<b>30</b>	<b>380</b>	<b>120</b>	<b>300</b>	<b>800</b>	<b>12</b>	<b>18</b>	<b>30</b>

## Structure & Examination Pattern of Second Year B.Arch

Semester-III								Total Duration-30hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme No.of hours			Examination Scheme No. of Marks				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
				Paper		Oral					
K8201	Architectural Design -III	1	5	6	40	-	60	100	1	5	6
K8202	Building construction and Material-III	1	5	6	40	-	60	100	1	5	6
K8203	Theory of structures-III	2	-	2	40	-	60	100	2	-	2
K8204	Creativity and Communication-III	1	2	3	40	-	60	100	1	2	3
K8205	Architecture drawings and graphics-III	1	4	5	40	-	60	100	1	4	5
K8206	History of Architecture-II	3	-	3	40	60	-	100	3	-	3
K8207	Building Services -I	2	1	3	40	60	-	100	2	1	3
K8208	Elective-I	1	1	2	100	-	-	100	1	1	2
<b>Total</b>		<b>14</b>	<b>16</b>	<b>30</b>	<b>380</b>	<b>120</b>	<b>300</b>	<b>800</b>	<b>14</b>	<b>16</b>	<b>30</b>

Elective I :Traditional Building Science/Vernacular architecture and Settlements/Environmental studies/Photography, etc.

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-IV								Total Duration-30 hrs/week Total Credits-30			
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
				Paper		Oral					
K8209	Architectural Design-IV	1	5	6	40	-	60	100	1	5	6
K8210	Building construction and Material-IV	1	5	6	40	-	60	100	1	5	6
K8211	Theory of structures-IV	2	-	2	40	-	60	100	2	-	2
K8212	Computer aided Design and Drawings	1	3	4	40	-	60	100	1	3	4
K8213	History of Architecture-III	3	-	3	40	60	-	100	3	-	3
K8214	Surveying and leveling	1	3	4	40	-	60	100	1	3	4
K8215	Building services-II	2	1	3	40	60	-	100	2	1	3
K8216	Elective-II	1	1	2	100	-	-	100	1	1	2
<b>Total</b>		<b>14</b>	<b>16</b>	<b>30</b>	<b>380</b>	<b>120</b>	<b>300</b>	<b>800</b>	<b>14</b>	<b>16</b>	<b>30</b>

Elective II:Seminar –I/Passive Design Principles/Animations/Communication Skills; etc.

## Structure & Examination Pattern of Third Year B.Arch

Semester-V					Total Duration-30hrs/week Total Credits-30						
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
		Paper	Oral								
K8301	Architectural Design-V	1	7	8	40	-	60	100	1	7	8
K8302	Building construction and Material-V	1	5	6	40	-	60	100	1	5	6
K8303	Theory of structures-V	2	-	2	40	-	60	100	2	-	2
K8304	Working drawing-I	1	4	5	40	-	60	100	1	4	5
K8305	History of Architecture-IV	3	-	3	40	-	60	100	3	-	3
K8306	Specification writing	2	-	2	40	60	-	100	2	-	2
K8307	Building services-III	2	-	2	40	60	-	100	2	-	2
K8308	Elective-III	1	1	2	100	-	-	100	1	1	2
<b>Total</b>		<b>13</b>	<b>17</b>	<b>30</b>	<b>380</b>	<b>120</b>	<b>300</b>	<b>800</b>	<b>13</b>	<b>17</b>	<b>30</b>

Elective III: Architecture Journalism/Appropriate Technology/Barrier-free Architecture/Seminar-II, etc.

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Semester-VI					Total Duration-30hrs/week Total Credits-30						
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits		
		L	S	Total	I.A	U.E		Total	L	S	Total
		Paper	Oral								
K8309	Architectural Design-VI	1	7	8	40	-	60	100	1	7	8
K8310	Building construction and Material-VI	1	5	6	40	-	60	100	1	5	6
K8311	Theory of structures-VI	2	-	2	40	-	60	100	2	-	2
K8312	Working drawing-II	1	3	4	40	-	60	100	1	3	4
K8313	Landscape Architecture	1	2	3	40	-	60	100	1	2	3
K8314	Estimation and Costing	2	1	3	40	60	-	100	2	1	3
K8315	Building services-IV	2	-	2	40	60	-	100	2	-	2
K8316	Elective-IV	1	1	2	100	-	-	100	1	1	2
<b>Total</b>		<b>13</b>	<b>17</b>	<b>30</b>	<b>380</b>	<b>120</b>	<b>300</b>	<b>800</b>	<b>13</b>	<b>17</b>	<b>30</b>

Elective IV: Green Materials/Theatre and set design/Visual Communication/Advanced Building Material, etc

**Structure & Examination Pattern of Fourth Year B.Arch**

<b>Semester-VII</b>								<b>Total Duration- 30hrs/week Total Credits-30</b>			
Subject code	Subject	Teaching Scheme			Examination Scheme			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Pap er	Oral				
K8401	Architectural Design-VII	1	9	10	40	-	60	100	1	9	10
K8402	Building construction and Material-VII	1	3	4	40	60	-	100	1	3	4
K8403	Theory of structures-VII	2	-	2	40	-	60	100	2	-	2
K8404	Interior Design I	1	3	4	40	-	60	100	1	3	4
K8405	Advance Landscape Architecture	1	2	3	40	-	60	100	1	2	3
K8406	Urban planning I	1	2	3	40	60	-	100	1	2	3
K8407	Building services-V	2	-	2	40	-	60	100	2	-	2
K8408	Elective-V	1	1	2	100	-	-	100	1	1	2
	<b>Total</b>	<b>10</b>	<b>20</b>	<b>30</b>	<b>380</b>	<b>-</b>	<b>420</b>	<b>800</b>	<b>10</b>	<b>20</b>	<b>30</b>

Elective V :Sustainable Architecture/Industrial architecture/Disaster management/Housings, etc

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

<b>Semester-VIII</b>								<b>Total Duration- 30hrs/week Total Credits-30</b>			
Subject code	Subject	Teaching Scheme			Examination Scheme			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
						Pap er	Oral				
K8409	Architectural Design-VIII	1	9	10	40	-	60	100	1	9	10
K8410	Building construction and Material-VIII	1	3	4	40	60	-	100	1	3	4
K8411	Vocabulary and Repertoire	1	2	3	40	-	60	100	1	2	3
K8412	Interior Design -II	1	3	4	40	-	60	100	1	3	4
K8413	Urban planning- II	1	2	3	40	60	-	100	1	2	3
K8414	Research Skills	1	3	4	40	-	60	100	1	3	4
K8415	Elective-VI	1	1	2	100	-	-	100	1	1	2
	<b>Total</b>	<b>10</b>	<b>20</b>	<b>30</b>	<b>340</b>	<b>-</b>	<b>360</b>	<b>700</b>	<b>07</b>	<b>23</b>	<b>30</b>

Elective VI : Conservation /Digital Architecture /Architectural software/ Real Estate Management , etc

**Structure & Examination Pattern of Fifth Year B.Arch**

<b>Semester-IX: Practical Training</b>								<b>Total Credits-30</b>			
Subject code	Subject	Teaching Scheme			Examination Scheme **			Credits			
		L	S	Total	I.A	U.E		Total	L	S	Total
K8501	Practical Training					Paper	Oral		100		
					40		60				
		-	-	-					-	-	30

Notations: L-Lectures, S-Studio

IA: Internal Assessment; UE: University Examination

Note 1: For practical training, a student is expected to work for standard office timings i.e. @ 8 hours a day and minimum five days per week. Student has to undergo minimum 15 -18 weeks (90 work days ) of training per semester. The credit requirement for practical training as per circular No.265, pt.II.8 is 24. Since a student will spend the entire semester learning at an office as an intern he/she will be given the 30 credits which are consistent with the 30 credits that are allotted to all other semesters.

Note 2: The work from practical training will be assessed after the student completes the internship in this semester.

Note 3: Validity of training shall be only for a year after completion of training.

<b>Semester-X</b>								<b>Total Duration-30hrs/week</b>				<b>Total Credits-30</b>			
Subject code	Subject	Teaching Scheme			Examination Scheme				Credits						
		L	S	Total	I.A	U.E		Total	L	S	Total				
K8502	Architecture Design Project	2	14	16	40		Paper		Oral	100	2	14	16		
						-		60							
K8503	Capstone project	1	5	6	40	-	60		100	1	5	6			
K8504	Professional Practice	2	2	4	40	60	-		100	2	2	4			
K8505	Self Study	1	3	4	100	-	-		100	1	3	4			
	<b>Total</b>	<b>06</b>	<b>24</b>	<b>30</b>	<b>220</b>	<b>60</b>	<b>120</b>	<b>400</b>	<b>06</b>	<b>24</b>	<b>30</b>				

# **Semester – I**

## Architectural Design -I

<b>Subject Code</b>	<b>K8101</b>	<b>Semester -I</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To acquire knowledge about elements of design and principles of design.
<b>2</b>	To explore and understand fundamentals of design central to architecture and space design.
<b>3</b>	To understand design as a composite process of elements, principles and fundamentals of design.

<b>A. Learning Outcomes: Student will be able to</b>	
<b>1</b>	explore elements of design, principles of design and fundamentals of design
<b>2</b>	assimilate the above three to understand comprehensive design process
<b>3</b>	learn and analyze built and/or non-built spaces with respect to above elements

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Elements, Principles and Fundamentals of Design</b> Introduction to <ul style="list-style-type: none"> <li>- different Elements of design,</li> <li>- Principles of design and</li> <li>- Fundamentals of Design</li> </ul>
<b>Unit II</b>	<b>Design Process: Function</b> <ul style="list-style-type: none"> <li>- Introduction to ‘human dimensions’ (anthropometry, modes of measurement)</li> <li>- Introduction to function and circulation of various building types</li> <li>- Demonstration the relationship of the above two with elements and principals of design (form, organization, movement, openings, linkages, etc)</li> </ul>
<b>Unit III</b>	<b>Design Process: Structure</b> <ul style="list-style-type: none"> <li>- Introduction to different structural systems</li> <li>- Introduction to components of structure</li> <li>- Introduction to structural behavior of different materials</li> </ul>
<b>Unit IV</b>	<b>Design Process : Context</b> <ul style="list-style-type: none"> <li>- Introduction to buildings and climate</li> <li>- Introduction to building and site</li> <li>- Introduction to building and orientation</li> <li>- Analyze and demonstrate relationship of context with elements and principles of design</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. ChingF. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons.</li> <li>2. Pramara V. S.(1997),<i>Design Fundamentals in Architecture</i>,New York, U.S.A., Somaiya Publications</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Editors of Phaidon Press (2004), <i>ThePhaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition.</li> <li>2. Pandya Y., VastuShilpa Foundation, (2013),<i>Elements of space making</i>, India, New Jersey, Mapin Publishing.</li> <li>3. Salvadori M., &amp; Robert H., (1975),<i>Structure in architecture: the building of</i></li> </ol>



	<i>buildings</i> , Cornell University, Prentice-Hall. 4. Gropius W., (1962), <i>Scope of Total Architecture</i> , New York, Collier book
<b>Websites:</b>	Drawing Guidelines – Shaping Space <a href="http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf">http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf</a>
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment (Any 3)</b>	
<b>1</b>	Analysis and study of design principles and elements using different kinds of examples of built and/or non-built spaces with help of sketches, photographs, drawings etc.
<b>2</b>	Study of structural systems, components of structures in built spaces.
<b>3</b>	Analysis of relationship between building and climate, building and site and orientation with the help of built and/or non-built environment with the help of sketches, photographs, drawings, etc.
<b>4</b>	Photo documentation and study of use of materials for various design components and design considerations.

## Building Construction and Materials-I

<b>Subject Code</b>	<b>K8102</b>	<b>Semester-I</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand the properties, characteristics, strength, processing and application of materials
<b>2</b>	To understand the different components of masonry construction

<b>Learning outcomes: Student will be able to</b>	
<b>1</b>	Explore materials, properties characteristics, methods of preservation, treatment and methods of construction and uses of different materials
<b>2</b>	Describe in detail the method of construction of superstructure with various masonry
<b>3</b>	Discuss different material used for fencing as well as for gates.
<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Introduction</b> <ul style="list-style-type: none"> <li>- Building construction as subject and its relevance to architectural design.</li> <li>- Introduction to various components of building from foundation to roof.</li> <li>- Basic structural systems load bearing and framed structure</li> </ul>
<b>Unit II</b>	<b>Study of Materials</b> Properties, various types, market form available, standard sizes, cost, application in buildings resource use, defects and strengths of each material <ul style="list-style-type: none"> <li>- Bricks and stones</li> <li>- Cement, Sand , aggregates</li> <li>- Mortar, Plaster, Pointing</li> <li>- Lime</li> </ul>
<b>Unit III</b>	<b>Superstructure Masonry</b> <ul style="list-style-type: none"> <li>- Fundamentals, principal of load bearing construction for medium rise structures using Brick, stone, Concrete Blocks, solid Blocks, Hollow Blocks, Cavity Block etc.</li> <li>- Introduction to various types and junctions of brick bond and types of stone masonry</li> </ul>
<b>Unit IV</b>	<b>Fencing And Entrance Gate</b> <ul style="list-style-type: none"> <li>- Fencing and compound wall construction in different materials like Barbed wire, Chain link, Wire mesh, R.C.C. Grills, M.S. Grills etc.</li> <li>- Constructional details of an entrance gate in a compound wall of following types: Sliding Gate, Entrance gate side hung with floor channel, Entrance gate side hung with wicket gate</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat, Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
<b>Reference Books:</b>	1. Varghese P.C.(2005) <i>Building Materials</i> . New Delhi, Prentice Hall of India put Ltd. 2. Duggal S.K.(1997) <i>Building materials</i> . New Delhi, Oxford and IBH

	publishing Co, put, Ltd 3. Spencke R. F.and Cook D.J.(1983) <i>Building Materials in Developing Countries</i> . New York,John Wiley and sons
<b>Websites:</b>	<b><a href="http://www.shannonmasonryconstruction.com">www.shannonmasonryconstruction.com</a></b>
<b>Journals:</b>	Construction and building materials -journal- else vier ( <a href="http://www.journals.elsevier.com/construction-and-building-materials/">www.journals.elsevier.com/construction-and-building-materials/</a> ) Journal of building construction and planning research ( <a href="http://www.scirp.org/journal/jbcpr/">www.scirp.org/journal/jbcpr/</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation.(Min.4drgs.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different designs in masonry construction and fencing designs for prescribed projects.(Under discretion of the subject faculty)

## Theory of Structure -I

<b>Subject Code</b>	<b>K8103</b>	<b>Semester-I</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand basic structural concepts
<b>2</b>	To understand behavior of different materials
<b>3</b>	To understand fundamentals of structure

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Develop understanding of basic requirements of stability, strength of materials
<b>2</b>	Develop understanding of behaviour of basic structural elements
<b>3</b>	Understand importance of basic structural elements in structural systems.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Introduction</b> Introduction to basic structural elements like column/post, beam, slab, load bearing walls. The load transfer mechanism. Introduction to dead load and live load. Simple calculation of dead load of one way slab and beam if their dimensions are known, in order to know how much load is transferred from each element
<b>Unit II</b>	<b>Supports</b> <ul style="list-style-type: none"> <li>- Types Of Supports And Load Transfer To The Supporting Element : Explain beams as a system in equilibrium and explain conditions of equilibrium (<math>\Sigma f_x</math>, <math>\Sigma f_y</math> and <math>\Sigma m = 0</math>)</li> <li>- Types of supports: roller hinged and fixed supports. Explain in which practical connection we idealize it as hinge/ roller/ fixed. (theory only)</li> <li>- Type of beams: simply supported, cantilever and overhanged beam. Calculating the reaction they transfer to the support. (calculation should include udl and point load standard cases</li> <li>- UDL over entire span</li> <li>- Point load at centre and eccentric</li> <li>- UDL near one support</li> <li>- Shear force and Bending Moment and its importance</li> </ul>
<b>Unit III</b>	<b>Properties Of Section</b> <ul style="list-style-type: none"> <li>- Centre of gravity – its importance</li> <li>- How to find CG of standard T, Channel, I, angle section and combination of such sections</li> </ul>
<b>Unit IV</b>	<b>Moment of Inertia</b> <ul style="list-style-type: none"> <li>- Moment of inertia – its importance</li> <li>- MI formulae of standard sections. Calculations for rectangle and circle, T, Channel, angle and I section using parallel axis theorem.</li> <li>- Section modulus and radius of gyration – definition.</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Mario Salvadori.(1980). <i>Why buildings stand up:The strength of architecture</i> .McGraw-Hill 2. Dongre A.P.(2011). <i>Strength of</i>

	<i>Materials</i> .Pune/Hyderabad,ScitechPublications
	3. Deo S.S.(2013). <i>Engineering Mechanics</i> .Pune,NiraliPrakashan 4. Deo S.S.(2013). <i>Strength of Materials</i> .Pune,NiraliPrakashan 5. S B Junnarkar& Dr. H J Shah,(2012). <i>Mechanics of Structures Vol. I &amp; II</i> .Anand,CharotarPublishing
<b>Reference Books:</b>	1. Beer and Johnston,(2008). <i>Mechanics of Materials</i> .New Delhi,Tata McGraw-Hill 2. Khurmi R.S.(2014). <i>Strength of Materials</i> .New Delhi,S.Chand& Company Ltd 3. Nash W.A.(1994)International edition <i>Strength of materials - III rd edition, (theory and problems)</i> .Singapore,McGraw-Hill book co. 4. Timoshenko Stephen.(2002). <i>Strength of materials part I &amp;II(elementary theory and problems) IIIrd ed</i> .New Delhi,CBS Publishers
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Calculate the load transferred on the supporting beam/ column for simply supported cantilever and overhang beam. (find reactions)
<b>2</b>	Study of various cross sections such T, C,L, I and O as various structural elements. Calculations of T,C, L ,I and o sections
<b>3</b>	Photo Documentation : various type of beams, various type of supports, various types of loads, various types of cross sections
<b>4</b>	Making models : various type of beams, various type of supports, various types of loads, various types of cross sections

## Creativity & Communication -I

<b>Subject Code</b>	<b>K8104</b>	<b>Semester -I</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	To understand elements of design and principles of design as a basic creative activity.
2	To study/analyze principles of organizations.
3	To develop artistic and architectural vocabulary for effective verbal and written communication.
4	To appreciate visual art forms like sculpture, paintings, calligraphy, caricatures etc.

<b>Learning Outcomes: Student will be able to</b>	
1	Explore basic elements of design and their expressions artistically
2	Explore principles of design and their expressions artistically
3	Understand and explore principles of organizations
4	Understand and develop artistic and architectural vocabulary

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Elements of Design</b> <ul style="list-style-type: none"> <li>- Introduction to Elements of design</li> <li>- Interpretation of points, lines and planes</li> <li>- Expressions through colors, textures and light</li> </ul>
<b>Unit II</b>	<b>Principles of Design</b> <ul style="list-style-type: none"> <li>- Introduction to Principles of Design</li> <li>- Theory on Lateral Thinking and exercise on generation of alternatives</li> <li>- Explorations of Principles of Design through 2D compositions</li> </ul>
<b>Unit III</b>	<b>Organization</b> <ul style="list-style-type: none"> <li>- Introduction to Organization</li> <li>- Explorations of Organization through 3D compositions</li> </ul>
<b>Unit IV</b>	<ul style="list-style-type: none"> <li>- Introduction to Visual arts (painting, sculpture, calligraphy etc.)</li> <li>- Understanding attributes of elements of visual and architectural aesthetics</li> <li>- Visual Arts appraisal</li> </ul>
<b>Unit V</b>	<b>Verbal and Written Communication</b> <ul style="list-style-type: none"> <li>- Exploration of different ways of verbal and written communication</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i>, New Jersey, John Willy and Sons</li> <li>2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Yatin Pandya (2014) <i>Elements of Space Making</i>, Ahmedabad, Mapin Publishing</li> <li>2. Shirish Vasant Bapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books</li> <li>3. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i>, Australia, Watson-Guptill Publications</li> <li>4. Bacon E.N. (1974) <i>Design of Cities</i>, England, Penguin Books</li> </ol>

	<p>5. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press</p> <p>6. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence King Publishing</p> <p>7. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books</p> <p>8. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i>, London, Grange Book Plc</p> <p>9. Edward De Bono (1990) <i>Lateral Thinking</i>, London, Penguin Books</p>
<b>Websites:</b>	<p>www.artinarch.org</p> <p>www.edwdebono.com</p>
<b>Journals</b>	

<b>Assessment</b>		<b>Marks</b>
<b>IA</b>	<b>Internal Assessment</b>	40
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>UE</b>	<b>University Examination</b>	60
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
Drawing portfolio consisting of relevant exercises including	
<b>1</b>	Self Portrait
<b>2</b>	Exercise on inter-relation of emotions and their expressions though lines and colors – in the form on thumb sketches or series of expressions explaining a story line OR creating a graphic strip explain a story OR creating a graphical story board for a concept
<b>3</b>	Exploration of textures in form of 3D models
<b>4</b>	Analysis of effects of different lighting conditions in architecture
<b>5</b>	Exploration of different generations of alternatives through modules
<b>6</b>	Exploration of Principles of Design based on 2D compositions of modules
<b>7</b>	Exploration of Vertical and Horizontal Planes based on modules to understand anthropometry
<b>8</b>	Exploration of Organization through 3D composition with solids like cubes, cuboids, pyramids, cones, cylinders, spheres etc.
<b>9</b>	Group work on Appreciation of Visual Arts
<b>10</b>	Exercise on verbal and written communication in the form of compilation of an architect's works and seminar presentation of the same or newspaper article etc.

## Architectural Drawings and Graphics-I

<b>Subject Code</b>	<b>K8105</b>	<b>Semester -I</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand visualization principles of various objects related to architecture.
<b>2</b>	To enable students to present in graphical form all building elements and free hand sketching.

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Develop skills in free hand sketching
<b>2</b>	Represent different forms, building elements and materials
<b>3</b>	Visualize and represent in Two-Dimension And Three-Dimension Graphic communication

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Basic skills of drafting</b> <ul style="list-style-type: none"> <li>- Lettering: Freehand architectural lettering.</li> <li>- Lines: Concept and types of lines, Dimension lines.</li> <li>- Drafting convention.</li> <li>- Study of Scales.</li> </ul>
<b>Unit II</b>	<b>Geometry</b> <ul style="list-style-type: none"> <li>- Geometrical constructions</li> </ul>
<b>Unit III</b>	<b>Represent 3D objects in 2 D</b> <ul style="list-style-type: none"> <li>- Definition, Meaning &amp; concept.</li> <li>- Projection of points, lines, planes and solids through orthographic projections to understand 2D building representation.</li> </ul> <b>Sections</b> <ul style="list-style-type: none"> <li>- To represent the building through sections</li> </ul>
<b>Unit IV</b>	<b>Three dimensional representation</b> <ul style="list-style-type: none"> <li>- Existing building views through sketching</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. F. D K. Ching (2009) <i>Architectural Graphics</i>, New Jersey, John and Wiley and Sons</li> <li>2. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i>, New York, Watson-Guptill Publications</li> <li>3. N.D.Bhatt (2012) <i>Engineering Drawing</i>, Gujrat, Charator Publishing House.</li> <li>4. Rangwala(1991)<i>Civil Engineering Drawing</i>, Gujarat, Charator Publishing House</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company</li> <li>2. David Littlefield (2012) <i>Matric Handbook</i>, London and New York, Routledge Taylor and Francis Group.</li> <li>3. Sleeper R.( 2000)<i>Architectural Graphic Standards</i>, New York, John Wiely and Sons.</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	



<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>UE</b>	<b>University Examination</b>	<b>60</b>
	Theory paper of 03 hours	

## Workshop –Model Making

<b>Subject Code</b>	<b>K8106</b>	<b>Semester -I</b>
<b>Credits</b>	<b>5</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To equip students with the basic skills necessary to represent their ideas in a model format using simple materials like paper, thermocol, hardwood, Metals, glass fiber etc.
<b>2</b>	To familiarize students with cutting, drilling, grinding, slotting, shaping, bending and measuring instruments, filing, scraping and fitting etc.; processes used in making models.

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Develop skills in making 2D and 3Dmodels.
<b>2</b>	Apply carpentry instruments and their uses.
<b>3</b>	Understand the importance of model making as a tool to represent ideas and visualize objects/ elements/structures in architecture.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Introduction to types of model</b> - Block models, detailed model, Construction Model and interior, Models etc.
<b>Unit II</b>	<b>Introduction to various materials</b> - Experimentation with these materials for different geometries and scales of models
<b>Unit III</b>	<b>Tools in model making</b> - Development of the skill to use the tools with precision to obtain desired results in model making.
<b>Unit IV</b>	<b>Exploration of Building materials</b> - Hands on approach

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press</li> <li>2. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence KingPublishing.</li> <li>3. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books</li> <li>4. Alexander Schilling, (2008)<i>Basics Model Building</i>, BostenBerlin,Birkhauser publishers for Architecture</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books.</li> <li>2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons.</li> <li>3. Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i>, New Jersey, John Willy and Son</li> </ol>
<b>Websites:</b>	www.artinarch.org
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	There is no 'University Examination' for this subjects	

<b>Assignments</b>	
<b>1</b>	Model making-design projects.
<b>2</b>	Model-Construction details.
<b>3</b>	Model -Creative Arts and crafts

## **Semester – II**

## Architectural Design -II

<b>Subject Code</b>	<b>K8107</b>	<b>Semester -II</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To develop communication and representation skills
<b>2</b>	To document spaces in graphic form
<b>3</b>	To explore concepts of space design with a focus on function and anthropometry

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Develop skills to understand and represent design ideas through graphic communication.
<b>2</b>	Learn to measure, document and represent spaces.
<b>3</b>	Understand and demonstrate a simple design responding to functional requirements and appropriate scale.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Measured Drawing</b> - Introduction and demonstration of modes of measurements and methods of documentation of built and/or non built spaces - Introduction and demonstration of different methods of representation
<b>Unit II</b>	<b>Analysis</b> - Study of function, circulation, scale and modes of measurement with respect to a specific activity.
<b>Unit III</b>	<b>Design Demonstration</b> - Design of single activity spaces reflecting understanding of the above.

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Batley C., (1948), <i>The design development of Indian architecture</i> , J. Tiranti, ltd. 2. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i> , New Jersey, Canada, John Wiley and sons. 3. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i> , Phaidon Press; Comprehensive Edition. 4. Pandya Y., VastuShilpa Foundation, (2013), <i>Elements of space making</i> , India, New Jersey, Mapin Publishing. 5. Thakkar J., & Morrison S., (2008) <i>Matra, Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , Ahmedabad, India, SID Research Cell 6. Radford W. A., (1921), <i>Architectural Details and Measured Drawings of Houses of the Twenties</i> , Courier Corporation. 7. Chitham R, (1980), <i>Measured Drawing for Architects</i> , originally from the University of Michigan, Architectural Press.
<b>Websites:</b>	Drawing Guidelines – Shaping Space <a href="http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf">http://www.riai.ie/downloads/education/pdf/ss_guidelines/drawing_guidelines.pdf</a> Pandya Y. & Tiwari. S., (nd), <i>An Ethnographic and Collaborative Model of Inquiry: Activity Centre Project in India</i> , Chapter 2, from <a href="http://www.springer.com/978-981-4585-10-1">http://www.springer.com/978-981-4585-10-1</a>
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Measured drawing of any structure relevant to the topic - Drawing Portfolio
<b>2</b>	Design of single activity unit with a demand of knowledge of function, circulation and anthropometry (e.g. Canteen, bus-stop, play school, library, clinic, boutique, etc.) – Drawing portfolio. Models to understand and explain the Designed Spaces.
<b>3</b>	Photo documentation and analysis of related / similar designed spaces.

## Building Construction and Materials-II

<b>Subject Code</b>	<b>K8108</b>	<b>Semester -I</b>
<b>Credits</b>	<b>5</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To involve students in a number of drawing exercises that will analyze the various building components in a simple load bearing structure.
<b>2</b>	To inform properties and characteristics of timber, its conversion, preservation and uses
<b>3</b>	To make students aware of various market forms of timber, their production, properties and application in the building industry

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Understand the different construction practices adapted for the various components of doors and windows to specific material in which it's made.
<b>2</b>	Understand the concept of opening and its construction techniques

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Door, Windows and Openings</b> <ul style="list-style-type: none"> <li>- Introduction to various hardware used for doors, window</li> <li>- Terminology and construction aspects of door ,windowand opening</li> </ul>
<b>Unit II</b>	<b>Spanning Of Opening</b> <ul style="list-style-type: none"> <li>- lintel and arch construction</li> <li>- Terminology of arch construction and load transfer</li> <li>- Construction and formwork for lintel and arch</li> <li>- Spanning of opening using brick and stone for various types of arches like flat, segmental, semi circular etc.</li> <li>- Spanning of opening using brick, stone, timber, built-up sections for lintel construction</li> </ul>
<b>Unit III</b>	<b>Doors</b> <ul style="list-style-type: none"> <li>- Design considerations, single and double shutters, party glazed and partly paneled shutters</li> <li>- Glazed, Paneled and Flush doors in wood. Types of Flush doors.</li> <li>- Ledged, braced and battened and framed door. ( Introduction)</li> <li>- Sliding and sliding- folding door in T.W. and Aluminum.</li> <li>- Steel Door Construction</li> <li>- Pressed sheet shutter</li> <li>- Box section frame and paneled shutter</li> <li>- Rolling shutter</li> <li>- Collapsible gates</li> <li>- Safety or Grilled doors</li> </ul>
<b>Unit IV</b>	<b>Windows</b> <ul style="list-style-type: none"> <li>- Underline principles for appropriate selection and application of different type of wooden windows &amp; steel windows.</li> <li>- Paneled, fixed and partly and fully glazed and louvered, centrally pivoted, top hung windows, Side hung windows in wood.</li> <li>- Bay windows in wood</li> <li>- Steel window using 'Z' section</li> <li>- Steel window using Box section &amp; of proprietary nature</li> </ul>

<b>Unit V</b>	<b>Study of Materials</b> <ul style="list-style-type: none"> <li>- Timber and Bamboo</li> <li>- Various timber joints</li> <li>- Hollow concrete block</li> <li>- Reinforced Brick work</li> </ul>
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<b>Learning Resources</b>	
<b>Text Books:</b>	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
<b>Reference Books:</b>	1. Don A. Watson, (1972) <i>Construction Materials and Processes</i> , New York, McGraw Hill. 2. WB Mackey, (1981) <i>Building construction, Vol 1,2</i> .UK, Longman UK. 3. Francisa D.K. Ching(2000) <i>Building Construction Illustrated</i> .NewYork,John Wiley & Sons.
<b>Websites:</b>	<a href="http://www.slideshare.net/parteeeks9/doors-windows-12082151">http://www.slideshare.net/parteeeks9/doors-windows-12082151</a> (doors n windows)
<b>Journals:</b>	The open construction and Building Technology journal (benthamopen.com/tobctj/home)

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b> Assignments or portfolios based on entire syllabus as mentioned below.	<b>60</b>

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation.(min.4 drawings.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different designs in door and window construction and opening designs for prescribed projects (Under discretion of the subject faculty).



## Theory of Structures-II

<b>Subject Code</b>	<b>K8109</b>	<b>Semester -II</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand forces acting on members
<b>2</b>	To understand properties and behaviour of different materials
<b>3</b>	To understand shear and bending stresses

<b>B. Learning Outcomes: Student will be able to</b>	
<b>1</b>	Develop understanding of stresses and strains on members.
<b>2</b>	Develop understanding of properties of basic structural materials.
<b>3</b>	Understand importance of consideration of shear forces.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Stress and Strain</b> - What is stress (axial, bending and shear), strain. - Calculation of axial stress, strain for composite material like RCC.
<b>Unit II</b>	<b>Bending Stress</b> - Calculation of bending stress using formulae for standard sections. T,C, L and I - What is combination of axial and bending stress,for a masonry column and base of retaining wall for stability.
<b>Unit III</b>	<b>Shear Stress Calculation</b> - Calculation of shear stress using formulae for standard sections. T, C, L and I.
<b>Unit IV</b>	<b>Elastic constants and stresses</b> - Structural properties: Elasticity, maximum Permissible Tensile/compressive stress, bending stress and shear stress for various materials like timber, masonry, concrete and steel. Explain the difference between behaviour of a ductile material like steel and brittle material like concrete subjected to tensile force. ( stress-strain curve and Hooke's law).

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Khurmi R.S.(2014)<i>Strength of Materials</i>. New Delhi, S.Chand&amp; Company Ltd.</li> <li>2. Nash W.A.(1994)International edition <i>Strength of materials - III rd edition, (theory and problems)</i>.Singapore, McGraw-Hill book company.</li> <li>3. Timoshenko Stephen.(2002)<i>Strength of materials part I. (elementary theory and problems) IIIrd ed</i>. New Delhi, CBS Publishers..Timoshenko Stephen.(2002)<i>Strength of materials part II (elementary theory and problems) IIIrded</i>.NewDelhi,CBS Publishers.</li> <li>4. Bansal R. K.(2014) <i>A text book of strength of materials</i>.</li> <li>5. Singhal S.B.&amp;Narayan.R. <i>Materials and structures (vol-I) Strength of materials</i>. New Delhi, R.Chand&amp; Company Ltd.</li> <li>6. Warnock F.V. <i>Strength of Materials with ED</i>. London, Sir Isaac Pitman &amp; Sons.Ltd.</li> </ol>

	7. RamamruthamS.Narayan.R. (2009) <i>Theory of Structures</i> . New Delhi, Dhanpatrai Publications P.Ltd. 8. RamamruthamS.Narayan.R.(2014) <i>Theory of Structures (for Engineering Degree ,Diploma)</i> .New Delhi, Dhanpatrai Publications P.Ltd.
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Numerical problems on calculation of axial stress and strain in composite elements.
<b>2</b>	Numerical problems on calculation of bending stress in beams and columns.
<b>3</b>	Numerical problems on calculation of combined stresses
	Photo Documentation: structural damages due to excessive stresses, identifying the reasons of damages.

## Creativity & Communication-II

<b>Subject Code</b>	<b>K8110</b>	<b>Semester -II</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand volume and form.
<b>2</b>	To study/analyze scale and proportions
<b>3</b>	To appreciate performing art forms like films, theatre, dance etc

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Explore volume and form as basic elements of design
<b>2</b>	Understand scale and proportion and their impact on spaces
<b>3</b>	Appreciate performing arts

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Volume and Form</b> - Introduction to Attributes of Form and Space - Understanding derivatives of form - Volumetric Study of Spaces – positive and negative spaces
<b>Unit II</b>	<b>Scale and Proportion</b> - Theory on Scale and Proportion - Exploration of Scale and Proportion through 2D and 3D mediums
<b>Unit III</b>	<b>Performing Arts Appraisal</b> - Introduction to Performing arts (films, theatre, dance etc.) - Understanding attribute of elements of performing arts
<b>Unit IV</b>	<b>Communication through performing art</b> Exploration of different ways of communication through performing art

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i> , New Jersey, John Willy and Sons 2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons 3. Yatin Pandya (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing 4. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i> , Pune, Bela Books 5. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i> , Australia, Watson-Guptill Publications 6. Bacon E.N. (1974) <i>Design of Cities</i> , England, Penguin Books 7. Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press 8. Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing 9. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i> , United Kingdom, Acropolis Books 10. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i> ,

	London, Grange Book Plc 11. Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books
<b>Websites:</b>	www.artinarch.org www.edwdebono.com
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
Drawing portfolio consisting of relevant exercises including	
<b>1</b>	Understanding Volume as an element of design and exploration of positive and negative spaces in a volume or 3D composition
<b>2</b>	Exercise on exploration of derivatives of form
<b>3</b>	Understanding theory of scale and proportions and representing the same through study of anthropometry of spaces
<b>4</b>	Group work on Documentary/ Film as Performing Arts appraisal

## Architectural Drawings and Graphics-II

<b>Subject Code</b>	<b>K8111</b>	<b>Semester -II</b>
<b>Credits</b>	<b>5</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To develop perception and presentation of different forms and their spatial dimension.
<b>2</b>	To develop rendering techniques and presentation skill

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Visualize three Dimensional representations of complex objects and to relate the graphics content with Architectural Design.
<b>2</b>	Explore Rendering technique skills with various media, incorporating sciography and creating three-dimensional effects.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Three dimensional representation</b> - Isometric, axonometric and oblique view of solid composition and building.
<b>Unit II</b>	<b>Interpenetration of solids</b> - Interpenetration of various solids and its relation in building design.
<b>Unit III</b>	<b>Presentation of drawings</b> - Rendering technique with various media.
<b>Unit IV</b>	<b>Sciography</b> - Introduction of sciography. - Representation of Shade and shadows in plans and elevations.

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company</li> <li>2. F. D K. Ching (2009) <i>Architectural Graphics</i>, New Jersey, John and Wiley and Sons.</li> <li>3. Francis DK Ching (1989) <i>Drawing A Creative Process</i>, Van Nostrad Reinhold</li> <li>4. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i>, New York, Watson-Guptill Publications.</li> <li>5. .N.D.Bhatt(2012) <i>Engineering Drawing</i>, Gujarat, Charator Publishing House</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Calvin F. Schmid, Stanton E. Schmid, (1954) <i>Handbook on Graphic Presentation</i>, New York, The Ronald Press Company</li> <li>2. David littlefield (2012) <i>Matric Handbook</i>, London and New York, RoutledgeTaylor and Francis Group.</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper of 03 hours	<b>60</b>

## History of Architecture-I

<b>Subject Code</b>	<b>K8112</b>	<b>Semester -II</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand development of architecture as a process of contextual and cultural evolution rather than simply as a product.
<b>2</b>	To acknowledge and interpret from history, best design guidelines which respond aptly to the vernacular character of that place, the lifestyle of the users and building traditions of that time.
<b>3</b>	To gain knowledge of the development of architectural form with reference to Technology, style and character.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Discuss Geography, Politics, Economy, Social Systems, Religion, Paintings and Sculptures and its influence on Architecture at different periods of time.
<b>2</b>	Explore cultures and civilizations and settlements across the world

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Pre-historic</b> <ul style="list-style-type: none"> <li>- Housing forms in the initial phase: Cave shelters- at Lascaux, Terra Amata</li> <li>- Community structures: Menhir, dolmen, gallery and passage graves, Stonehenge, Ggantija Malta</li> </ul>
<b>Unit II</b>	<b>River Valley Civilizations</b> <ul style="list-style-type: none"> <li>- Yellow River</li> <li>- Indus River</li> <li>- Nile River</li> <li>- Tigris River</li> </ul>
<b>Unit III</b>	<b>Vedic Architecture</b> <ul style="list-style-type: none"> <li>- Vedic culture and town planning layouts, Vedic Village, City Planning in later Vedic period, Building materials and construction techniques.</li> </ul> <b>Buddhist Phase</b> <ul style="list-style-type: none"> <li>- Major typologies – Stambha, Stupa, Chaitya, Vihara.</li> <li>- Development of Chaitya arch - Lomas Rishi, AshokanStambhas, The Great Stupa at Sanchi, Chaitya Hall at Karli, Viharas at Ajanta</li> </ul>
<b>Unit IV</b>	<b>Greek Civilization</b> <ul style="list-style-type: none"> <li>- History, evolution and characteristics Elements of special attributes: Classical Orders, Optical corrections – Acropolis, City of Athens</li> <li>- Major typologies</li> <li>- Temples, Theatres, Agora, Stoa, Council Halls</li> </ul>
<b>Unit V</b>	<b>Roman Civilization</b> <ul style="list-style-type: none"> <li>- History, evolution and characteristics Elements of special attributes:</li> <li>- Arches, lintels, bridges, aqueducts, Roman engineering skills</li> <li>- Major typologies</li> <li>- Temples- Pantheon, Basilica at Trajan, Amphitheatre, Hippodrome, Circus, Palaces, Thermae at Carcalla</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Sir Banister Fletcher, (1999) <i>A History of Architecture, Indian Edition</i>. Delhi, CBS Publications.</li> <li>2. Spiro Kostof, (1985) <i>A History of Architecture: Setting and Ritual</i>. London, Oxford University Press.</li> <li>3. Leland M Roth, (1994) <i>Understanding Architecture: Its Elements, History and Meaning</i>. Craftsman House;</li> <li>4. Pier Luigi Nervi, General Editor, (1972) <i>History of World Architecture – Series</i>. New York, Harry N. Abrams Inc. Pub.</li> <li>5. Burns, Ralph, Lerner, Meacham, (1991) <i>World Civilizations</i>. First Indian Edition, Delhi, Goyal Saab Publishers and Distributors.</li> <li>6. Roger Smith, (1987) <i>An Illustrated history of Architectural Styles</i>.</li> <li>7. Omega Books Ltd.</li> <li>8. Sebastiano Serlio, (1982) <i>The five books on architecture</i>. New York, Dover Publication Inc.</li> <li>9. Percy Brown, (1983) <i>Indian Architecture (Hindu And Buddhist)</i>. Bombay, Taraporevala and Sons.</li> <li>10. Denis Montagnon, (2001) <i>Rome</i>. ISBN 3-8228-5870-6. Germany, TashchenGmnH</li> <li>11. Satish Grover, (2003) <i>The Architecture of India (Buddhist and Hindu Period)</i>. New Delhi, Vikas Publishing Housing Pvt. Ltd.</li> </ol>
<b>Websites:</b>	<p>www.ancient.eu/Roman_Architecture/            www.slideshare.net/mfresnillo/roman-architecture-398210            www.slideshare.net/mfresnillo/greek-architecture            architecture.pppst.com/greek.htm            msroseclass.weebly.com/uploads/2/5/9/.../ms_rose_greek_architecture.pp.            http://www.slideshare.net/kabithamadhu/vedic-age</p>
<b>Journals:</b>	<p>JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah)            Architectural Heritage-Edinburgh University Press            (www.euppublishing.com/journal/arch)            Architectural History (journal.eahn.org/)</p>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Climatology and Climate Responsive Architecture

<b>Subject Code</b>	<b>K8113</b>	<b>Semester -II</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand climate and its impact on architectural design.
<b>2</b>	To understand co-relation between climate and other environmental parameters and built form at individual and settlement level
<b>3</b>	To understand the use of surrounding environment as one of the strategic design parameters.

<b>C. Learning Outcomes: Student will be able to-</b>	
<b>1</b>	Familiarize with climatological influences on built environment and comfort conditions for inhabitants.
<b>2</b>	Explore design principles in different climatic zones

<b>Units</b>	<b>Content</b>
<b>Unit I</b>	<b>Basic Climatology</b> <ul style="list-style-type: none"> <li>- Introduction: To climate, weather, earth, sun relationship. Global, Macro and Micro climate. Importance of climate in architecture.</li> <li>- Elements of climate: Temperature, rainfall, humidity, wind, solar radiation etc.</li> </ul>
<b>Unit II</b>	<b>Basic Climatology</b> <ul style="list-style-type: none"> <li>- Human Comfort:</li> <li>- Human heat balance and comfort, thermal comfort and means of thermal comfort, heat stress, effective temperature, bioclimatic chart, subjective variables</li> <li>- Thermal Comfort Indices</li> <li>- Active &amp; Passive means of thermal control: Degree of control</li> </ul>
<b>Unit III</b>	<b>Basic Climatology</b> <ul style="list-style-type: none"> <li>- Structural control : Shadow formation, sun control and shading devices</li> <li>- Ventilation &amp; Air movement: Study of ventilation &amp; its functions in buildings, air flow through buildings, position &amp; size of opening</li> </ul>
<b>Unit IV</b>	<b>Climate Responsive Architecture</b> <ul style="list-style-type: none"> <li>- Study of nature of climate, its physiological objectives and design criteria's and discomfort indices. Planning of internal and external spaces, surface treatments and openings etc. for various climatic zones</li> <li>- Case Study of a contemporary or traditional shelter in the given climate</li> <li>- Study of traditional /vernacular architecture from various climatic zones (Hot and Dry; Warm and Humid; Composite; Cold –Dry, Cold-wet)</li> <li>- Study of effect of orientation, topography, vegetation, form, building material and surfaces on building design in response to climate</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Koenigsberger, Ingersoll, Mayhew, Szokolay, (1996) Manual of Tropical Housing and Building - Climatic Design, Orient Longman Limited
<b>Reference Books:</b>	2. G. Z. Brown and Mark Dekay, John Wiley and Sons, (2001) Sun, Wind and Light, 2nd Edition, New York



	<p>3. Baruch Givoni,(1976) Man, Climate and Architecture, U. K., Applied science Publishers, 2nd Edition</p> <p>4. T. N. Sheshadri,(2001) Climatological and Solar Data for India, Meerat, SaritaPrakashan</p> <p>A. Krishan,(2001), Climate Responsive Architecture, Tata Mcgraw Hill</p>
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment</b>	
<b>1</b>	Case study of a climate responsive building
<b>2</b>	Study of shading devices in a building.
<b>3</b>	Performance of openings for light and ventilation
<b>4</b>	Site-Analysis (Climatic context) considering various climatic elements.

## Workshop-Model Making and Building Appraisal

<b>Subject Code</b>	<b>K8114</b>	<b>Semester -II</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand appreciation in architecture.
<b>2</b>	To understand how to read a building.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Explain building using architecture language.
<b>2</b>	Analyses components of the building.
<b>3</b>	Represent same building in model format.
<b>4</b>	Apply model making as a tool of expression.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Aspects of appraisal</b> - Aesthetics, Technical, Financial, Economic, Environmental and anthropological appraisals.
<b>Unit II</b>	<b>Art consciousness</b> - Aesthetics, perception, symbolism, expression, style, fashion, appropriateness and values.
<b>Unit III</b>	<b>Building Appraisal</b> - Understanding the meaning of appreciation and its normative criteria such as Form, space, site, function, structure etc.
<b>Unit IV</b>	<b>Analysing design</b> - Identification of place, Basic and modifying elements of architecture, geometries, Themes in Spatial organization - Appreciation of designer skills, theories of perception and variability of perception.
<b>Unit V</b>	<b>Model Making</b>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Simon Unwin (2009). <i>Analysing Architecture</i> third edition, revised and enlarged. USA and Canada by Routledge
<b>Reference Books:</b>	1. Corol Davidson cragoe(2008). <i>How to read building: A crash course in architectural styles</i> .NewYork,Rizzoli. 2. John Mittendorf and Dave Dodson (2015). <i>The art of readingbuilding</i> .USA.Penwell Cooperation. 3. Corol Davidson cragoe(2008). <i>How to read building: A crash course in architecture</i> New York, Herbert press Ltd
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	<b>There is no 'University Examination' for this subjects</b>	

<b>Assignment</b>	
<b>1</b>	Building appraisal Essay/report with sketches /Photographs
<b>2</b>	Model of a structure

## **Semester – III**

## Architectural Design -III

<b>Subject Code</b>	<b>K8201</b>	<b>Semester -III</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To study and explore properties and behavior of different structural materials
<b>2</b>	To introduce students to a design process with a focus on materials and structural systems
<b>3</b>	To develop capacity of third dimensional thinking in students
<b>4</b>	To understand the process of multi activity space designing

<b>Learning Outcomes: students will be able to</b>	
<b>1</b>	Make appropriate choice of material based on the requirements of the design project
<b>2</b>	Explore properties of a particular material to its fullest.
<b>3</b>	visualize and think in third dimension and translate it into two dimensional design
<b>4</b>	synthesize and reflect analytical understanding of multi activity spaces into Architectural Design

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Exposure to Materials</b> - Introduction and knowledge of different materials and innovative structural systems
<b>Unit II</b>	<b>Exploration of Forms</b> - Exploration of innovative forms of structures based on the behavior of materials
<b>Unit III</b>	<b>Design Demonstration</b> - Introduction to a complex multi activity space design - Demonstrating the best use of the studied material/s in this space

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books</b>	<ol style="list-style-type: none"> <li>1. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons.</li> <li>2. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition.</li> <li>3. Salvadori M., &amp; Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall</li> <li>4. Shankar P., (2014) <i>Himalayan Cities: Settlement Patterns, Public Places and Architecture</i>, New Delhi, India, USA, Canada, Niyogi Books.</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>
	Refer To 'Rule number 6, sub point 6.2.2.'
<b>U.E.</b>	<b>University Examination</b>
	<b>60</b>

	Assignments or portfolios based on entire syllabus as mentioned below.	
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<b>Assignment</b>	
<b>1</b>	Analysis of different materials and structural systems through research and market surveys
<b>2</b>	Experimentation with models to explore properties, strengths, weaknesses, possibilities of different configurations of chosen materials (application of lateral thinking process)
<b>3</b>	Drawing portfolio for design of a complex multi activity space design (e.g., bungalow of some celebrity or professional, a small neighborhood shopping, primary health clinic, departmental store, small scale community housing, etc.

## Building Construction and Materials-III

<b>Subject Code</b>	<b>K8202</b>	<b>Semester-III</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To involve students in a number of drawing exercises that will analyze the Various building components in a simple framed structure.
<b>2</b>	To inform the properties and characteristics of different roofing and flooring materials

<b>Learning outcomes: Student will be able to</b>	
<b>1</b>	Understand the construction techniques of different building components like staircase and roof.
<b>2</b>	Acquire the knowledge of different flooring materials and its construction techniques.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Staircase</b> <ul style="list-style-type: none"> <li>- Design Consideration</li> <li>- Principles and components of staircase</li> <li>- Types of staircases</li> <li>- Staircase in Timber, steel and stone</li> </ul>
<b>Unit II</b>	<b>Roof</b> <ul style="list-style-type: none"> <li>- Timber Roofs: General idea of various forms in timber for different spans. General information of timber trusses, fixing of Mangalore tiles.</li> <li>- Steel roofing: Simple ridge roof trusses for various spans, design consideration, advantages, Connections of various members supported on RCC column, Brick piers, fixing of G.I. and A.C. and Aluminum sheets, gutter types, wind bracing etc.</li> <li>- Steel North light Roofing system: Connections, Gutters, paneled glazing etc.</li> <li>- Steel Monitor roofs: on steel Stanchions, Connections, Gutters, paneled glazing etc.</li> <li>- R.C.C. roofing types: Flat slabs (one way and two ways), vaults, domes, Grid slabs.</li> <li>- Masonry vaults and domes</li> </ul>
<b>Unit III</b>	<b>Floors</b> <ul style="list-style-type: none"> <li>- Specialized timber flooring for: - Dance halls, Sports halls etc.</li> <li>- Parquet flooring details.</li> <li>- General idea of timber floors in relation to spans, load transmission, Jack arch and composite floors.</li> <li>- Flooring &amp; paving materials such, IPS Finish, Mosaic Tiles, and Plain Cement Tiles. Natural stones like Shahabad, Tandoor, Kota, Kadappa, Marble, Granite, etc.</li> <li>- Glazed and Ceramic Tiles, PVC Rubber, Linolium, Carpet etc</li> </ul>

<b>Unit IV</b>	<b>Study of Materials</b> <ul style="list-style-type: none"> <li>- Roofing materials.</li> <li>- Different flooring materials.</li> <li>- Importance of water proofing, its need in building construction.</li> <li>- Traditional and modern systems of water proofing and various water proofing materials available in the market</li> </ul>
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<b>Text Books:</b>	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
<b>Reference Books:</b>	1. Don A. Watson,(1972) <i>Construction Materials and Processes</i> , New York, McGraw Hill. 2. WB Mackey,(1981) <i>Building construction, Vol 3,4</i> .UK, Longman UK.
<b>Websites:</b>	<a href="http://www.slideshare.net/mohdhasrimohdhasim/superstructure-construction">www.slideshare.net/mohdhasrimohdhasim/superstructure-construction</a>
<b>Journals:</b>	Journal of construction engineering, technology <a href="http://stmjournals.com/index.php?journal=jocetm">stmjournals.com/index.php?journal=jocetm</a> Master builder -construction magazine, construction news( <a href="http://www.masterbuilder.co.in">www.masterbuilder.co.in</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different design in staircase for prescribed projects. (Under discretion of the subject faculty)



## Theory of Structure -III

<b>Subject Code</b>	<b>K8203</b>	<b>Semester-I</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand types-indeterminate and analysis of structures
<b>2</b>	To understand behavior of different structural elements

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	develop understanding of basic requirements of framed structure
<b>2</b>	develop understanding of behaviour of basic structural elements
<b>3</b>	understand importance of basic structural elements in structural systems

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Shear force and bending moment diagram</b> - Simply supported beams, cantilever beams and overhang beams for simple combinations of the cases mentioned in segment 1.
<b>Unit II</b>	<b>Deflection in beams</b> - Using formulae for standard cases simply supported and cantilevers reaction of propped cantilever. Maximum and zero deflection conditions for simply supported and cantilever beams. Factors affecting deflection. Importance of deflection in design of structural elements.( no complicated problems with double integration
<b>Unit III</b>	<b>Introduction to arches</b> - Two hinged and three hinged. Differentiate between beam and arch action. (no problems) - Suspension structures: their behaviour and sample analysis. (no problems)
<b>Unit IV</b>	<b>Fixed beams</b> - Concept of fixity and end moments using formulae.Deflected shape and placement of steel. (no analysis) - Continuous beams Concept of continuity and moments using co-efficients from IS 456, concept of distribution of moments based on stiffness only explanation (no analysis by moment distribution method)

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Dongre A.P. (2011) <i>Strength of Materials</i> .Pune/Hyderabad,Scitech Publications. 2. Deo S.S.(2013) <i>Strength of Materials</i> .Pune,NiraliPrakashan. 3. S B Junnarkar and Dr. H J Shah.(2012) <i>Mechanics of Structures Vol. I &amp; II</i> .Anand,Charotar Publishing house.
<b>Reference Books:</b>	1. Parikh Janak P. (2002) <i>Understanding the concept of structural design and analysis</i> .Anand,Charotar Publishing house. 2. PanditG.S.Gupta S.P.(2002) <i>Structural analysis a matrix approach</i> .New Delhi, 3. Tata McGraw-Hill Publishing company limited. 4. Varghese P.C.(2001) <i>Limit state design of reinforced concrete</i> .New Delhi,Prentice-Hall of India.
<b>Websites:</b>	

<b>Journals:</b>	
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<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment</b>	
<b>1</b>	Problems of SFD, BMD
<b>2</b>	Deflection (limited to the standard load cases mentioned in segment 1) deflection problems using formulae, study of behavior of Arches, suspension bridges
<b>3</b>	Behavior of fixed and continuous beams.
	Making models of fixed beam, continuous beams, arches, suspension bridges, tensile structures, deflection of long span structures.

## Creativity & Communication -III

<b>Subject Code</b>	<b>K8204</b>	<b>Semester -III</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To enhance creative skills with different techniques and sources of inspiration.
<b>2</b>	To enhance digital communication skills.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Understand various methods of improving creative skills.
<b>2</b>	Use different sources of inspiration to improve creative skills.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Techniques for improving Creativity</b> - Brainstorming, Lateral Thinking, Random Combinations, Use of Manipulative Verbs, Tree of Possibilities, Abstraction, Transformation, Use of the Ridiculous, Matrix of Ideas, Role of Memory and Experience
<b>Unit II</b>	<b>Sources of inspiration for Creativity</b> - Material, Geometry, History, Nature & Climate, Mimesis, Multicultural, Association with other arts, Biographies, Fantasy.
<b>Unit III</b>	<b>Graphical Communication</b> - Introduction and application of computer software for graphical communication

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i>, New Jersey, John Willy and Sons</li> <li>2. Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i>, New Jersey, John Willy and Sons</li> <li>3. Yatin Pandya (2014) <i>Elements of Space Making</i>, Ahmedabad, Mapin Publishing</li> <li>4. ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i>, Pune, Bela Books</li> <li>5. Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i>, Australia, Watson-Guptill Publications</li> <li>6. Bacon E.N. (1974) <i>Design of Cities</i>, England, Penguin Books</li> <li>7. Akiko Busch (1991) <i>The Art of Architectural Models</i>, Hong Kong, Design Press</li> <li>8. Nick Bunn (2010) <i>Architectural Model Making</i>, London, Laurence King Publishing</li> <li>9. Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i>, United Kingdom, Acropolis Books</li> <li>10. Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i>, London, Grange Book Plc</li> <li>11. Edward De Bono (1990) <i>Lateral Thinking</i>, London, Penguin Books</li> </ol>
<b>Websites:</b>	www.artinarch.org www.edwdebono.com
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination-</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
	Drawing portfolio consisting of relevant exercises including –
<b>1</b>	Any two exercises to demonstrate Techniques for improving Creativity (2D and 3D)
<b>2</b>	Any two exercises to explore Sources of inspiration for Creativity (2D and 3D)
<b>3</b>	One exercise to demonstrate Graphical Communication
	(The nature of exercises will depend on the focus of the studio)

## Architectural Drawings and Graphics-III

<b>Subject Code</b>	<b>K8205</b>	<b>Semester -III</b>
<b>Credits</b>	<b>5</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand the relation between depth of building elements and shades and shadows.
<b>2</b>	To understand three - dimensional view of architectural projects

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Represent Sciography in Plan and Elevation of Architectural design project
<b>2</b>	Sketch perspective of Interior and Exterior.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Sciography</b> - Sciography in buildings. - Projection of sciography in plan and elevation
<b>Unit II</b>	<b>Perspective</b> - Anatomy of perspective: Station point, Eye level, Cone of vision, Picture plane, Horizon line, Ground line, Vanishing points. - Types of perspectives: One point, Two point, Three point
<b>Unit III</b>	<b>Perspective</b> - Perspective drawing by, Measuring pt. method, directs projection method Grid method etc - Perspectives of simple and complex blocks - Perspectives of simple household furniture items. - Perspectives of interiors - Perspectives of Residences
<b>Unit IV</b>	<b>Sciography in perspective</b>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. F. D K. Ching (2009) <i>Architectural Graphics</i>, New Jersey, John and Wiley and Sons.</li> <li>2. Francis D K Ching (1989) <i>Drawing a creative process</i>, Van Nostrad Reinhold</li> <li>3. Hugh C. Browing (1996) <i>The Principles of Architectural Drafting</i>, New York, Watson-Guptill Publications.</li> <li>4. Rangwala(1991)<i>Civil Engineering Drawing</i>, Gujarat, Charotor Publishing House.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Gill R.W.(2011) <i>Rendering with Pen and Ink</i>, London, Thames &amp;Hudson ltd.</li> <li>2. Sleeper R. (2000)<i>Architectural Graphic Standards</i>, New York, John Wiely and Sons.</li> </ol>
<b>Websites:</b>	<a href="http://www.assignmenthelp.net/sciography-of-geometrical">http://www.assignmenthelp.net/sciography-of-geometrical</a>
<b>Journals:</b>	

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>40</b>
	20
	Refer To 'Rule number 6, sub point 6.2.2.'

<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>		
<b>I.A. Assignments</b>		
<b>1</b>	Sem II AD Project to be presented with 2 point Perspective using any method.	
<b>2</b>	Sciography of overhangs, stairs porticos pergolas to be enhanced on vertical, horizontal and curved surfaces.	
<b>U.E. Assignments</b>		
<b>3</b>	Drawing portfolio - Adequate number of drawings covering all the units.	

## History of Architecture-II

<b>Subject Code</b>	<b>K8206</b>	<b>Semester -III</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand development of architecture as a process of contextual and cultural evolution rather than simply as a product.
<b>2</b>	To acknowledge and interpret from history, best design guidelines which respond aptly to the vernacular character of that place, the lifestyle of the users and building traditions of that time.
<b>3</b>	To gain knowledge of the development of architectural form with reference to technology, style and character

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Explore Geography, Politics, Economy, Social Systems, Religion, Paintings and Sculptures and its influence on Architecture at different periods of time.
<b>2</b>	Acquire knowledge of the development of architectural form with reference to technology, style and character in the Indian context through the evolution of the temples, mosques and tombs in the various phases of Hindu and Islamic rule in India.
<b>3</b>	Acquire knowledge of the development of architectural form with reference to technology, style and character in the Western World through the evolution of the church from early Christian phase up to the Renaissance period

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<p><b>Architecture in Indian sub-continent-Hindu Temple Architecture</b></p> <ul style="list-style-type: none"> <li>- Evolution of architectural style, major influences on development of form and other architectural elements.</li> <li>- Gupta and early Chalukyan style</li> <li>- Gupta temple, Tigawa, Dasavatara Temple, Deogarh, Ladkhan and Durga temples, AiholeVirupaksha temple, Pattadakkal, Papanath temple, Pattadakkal, Cave temple, Badami, Kailash Temple, Ellora</li> </ul> <p><b>Dravidian style</b></p> <ul style="list-style-type: none"> <li>- Pallava - Rathas, Mamallapuram, Shore temple, Mamallapuram</li> <li>- Chola - Brihadeswara temple, Thanjavur</li> <li>- Hoysala - Keshava temple, Somnathpur</li> <li>- Vijayanagara - Vitthalaswami temple, Hampi, column orders</li> <li>- Madura - Meenakshi temple, Madurai, Sriranganathaswami temple, Srirangam</li> </ul> <p><b>Indo Aryan Style</b></p> <ul style="list-style-type: none"> <li>- Orissa - Parasurameswara, Mukteswara, Lingaraja temples, Bhubaneswar, Sun temple, Konark</li> <li>- Khajuraho - KandariyaMahadeo temple, Khajuraho</li> <li>- Gujarat - Sun temple, Modhera</li> </ul> <p><b>Jain School</b></p> <ul style="list-style-type: none"> <li>- Vimal Shah at Mount Abu, Chaumukh at Ranakpur</li> </ul>
<b>Unit II</b>	<p><b>Architecture in Indian sub-continent -Islamic Architecture in India</b></p> <ul style="list-style-type: none"> <li>- A brief introduction to origin and characteristics of Islamic architecture: building types, elements, structural systems, construction techniques</li> </ul>

	<p><b>Imperial style of Delhi</b></p> <ul style="list-style-type: none"> <li>- Slave dynasty</li> <li>- Quwat-ul-Islam Mosque, QutbMinar, Khirki Masjid, Sultan Ghari, Tomb of Iltumish, Tomb of Balban</li> <li>- Khilji Dynasty</li> <li>- Alai Darwaza., JamatKhana masjid</li> </ul> <p><b>Provincial styles: (any two provinces)</b></p> <ul style="list-style-type: none"> <li>- Punjab,Sind,Bengal,Gujrat,Kashmir,Jaunpur,Malwa,Deccan</li> <li>- Mosque: Jami – Ahmedabad, Champaner and Gulbarga</li> <li>- Tomb: GolGumbaj, Ibrahim Rauza, Bijapur</li> <li>- Civic work: Dada Hari stepped well, Adalaj</li> </ul> <p><b>The Mughal phase</b></p> <ul style="list-style-type: none"> <li>- Evolution of Mughal style and the different eras of rule:</li> <li>- Mosque: Jami – FatehpurSikri , Delhi</li> <li>- Tomb: Humayun, Akbar, Itmadud-daulla, TajMahal</li> <li>- Fort: FatehpurSikri, Red Fort, Delhi,</li> <li>- Regal Buildings: Birbal’s house, Jodhabai’s palace at FatehpurSikri</li> </ul>
<b>Unit III</b>	<p><b>Architecture in Europe</b></p> <p><b>Early Christian and Byzantine Architecture</b></p> <ul style="list-style-type: none"> <li>- Evolution of Church form, technique adopted to construct domes, surface treatment and material of construction</li> <li>- Elements of Special Attributes:</li> <li>- Domes, timber trusses, clear storey, pendentives</li> <li>- Major typologies</li> <li>- St. Peters, Rome (earlier one) Hagia Sophia, Constantinople</li> </ul> <p><b>Romanesque</b></p> <ul style="list-style-type: none"> <li>- Design evolution, planning principles and structural details</li> <li>- Elements of Special Attribute: Wall passages, raking arcades, triforium gallery, vaulting systems</li> <li>- Major typologies</li> <li>- Churches – St. Michelle Pavia, Campus at Pisa</li> </ul>
<b>Unit IV</b>	<p><b>Architecture in Europe</b></p> <p><b>Gothic Phase</b></p> <ul style="list-style-type: none"> <li>- Elements of Special Attribute: Structural innovations with buttresses, pointed arches, vaulting systems, window traceries, flying buttresses etc.</li> <li>- Major typologies</li> <li>- Churches- Amines Cathedral, Notre dame cathedral, Salisbury cathedral, West Ministers Abbey, castles</li> </ul> <p><b>Renaissance Phase</b></p> <ul style="list-style-type: none"> <li>- Elements of Special Attribute: Revived column orders, rusticated masonry, grand cornices, public architecture – piazzas- St Mark, Del Signoria</li> <li>- Major typologies</li> <li>- Churches – St. Peters Rome, St Paul’s, Palladian villas, buildings with respect to architects</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Percy Brown, (1983) <i>Indian Architecture (Hindu And Buddhist)</i> . Bombay, Taraporevala and Sons.



	<p>2. Henri Stierlin, (2002) <i>Hindu India</i>. ISBN 3-8228-1767-8. Taschen GmbH.</p> <p>3. George Michell, (1995) <i>Architecture of the Islamic World</i>. London, Thames and Hudson Ltd.</p> <p>4. Sandra Forty, (2004) <i>Architecture..</i> Rochester, Grange books</p> <p>5. Sir Banister Fletcher, (1996) <i>A History of Architecture</i>. Delhi, CBS Publishers.</p> <p>6. Hiraskar, (2009) <i>The Great Ages of World Architecture</i>. New Delhi, DhanpatRai Publications (P) Ltd, 16<sup>th</sup> Reprint.</p>
<b>Websites:</b>	<p><a href="http://www.twcenter.net/forums/showthread">http://www.twcenter.net/forums/showthread</a></p> <p><a href="http://www.mughalhistory.com/humayun.htm">http://www.mughalhistory.com/humayun.htm</a></p> <p><a href="http://www.indhistory.com">www.indhistory.com</a></p> <p><a href="http://www.indianetzone.com">http://www.indianetzone.com</a></p>
<b>Journals:</b>	<p>JSAH-Society of Architectural Historians (<a href="http://www.sah.org/publications-and-research/jsah">www.sah.org/publications-and-research/jsah</a>)ArchitecturalHeritage-EdinburghUniversity Press(<a href="http://www.euppublishing.com/journal/arch">www.euppublishing.com/journal/arch</a>)</p> <p>Architectural History (<a href="http://journal.eahn.org/">journal.eahn.org/</a>)</p>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Building Services-I

<b>Subject Code</b>	<b>K8207</b>	<b>Semester -III</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To Study Water supply, treatments, distribution and plumbing system for various type of buildings.
<b>2</b>	To Study Waste water treatments, Sewer lines for various types of buildings
<b>3</b>	To Study Drainage system for a low and medium level building

<b>Learning Outcomes : Students will be able to</b>	
<b>1</b>	Understand how water supply and sanitation services are managed, in small and medium buildings.
<b>2</b>	Acquire knowledge about the principles of water supply and sanitation

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Water supply</b> - Sources of water supply. - Treatment plants and Pipe Appurtenances
<b>Unit II</b>	<b>Distribution Patterns</b> - Service Connection (Ferrule, water meter etc.) - Water storage tanks (Ground and overhead), their capacity and location. Calculation of water consumption. - Water Distribution pipes, their sizes, materials, jointing, fixing and laying
<b>Unit III</b>	<b>Sanitation</b> - Principles of sanitation. Introduction of various terminologies used in sanitation. Collection of waste matter in buildings. Various sanitary fittings and fixtures like washbasins, WC's, bathtubs, sink urinals, bidets, flushing cistern traps etc. Various traps and their functions. - Sewerage Systems: Dry conservancy method Water carriage systems. - Sewage collection and disposal system for individual house of urban areas. - Locations and use of appurtenances i.e. I.C, manholes, disconnecting chambers. - Various types of sanitary pipes, their joining, fixing and laying. Pipes and piping network. Anti- Siphonage Pipes.
<b>Unit IV</b>	<b>Testing of house drains.</b> - Sewage disposal system for individual house of rural areas or un-sewered localities (Septic tank, soak pit, cesspools, aqua privy, leeching pits. - Self-cleaning and non-scouring velocities for drain pipes. Invert levels and drains on sloping site

<b>Learning Resources</b>	
<b>Text Books:</b>	1. S.C.Rangwala,(1989) <i>Water supply and sanitary engineerin.</i> ,Gujarat, Charotar publishing house.
<b>Reference Books:</b>	1. AFE Wise, JA Swaffied Water,(2002) <i>Sanitary &amp; Waste Services in buildings</i> . V Edition, Los Angeles, Mitchell Publishing, Co. Ltd. 2. C. shah,(1999) <i>Water supply and sanitary engineering</i> , Delhi,Galgotia publishers.

<b>Websites:</b>	http://www.slideshare.net/prinskhaleel/sanitary-and-water-supply http://www.slideshare.net/Liquidliquid/presentation-plumbing
<b>Journals:</b>	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-( <a href="http://www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t">www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Elective-I

<b>Subject Code</b>	<b>K8208</b>	<b>Semester- III</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes: student will be able to</b>	
1	Engage in systematic self study of topic they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<b>Traditional Building science</b>
	<ul style="list-style-type: none"> <li>- Introduction, Meaning, Elements etc.</li> <li>- Vastusastra Principles</li> <li>- Climatological, sustainable aspects of VastuSastra.</li> <li>- Relevance of vastushastra in Today's Built Environment</li> </ul>
<b>2</b>	<b>Vernacular architecture and settlements ( Regionalism )</b>
	<ul style="list-style-type: none"> <li>- Defining Vernacular</li> <li>- Culture ,Tradition, Society, Climate and Shelter</li> <li>- Vernacular architecture in India</li> <li>- Study of traditional Building materials and Techniques</li> <li>- Study of Vernacular Settlements pattern</li> <li>- Style of the Maratha region</li> </ul>
<b>3</b>	<b>Environmental Studies</b>
	<ul style="list-style-type: none"> <li>- Environmental Factors effecting human habit such as climate, environmental pollution, environmental degradation, Green cover etc.at micro and macro scales.</li> <li>- Fundamentals of eco system</li> <li>- Environmental legislation</li> </ul>
<b>4</b>	<b>Photography</b>
	<ul style="list-style-type: none"> <li>- Introduction to Architectural Photography.</li> <li>- Techniques of Recording Building and surrounding on a film with respect to position of viewer and angle, light and shades, foreground and background, scale, colour, texture, mood, time etc.</li> <li>- Techniques of Photography for documentation</li> <li>- Photographs of drawings, models, feature of buildings and surroundings to be elaborated.</li> <li>- Close up Photographs</li> <li>- Photography practicals on: simple objects, still life composition with the play of light and shadow, Historical and modern Buildings with surroundings landscape ,Architectural details such as brackets, staircase etc.</li> </ul>

<b>Assessment</b>		<b>Marks</b>
<b>IA</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – IV**

## Architectural Design -IV

<b>Subject Code</b>	<b>K8209</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand the contextual relationship of buildings with climate and landform
<b>2</b>	To document rural/traditional settlement to understand the context, people, function
<b>3</b>	To understand the process of complex multi-activity space design

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	understand relationship of building and site, climate and landform
<b>2</b>	document rural/traditional settlement
<b>3</b>	design multi-activity spaces responding to climate and landform

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Documentation and analysis of Settlement</b> <ul style="list-style-type: none"> <li>- Document rural settlement in terms of settlement patterns, cluster configurations and building typology.</li> <li>- Document and analyze influence of climate and landform and all three levels</li> <li>- Document and analyze any traditional knowledge systems, structural system and architectural vocabulary of that place.</li> <li>- Documentation of social structure, religious and cultural practices that guide the built form</li> </ul>
<b>Unit II</b>	<b>Application of Context</b> <ul style="list-style-type: none"> <li>- Proposal of small design insert responding to existing context of the settlement based on the analysis</li> </ul>
<b>Unit III</b>	<b>Design Demonstration</b> <ul style="list-style-type: none"> <li>- Climate responsive design demonstrating passive design principles</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Baruch G., (1976), <i>Man, Climate and Architecture</i>, 2nd Edition, U. K., Applied Science Publishers.</li> <li>2. Ching F. D. K. (2007), <i>Architecture: form, space, and order</i>, New Jersey, Canada, John Wiley and sons.</li> <li>3. Dingle N., (2013), <i>Zarokha</i>, Brain Tonic Publishing.</li> <li>4. Dingle N., (1998), <i>The Introvert and Extrovert Aspects of the Marathi House'</i>, House and Home in Maharashtra, USA, Oxford University Press.</li> <li>5. Editors of Phaidon Press (2004), <i>The Phaidon Atlas of Contemporary World Architecture</i>, Phaidon Press; Comprehensive Edition.</li> <li>6. Shankar P., (2014) <i>Himalayan Cities: Settlement Patterns, Public Places and Architecture</i>, New Delhi, India, USA, Canada, Niyogi Books.</li> <li>7. Jain K. B. &amp; Jain M., (2001), <i>Architecture of the Indian Desert</i></li> <li>8. Koenigsberger O.H.; Ingersoll, T.G.; Mayhew, Alan; Szokolay, S.V., (1980), <i>Manual of Tropical Housing and Building. Part one: Climatic design</i>, Longman Used.</li> </ol>

	9. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i> , India, Super Book House
<b>Websites:</b>	
<b>Journals:</b>	Ahmed Muhaisen, S. "Shading simulation of the courtyard form indifferent climatic regions", <i>Building and Environment</i> Vol. 41, pp. 1731-1741, 2005.

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Rural/traditional settlement studio - Drawing portfolio, Models
<b>2</b>	Drawing portfolio or a detailed model for short design-insert related to settlement study shall be carried out as a time bound exercise
<b>3</b>	Drawing portfolio for design of a small campus involving complex issues of site, topography, integration, environment (primary school, sports club, small resort / institute, primary health care, nursing home, etc.)



## Building Construction and Materials-IV

<b>Subject Code</b>	<b>K8210</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To involve students in construction process of special construction of cavity walls and retaining walls.
<b>2</b>	To aware student for natural disasters and techniques of protection
<b>3</b>	To inform the students about materials like steel and aluminum its properties

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Understand special construction of masonry walls.
<b>2</b>	Understand site development with retaining walls with respect to different materials.
<b>3</b>	Be aware about earthquake resisting structures and its protections.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Retaining Wall</b> - Retaining walls and its terminology, mass retaining wall in bricks, Stones etc. and cantilever retaining wall in R.C.C.
<b>Unit II</b>	<b>Cavity Walls:</b> - Principles of Cavity wall construction & advantages of Cavity wall - Cavity wall in Brick, Stone and Concrete blocks - Precautions in Hollow Concrete wall construction - Reinforced and Decorative Brick masonry, Jali construction
<b>Unit III</b>	<b>Aluminum Doors &amp; Windows</b> - Aluminum and P.V.C. Windows - Aluminum and P.V.C. Doors
<b>Unit IV</b>	<b>Earthquake Resistant Structures</b> - For engineered and non-engineered construction.
<b>Unit V</b>	<b>Study of Materials</b> - Steel and Aluminum. - Water concrete admixtures. - Paints and varnishes

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Rangwala S. C.(2007) <i>Engineering Materials</i> . Gujarat,Charotar, Publishing House. 2. Duggal S.K.(2009) <i>Building materials</i> . New Delhi, New Age International.
<b>Reference Books:</b>	1. J. S. Foster, Roger Greeno (2007) <i>Mitchell's Structure &amp; Fabric: Part 2</i> .New York,Taylor and Francis group
<b>Websites:</b>	<a href="http://www.slideshare.net/vikskyn/earthquake-resistant-structure">www.slideshare.net/vikskyn/earthquake-resistant-structure</a>
<b>Journals:</b>	Journal of construction engineering, technology <a href="http://stmjournals.com/index.php?journal=jocetm">stmjournals.com/index.php?journal=jocetm</a> ) Master builder -construction magazine, construction news( <a href="http://www.masterbuilder.co.in">www.masterbuilder.co.in</a> )

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b> <b>40</b>

	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different design in aluminum door and window for prescribed projects. (Under discretion of the subject faculty).

## Theory of Structures-IV

<b>Subject Code</b>	<b>K8211</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand basic structural concepts
<b>2</b>	To understand behavior of RCC as a material for framed structure
<b>3</b>	To understand fundamental beam column slab construction and loading

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	develop understanding of basic requirements of framed structure
<b>2</b>	develop understanding of strength of RCC structure
<b>3</b>	Understand different loads affecting strength and stability of structure.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<p><b>Design of RCC structures using limit state method (IS456)</b></p> <ul style="list-style-type: none"> <li>- Different type of loads: dead load, live load, wind load, earthquake load.</li> <li>- Calculation of dead load (self weight) if dimensions of a beam, column, wall or slab and unit weight of material are given.</li> <li>- Principles and applications of live load and wind load in different types of structures such as residential, commercial, institutional etc.</li> <li>- Introduction to related IS specifications.</li> </ul>
<b>Unit II</b>	<ul style="list-style-type: none"> <li>- RCC framed structures flat roof i.e. beam slab column system</li> <li>- IS 456 provisions for removal of formwork, nominal cover.</li> <li>- Design of one way and two way slab, cantilever slab, load transfer from one way and two way slabs to beams and cantilever slab.</li> <li>- Beam design 1) simply supported 2) cantilever and 3) continuous. Continuous beam moments to be found using co-efficient. Explain similar details for continuous slab</li> <li>- Design of columns. Explain the structural actions on columns, explain slenderness ratio and its effect on load carrying capacity of columns, design of only short axially loaded columns. Explain uni-axial and biaxial bending cases.</li> <li>- Introduction to doubly reinforced beams and T or L beams. (no design problems)</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Dr.Shah V.L. &amp; Dr. Karve S.R.(2014)<i>RCC Theory and Design</i>.Pune,Structures Publishers.</li> <li>2. Shah H.J. (2013)<i>Design of Reinforced Concrete Structures</i>.Anand,Charotar Publishing house.</li> <li>3. Sinha S.N. (2014) <i>Reinforced Concrete Design</i>.New Delhi,Tata McGraw-Hill Publishing Company limited.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Dr.Shah V.L. &amp; Dr. Karve S.R.2014) <i>Illustrated design of reinforced concrete buildings(design of G+3 storied office/residential building)</i>.Pune, Structures Publishers.</li> <li>2. Negi L.S.&amp;Jangid R.S.(2000)<i>Structural analysis</i>. New Delhi,Tata McGraw-Hill Publishing company limited</li> </ol>
<b>Websites:</b>	Bureau of Indian standards

<b>Journals:</b>	IS: 456 - 2000
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<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	calculation of dead load, live load, G+1 building slab design, one beam, one column design, make drawings and schedule for the same

## Computer Aided Design and Drawings

<b>Subject Code</b>	<b>K8212</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To develop computer aided drafting skill in 2D and 3D.
<b>2</b>	To familiarize with various software available for documentation, presentation and drawing purpose.
<b>3</b>	To understand the use of computer for graphical applications.
<b>4</b>	To introduce and use of various software's available for computer application in Architecture.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Understand the use of computer as a tool for imagination and design.
<b>2</b>	Apply architectural presentation techniques using different software's.
<b>3</b>	Know how to use commands rather than what commands are.
<b>4</b>	Create 3D compositions and drafting plans.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Computer Aided Drawing ( 2D Composition)</b> <ul style="list-style-type: none"> <li>- Introduction of Auto CAD as drafting tool.</li> <li>- Basics of 2D drafting, Drawing simple objects, projections and plans etc.</li> <li>- Preparation of 2 dimensional drawing with dimensioning.</li> <li>- Creating layers, styles, Blocks, line types etc</li> </ul>
<b>Unit II</b>	<b>Computer Aided Architectural Modeling</b> <ul style="list-style-type: none"> <li>- Introduction to Auto cad 3D/Sketch up /3Dmax.</li> <li>- Drawing 3D standard solid models.</li> <li>- Drawing 3D planes and surfaces.</li> <li>- Complex 3D commands such as extrude/revolve, meshes and solids</li> <li>- Solid editing in 3D such as subtract</li> <li>- General introduction to rendering and light effects</li> </ul>
<b>Unit III</b>	<b>Computer aided presentation skills</b> <ul style="list-style-type: none"> <li>- Introduction of various software available for Architectural presentation.</li> <li>- Introduction to power point, Microsoft excel, Microsoft word</li> </ul>
<b>Unit IV</b>	<b>Animation/Walkthroughs</b>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. George Omura(1998).<i>Mastering Autocad</i>,Singapore,Tech publications.</li> <li>2. Ted Boardman and Jercy Hubbell (1998).<i>Inside 3D studio Max2</i>, volume II,Modeling and Materials,New Delhi,G.C.Jain for techmedia.</li> <li>3. Stephen Paul Jacobs(1991)<i>The CAD Design studio,3DModeling as a Fundamental Design Skill</i>,New York,McGraw-Hill,Inc.</li> <li>4. Durvid Frey (1998)<i>Autocad 14</i>,New Delhi,BPB publications.</li> </ol>
<b>Reference Books</b>	As required by subjects /topics in a particular semester.

<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Rendering drafting for Sem.III design .
<b>2</b>	Prepare digital drawings for Sem.III design portfolio.
<b>3</b>	Create 3D model.

## History of Architecture-III

<b>Subject Code</b>	<b>K8213</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To gain knowledge of the development of architectural form with reference to style and character in the Indian context through the evolution of colonial Architecture in the country
<b>2</b>	To understand the Industrial era as evolving within specific contexts including aspects of social and political factors.
<b>3</b>	To gain knowledge of the development of architectural form with reference to technology, style and character in the Western World through the Industrial revolution and in the phases covering the Art and Craft , Art Nouveau styles

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Explore spatial and stylistic qualities associated with Colonial architecture.
<b>2</b>	Explain architecture as an outcome of various social, political and economic upheavals
<b>3</b>	Comprehend the condition of Industrial Revolution and its impact on architecture
<b>4</b>	Understand Art and Craft, Art Nouveau styles with reference to Industrial Revolution.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<p><b>Colonial Architecture in India</b></p> <ul style="list-style-type: none"> <li>- Colonial Architecture under British, Portuguese and French with reference to industrial revolution and emergence of new materials and construction techniques.</li> <li>- Indian Colonial architecture-British: The styles and trends of architecture brought by British to India and their evolution – The impact of Indo-Sarcenic style on the British Architecture in India – The characteristics of British Colonial Architecture with examples from work of Edwin Lutyens.</li> <li>- The Impact of Portuguese architecture in India – The characteristics of Portuguese Colonial Architecture with examples from Goa-Bom Jesus Cathedral Complex-Old Goa.</li> <li>- The Impact of French Architecture in India – The characteristics of French Colonial Architecture with examples from Puducherry, Maheetc</li> <li>- The Impact of French Architecture in India – The characteristics of French Colonial Architecture with examples from Puducherry, Maheetc</li> </ul>
<b>Unit II</b>	<p><b>Baroque Art, Rococo Art</b></p> <ul style="list-style-type: none"> <li>- Roman Baroque churches: The central plan modified – St. Peters, Rome;</li> <li>- French Baroque: Versailles</li> <li>- English baroque – Sir Christopher Wren;</li> <li>- St. Paul’s London – Domestic Architecture in England.</li> <li>- Rococo Architecture – Interiors – hotels</li> </ul>
<b>Unit III</b>	<p><b>Neo classical Art and Architecture</b></p> <ul style="list-style-type: none"> <li>- Beginnings of modernity –Origin and development of Neo Classicism</li> </ul> <p>Structural Neo classicists: Laugier, Soufflot, Schinkel, Labrouste - Romantic Neo classicists: Ledoux, Boullée, Durand, Jefferson</p>

<b>Unit IV</b>	<p><b>Industrial Revolution</b></p> <ul style="list-style-type: none"> <li>- Causes, consequence and impact in Architecture – Urbanization in Europe and America- split of design education into architecture and engineering streams- Emergent new building / space types. Growing need for mass housing .Its influences in building, technology and modern building materials Steel, glass, RCC etc. Industrial exhibitions- Chicago School and skyscraper development.</li> <li>- Arts and Crafts in Europe and America : Morris, Webb</li> <li>- Art Nouveau: Opposition to industrial arts and production Horta, Van De Velde, Gaudi, Guimard, Mackintosh Hoffman, Olbrich- Wright’s early works</li> </ul>
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<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Kenneth Frampton, (1994) <i>Modern Architecture: A Critical History</i>. London, Thames &amp; Hudson.</li> <li>2. James C. Harle, (1994) <i>The Art and Architecture of the Indian Subcontinent</i>. Second Edition. Yale, Yale University Press.</li> <li>3. Banister Fletcher, (1996) <i>A History of Architecture</i>. New York, Architectural Press,</li> <li>4. Raeburn Micheal, (1988) <i>Architecture of the Western World</i>. England, Popular Press.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Hiraskar, (2009) <i>The Great Ages of World Architecture</i>. New Delhi, Dhanpat Rai Publications (P) Ltd, 16<sup>th</sup> Reprint.</li> <li>2. Christian Norburg-Schulz,( 1993) <i>Meaning in Western Architecture</i>. Rizzoli, Revised edition,</li> <li>3. Ed.HenriStierlin,(2002) <i>Architecture of the world- Baroque</i>. ISBN 3-8228-9300-5.Germany, BenediktTaschenVerlagGmbtt</li> </ol>
<b>Websites:</b>	<p>www.culturalindia.net › Indian Architecture            www.britannica.com/EBchecked/...architecture/.../Baroque-and-Rococo            www.greatbuildings.com/types/styles/neo-classical.html            https://thearchiblog.wordpress.com/.../impact-of-industrial-revolution            http://www.quora.com/What-is-impact-of-the-Industrial-Revolution-on-nineteenth-century-architecture</p>
<b>Journals:</b>	<p>JSAH-Society of Architectural Historians (www.sah.org/publications-and-research/jsah)            Architectural Heritage-Edinburgh University Press            (www.euppublishing.com/journal/arch)            Architectural History (journal.eahn.org/)</p>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

<b>Assignments</b>	
1	Study of Colonial Architecture in India with literature survey
2	Analysis of various Architecture and Art styles studied and their development
3	Report based on field study.



## Surveying & Leveling

<b>Subject Code</b>	<b>K8214</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand various land forms.
<b>2</b>	To introduce surveying as a method to explain land form and its utility in site planning.
<b>3</b>	To acquaint students with the physical surveying and levelling work in order to, Measure and document built and non-built spaces.
<b>4</b>	To prepare and interpret of Base Map for Architectural Design Projects.
<b>5</b>	To read and interpret various forms of cartographic presentation.

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Understand importance of land forms and topography and its significance in site planning /Design.
<b>2</b>	Calculate area of a site / plot.
<b>3</b>	Discuss slope of land for site planning.
<b>4</b>	Design services and buildings on sloping terrain

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<ul style="list-style-type: none"> <li>- Introduction to surveying and survey equipments, understanding land topography and its relevance in Architecture.</li> <li>- Methods of Surveying: Chain and Compass, Plane Table Survey, computation of areas</li> </ul>
<b>Unit II</b>	<ul style="list-style-type: none"> <li>- Methods of Levelling: Contour Survey, Use of Theodolite.</li> <li>- Use of electronic equipment like EDM, Total Station etc.</li> </ul>
<b>Unit III</b>	<ul style="list-style-type: none"> <li>- Introduction to remote sensing and aerial photographic surveying etc.</li> <li>- (Electronic Total Station) ETS Survey</li> <li>- Study and analysis of Topo-sheet</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. N.N. Basak ,(2004) <i>Surveying and Levelling</i> , New Delhi ,Tata Mcgraw Hill,</li> <li>2. Kanetkar, T.P and Kulkarni, S.V (2013) <i>Surveying and Leveling</i>. Pune Vidyarthi Pune.</li> <li>3. R.Subramanian (2012) <i>Surveying and Leveling</i>Roorkee,Cyber TechPublication.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. David Clerk, Surveying Vol -I &amp; II,</li> <li>2. Dr. K.R. Arora, Surveying Vol -I &amp; II,</li> <li>3. S.K. Duggal, Fundamentals of Surveying Milton.O.Schimidit.</li> </ol>
<b>Websites:</b>	<p>www.aboutcivil.org,                      www.cambridge.org,                      www.civilprojectsonline.com</p>
<b>Journals:</b>	<p>International Organization of Scientific Research (IOSR)                      IOP Science (Institute of Physics),                      American Journal of Engineering Research (AJER)</p>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	To measure plot by linear method and determine the area.
<b>2</b>	To measure the contour plot and work out the site sections to understand levels and slopes.
<b>3</b>	To prepare small report with presentation of various equipments used in surveying and leveling
<b>4</b>	Measurement of plot by using different methods. (Equipments, plot selection can be done by the student and approved by instructor
<b>5</b>	To measure the live plot by using chain & compass, plane table survey, and prepare drawing for the area calculation
<b>6</b>	Survey of a given area of city road to understand slope, road details by using chain & compass, plane table survey .submission will in the form of drawings and digital presentation
<b>7</b>	Report on topics related to remote sensing and aerial photographic survey.

## Building Services-II

<b>Subject Code</b>	<b>K8215</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To Study basics of electricity and wiring systems within domestic and commercial buildings.
<b>2</b>	To Study fundamentals of lighting and lighting design.
<b>3</b>	To familiarize the students with the fundamentals of acoustics and principles in designing various built environment

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Understand the basics of Electricity and wiring system
<b>2</b>	Understand various fundamentals of Lighting and Lighting design
<b>3</b>	Learn and evaluate fundamentals of acoustics and its applications in buildings.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Electrical Services.</b> <ul style="list-style-type: none"> <li>- Different wiring systems, fuses and MCBs, electrical fittings and appliances.</li> <li>Detailed layout of electrical services in residences</li> </ul>
<b>Unit II</b>	<b>Daylighting</b> <ul style="list-style-type: none"> <li>- Day lighting, sky condition, daylight availability graph, sky condition square.</li> <li>- Luminance levels for various sky conditions as a function of solar altitude, daylight factor, daylight factor standards, components of daylight factor, functional objectives of daylight,</li> <li>- Site criteria, building configuration, building orientation.</li> <li>- Day light apertures, glare control, shading devices- external and internal, measurement of day lighting</li> </ul>
<b>Unit III</b>	<b>Illumination (Artificial lighting)</b> <ul style="list-style-type: none"> <li>- Light radiation, its unit, laws of illumination, types of illumination schemes –direct, semi direct, diffused lighting and their design consideration</li> <li>- Light sources, various types of lamps and their characteristics</li> <li>- Types of luminaries for interior and exterior</li> <li>- Exterior lighting for monuments, gardens, fountains, sculptures etc</li> </ul>
<b>Unit IV</b>	<b>Acoustics</b> <ul style="list-style-type: none"> <li>- Frequency range of Audible sound.</li> <li>- Propagation of sound, sound reflection, diffusion, diffraction, sounds insulation.</li> <li>- Echo, Reverberation and Doppler effect.</li> <li>- Sound absorption, absorbing materials, their classification and application. Sound Reflection and reflecting materials, their classification and application.</li> <li>- Space layout consideration and Buffer zones</li> <li>- Noise and Noise control Noise criteria curves, noise from ventilation and AC systems.</li> <li>- Floor and ceiling construction for noise insulation.</li> <li>- Floating floors, outdoor barriers for noise Control.</li> <li>- At least one live case study in detail of acoustical treatment of</li> </ul>

	<ul style="list-style-type: none"> <li>- Auditorium, Lecture halls/Conference hall (any performing space)</li> <li>- Acoustical defects and remedies.</li> </ul>
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<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. E.P. Ambrose,(1968) <i>Electric Heating</i> . New York, John Wiley & Sons Inc. 2. Philips,(1964) <i>Lighting in Architectural Design</i> . New York, McGraw Hill. 3. R. G. Hopkenson& J. D. Kay, (1969) <i>The lighting of Buildings</i> , London, Faber& Faber. 4. National Building Code of India, 2005 (NBC 2005)
<b>Websites:</b>	www.slideshare.net/haroldtaylor1113/9-acoustics-sound-and-noise-control <a href="https://www.scribd.com/doc/59706240">https://www.scribd.com/doc/59706240</a>
<b>Journals:</b>	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-( <a href="http://www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t">www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

<b>Assignments( Any 2)</b>	
1	Design electrical layout for a low or medium size building.(an individual /independent unit)
2	Layout of acoustical space with reverberation time calculations
3	Daylight Calculation in medium sized space.

## Elective - II

<b>Subject Code</b>	<b>K8216</b>	<b>Semester IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes: student will be able to</b>	
1	Engage in systematic self study of topic they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<b>Passive Design Principles (SBDP)</b> <ul style="list-style-type: none"> <li>- Meaning ,Need of Passive Cooling</li> <li>- Principles of Passive Cooling</li> <li>- Passive Cooling in Different Climatic zones</li> <li>- Case studies</li> </ul>
<b>2</b>	<b>Seminar –I (Design Philosophies of Master Architects)</b> <ul style="list-style-type: none"> <li>- Independent study and documentation of architectural and allied subjects by individual student along with oral and visual presentation.</li> <li>- The seminar shall be a research paper on a topic related to Architecture.</li> </ul>
<b>3</b>	<b>Human settlements</b> <ul style="list-style-type: none"> <li>- Origin and growth of human settlement.</li> <li>- Role of River Banks in growth of human settlement.</li> <li>- Study of ancient Indian settlements like Mohenjodaro, Taxila, Nalanda.</li> <li>- Study of ancient Indian cave settlements of Ajanta, Ellora, Elephanta.</li> <li>- Ancient texts and treatises on settlement and area planning in India.</li> <li>- Historical survey of the city as an expression of the vitality of a civilization.</li> <li>- Human settlements during ancient medieval and modern periods in and India, and other parts of the world.</li> <li>- Characteristics of human settlements built by Hindu and Islamic Rulers in India</li> </ul>
<b>4</b>	<b>Communication skill/public speaking</b> <ul style="list-style-type: none"> <li>- Basic principles and Benefits of Better Communication, Communication Theory, Organizing Thoughts, Valuing People, Choosing Appropriate Words, Using Non Verbal Behaviors (Body Language, Voice Inflection)</li> <li>- Conducting Meetings, Giving Presentations, Writing for Business, Writing Letters, Memos and minutes, Writing Reports and reviews, Using Visuals, Interviewing and facing interviews.</li> <li>- English usage, grammar and composition, learning to listen and speak correctly (One to one communication, on the telephone, Group discussions)</li> <li>- Basic knowledge of effective use of ms word and excel and power point.</li> <li>- Business Etiquettes: Professional Image, Introductions and Greetings, Networking Manners, General, Workplace Manners, Life on the Cube Farm, Interacting With Superiors, Manager's Manners, Business Meetings,</li> </ul>

	Business Gifts, Business Cards, Telephone Manners, Cell Phone Etiquette, E-Mail Etiquette, Gender-Free Etiquette, Business Dining, Avoiding Social Blunders When Abroad, Dealing with Angry Customers
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<b>Assessment</b>		<b>Marks</b>
<b>IA</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
Note	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – V**

## Architectural Design -V

<b>Subject Code</b>	<b>K8301</b>	<b>Semester -V</b>
<b>Credits</b>	<b>8</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand and reflect 'culture as maker of space'

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Develop analytical skill set for spatial design of built spaces
<b>2</b>	Synthesize and translate analytical understanding into Architectural Design

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Research and analysis of community living with examples.
<b>Unit II</b>	Study of theories on neighborhood planning concepts, community living, campus planning principles etc.
<b>Unit III</b>	It can be a small eskii project like a club house, small community hall, badminton court.

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Bhatt V. &amp; Seniver P., (1990), <i>Contemporary Indian Architecture: After The Masters</i>, Ahmedabad, USA, Mapin Publishing Pvt. LTD.</li> <li>2. Kanvinde A. P. &amp; Miller J. H., (1969), <i>Campus Design in India: Experience of a Developing Nation</i>, Jostens/American Yearbook Company</li> <li>3. Mehta J., (2011) <i>Rethinking Modernity</i>, New Delhi, India, Niyogi Books</li> <li>4. Pressman A., <i>Design Architecture the elements of Process</i>, USA, Routledge</li> <li>5. Pandya Y., (2005) <i>Concepts of Space in Traditional Indian Architecture</i>, India, New Jersey, Mapin Publishing.</li> <li>6. Salvadori M., &amp; Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall</li> <li>7. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i>, India, Super Book House</li> <li>8. Unwin S. (4<sup>th</sup> Ed), <i>Analysing Architecture</i>, Canada, Routledge</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Design Project demonstrating principles of community living, neighborhood planning etc. on any one of the following - Group Housing, High-end residential building, housing for economically weaker sections, Community Housing etc. –



	Drawing portfolio and model.
<b>2</b>	Design Project on any one of the following – Club House, Community Hall, Sports Club etc. which can be an extension of the projects mentioned above - Drawing portfolio and model.

## Building Construction and Materials-V

<b>Subject Code</b>	<b>K8302</b>	<b>Semester-V</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To introduce construction of building components in Reinforced Cement Concrete.
<b>2</b>	To introduce water proofing, insulation & protection systems and their methods of construction
<b>3</b>	To explain the concept of curtain wall and its architectural relevance.

<b>Learning outcomes: Student will be able to</b>	
<b>1</b>	Understand different foundation systems with respect to site and building character
<b>2</b>	Explore special construction techniques of curtain wall and design integration.
<b>3</b>	Become knowledgeable of alternative building materials used in construction

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Foundation :</b> <ul style="list-style-type: none"> <li>- Concept of bulb of pressure and its significance for site investigation.</li> <li>- Introduction to relevance of soil mechanics in foundation design</li> <li>- Soil types &amp; its behavior under different loading conditions</li> </ul>
<b>Unit II</b>	<b>Types Of Foundation</b> <ul style="list-style-type: none"> <li>- Mass concrete strip foundation.</li> <li>- Foundation for brick piers, entrance steps, compound walls etc.</li> <li>- Foundation on sloping site.</li> <li>- Foundation for point load.</li> <li>- Isolated R.C.C. footing for columns</li> <li>- Combined R.C.C. footing</li> <li>- Cantilever R.C.C .footing &amp; eccentric footing</li> <li>- Foundation on weak strata.</li> <li>- Raft Foundation.</li> <li>- Pile Foundation</li> </ul>
<b>Unit III</b>	<b>Foundation and D.P.C.</b> <ul style="list-style-type: none"> <li>- Damp proof course treatment using rigid &amp; flexible treatment</li> <li>- Brick on edge</li> <li>- Rough Shahabad stone</li> <li>- Bitumen sheets</li> </ul>
<b>Unit IV</b>	<b>Misc. Constructions :</b> <ul style="list-style-type: none"> <li>- Construction Details of Curtain Walls and Structural Glazing Including External Fixing and Cladding Details.</li> </ul> <b>Special Construction:</b> <ul style="list-style-type: none"> <li>- Basement Construction, Water Proofing details, etc. (Sketches, notes etc.)</li> <li>- Shoring and Underpinning</li> <li>- Flying, raking &amp; dead shoring</li> <li>- Wall, Jack and mega pile, needle &amp; pile, column underpinning</li> </ul>

<b>Unit V</b>	<b>Study of Materials</b> <ul style="list-style-type: none"> <li>- R.C.C. end connection details.(beam and column. Slab and beam etc.)</li> <li>- Reinforcement.</li> <li>- Fly ash brick, Stabilized earth block, Rammed earth block, Ferrocete, Concrete debri block.</li> <li>- Timbering &amp; shuttering for French excavation</li> <li>- Glass</li> </ul>
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<b>Learning Resources</b>	
<b>Text Books:</b>	1. M.S.Shetty(1986) <i>Concrete Technology</i> New Delhi, S.Chand&Co.ltd.
<b>Reference Books:</b>	1. J. S. Foster, Roger Greeno(2007). <i>Mitchell's Structure &amp; Fabric: Part 2</i> .New York,Taylor and Francis group. 2. Mörsch, Emil (1909). <i>Concrete-steel Construction(Der Eisenbetonbau)</i> .New York, The Engineering News Publishing Company.
<b>Websites:</b>	<a href="http://www.slideshare.net/mvm2594/concrete-technology-12587295">www.slideshare.net/mvm2594/concrete-technology-12587295</a>
<b>Journals:</b>	Journal of construction engineering, technology <a href="http://stmjournals.com/index.php?journal=jocetm">stmjournals.com/index.php?journal=jocetm</a> Master builder -construction magazine, construction news( <a href="http://www.masterbuilder.co.in">www.masterbuilder.co.in</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different design in aluminum door and window for prescribed projects. (Under discretion of the subject faculty).

## Theory of Structure -V

<b>Subject Code</b>	<b>K8303</b>	<b>Semester-V</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand basic structural concepts in steel design.
<b>2</b>	To understand behavior of steel as a structural materials.
<b>3</b>	To understand fundamentals of steel structure.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Develop understanding of basic requirements of steel structure
<b>2</b>	Develop understanding of behavior of use of steel structures
<b>3</b>	Explain importance of types of steel connections and jointing

<b>Units</b>	<b>Contents</b>
	Steel design ( working stress and limit state both are acceptable – IS: 800)
<b>Unit I</b>	<b>Sloping roof system</b> - truss, loads acting on truss, design of purlin (working stress or limit state both shall be acceptable), analysis of truss using method of joints, identifying ties and struts, design of tension and compression members.
<b>Unit II</b>	<b>Connections</b> - Riveted, welded bolted connections, their strength. Explain single and double shear (no calculations, no zigzag riveting). Finding length of weld and arranging it along member edges
<b>Unit III</b>	<b>Design of steel beams</b>
<b>Unit IV</b>	<b>Design of steel columns</b> - (Compression members) single and built in (Introducing lacing and battening. No calculations for lacing and battening design) - Introduction to masonry structures and timber structural members. (no numericals)

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Negi L.S (2008)<i>Design of Steel Structures</i>.New Delhi,Tata McGraw-Hill Publishing company limited.</li> <li>2. Bhavikatti S.S.(2009)<i>Design of Steel Structures</i>.I.K. International publishing house.</li> <li>3. Vazirani V. N. &amp;Ratwani M. M. &amp;Mehra H.(2012)<i>Analysis and Design of Steel Structures</i>.New Delhi,Khanna Publishers.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Mckay J.K.<i>The construction of buildings, vol- IV, 4th ed. (metric), preparations steel RCC fire protection.</i></li> <li>2. Ed Ownens, G.W. Knowles,P.R. Dowling. <i>Steel designers manual Vththe steel construction institute.</i></li> <li>3. Iyengar K.T.S.&amp;Viswanathan C.S.(2003)<i>Torsteel design handbook for reinforced concrete members with limit state design</i>.New Delhi,Tata McGraw-Hill Publishing company limited.</li> <li>4. Negi L.S.(2002)<i>Design of steel structures 2nd ed</i>.NewDelhi,Tata McGraw-Hill Publishing company limited.</li> <li>5. Karve S.R. &amp; Shah V. L.(2014)<i>Structural design databook steel structures according to IS 800-1984</i>.Pune,Structures Publication.</li> </ol>

	<p>6. Vazirani V. N. &amp;Ratwani M. M. &amp;Mehra H. (2012)<i>Steel structure design and analysis</i>.New Delhi,Khanna Publishers.</p> <p>7. Habermann S.S.<i>Steel construction manual</i>.InternationalCertification.</p> <p>8. AISC<i>Seismic provisions for structural steel buildings april 15th 1997</i>.American society of plant physiologists.</p> <p>9. RamamruthamS.&amp;Narayanan R.(1997)<i>Design of steel structure</i>.New Delhi,DhanpatRai Publishing.</p>
<b>Websites:</b>	www.bis.org.in
<b>Journals:</b>	IS 800-2007

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Design of an industrial building, show column locations for given plan area, determine type of truss, design of purlin, purlin-truss connection detail, analysis of any three joints of truss, design of tension member with rivet/weld/bolt, design of compression member, design of columns (built in) supporting the trusses. Drawings and schedule

## Working Drawing-I

<b>Subject Code</b>	<b>K8304</b>	<b>Semester -V</b>
<b>Credits</b>	<b>5</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand and prepare working drawings necessary for construction/execution of buildings on site.
<b>2</b>	To make student understand how to read “Working drawings” on site

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Prepare working drawings for load bearing structure.
<b>2</b>	Prepare Detailed drawings such as doors, windows, toilets, kitchen, flooring etc.
<b>3</b>	Prepare drawing which are readable for all agencies which are involved in execution of the project.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Introduction to WD, their significance, study of Example of Working Drawings, site visit
<b>Unit II</b>	Translating design into working drawing of entire project.
<b>Unit III</b>	Drawing showing construction details.
<b>Unit IV</b>	Details of toilets, doors, windows etc

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhom (2011). "The Professional Practice Of Architectural Working Drawings" 2. Drawings from ISO certified architect office
<b>Websites:</b>	
<b>Journals:</b>	Gawne, Eleanor. "Cataloguing architectural drawings." Journal of the Society of Archivists 24.2 (2003): 175-187

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>40</b>
<b>Internal Assessment</b>	
	Refer To ‘Rule number 6, sub point 6.2.2.’
<b>U.E.</b>	<b>60</b>
<b>University Examination</b>	
	Assignments or portfolios based on entire syllabus as mentioned below.

<b>Assignments</b>	
<b>1</b>	Site visit report, Common project assignment.
<b>2</b>	Assignment of Time bound working studio assignment.
<b>3</b>	A portfolio of working drawings where student selects their own design.

## History of Architecture-IV

<b>Subject Code</b>	<b>K8305</b>	<b>Semester -V</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To introduce the idea of modernity and demonstrate its impact in the realm of Architecture.
<b>2</b>	To study modern architecture as evolving from specific aspects of modernity industrialization, urbanization, material development, modern art.
<b>3</b>	To study in detail different post modern and contemporary directions in World Architecture
<b>4</b>	To study quest for Indianness in architecture of India from the end of colonial rule to contemporary period

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Acquire knowledge of the development of architectural form with reference to technology, materials, style and character of the decades of modernism, post modernism and contemporary architecture and architects.
<b>2</b>	Obtain an overall understanding of the architectural developments of Architecture of post-colonial India

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<p><b>Modernism</b></p> <ul style="list-style-type: none"> <li>- Introduction to Modern Architecture.</li> </ul> <p><b>Isms in Art and Architecture</b></p> <ul style="list-style-type: none"> <li>- Adolf Loos and critique of ornamentation- Raumplan: Peter Behrens-Werkbund. Expressionism: Mendelsohn, Taut, Polzeig- Futurism- Constructivism, Cubism-Suprematism- De-Stijl. Bauhaus- Gropius, Meyer and Mies. Bauhaus School, Chicago School of Architecture and Taliesin School of Architecture – Great masters like Louis Sullivan, Frank Lloyd Wright</li> </ul> <p><b>International Style</b></p> <ul style="list-style-type: none"> <li>- Post WW II developments and spread of international style –works of Corbusier:- Brasilia, Unite</li> <li>- Works of later modernists: Louis Kahn, Paul Rudolph, Eero Saarinen, Philip Johnson</li> </ul>
<b>Unit II</b>	<p><b>Post Modernism</b></p> <ul style="list-style-type: none"> <li>- Critiquing Modernism - Brutalism- projects of Smithsons and Aldo Van Eyck – writing of Jane Jacobs, Robert Venturi, Aldo Rossi and Christopher Alexander</li> <li>- Deconstructivism –Critical regionalism</li> <li>- Innovation and ideas of Archigram – post modern architects like Peter Cook, Paolo Soleri, Robert Venturi</li> <li>- Contemporary architects: Norman Foster, Richard Rogers, James Sterling, Peter Eisenman, Renzo Piano, Daniel leibskind, Zahahadid, Frank O Gehry, Santiago Calatrava, , Rem koolhaas</li> </ul>
<b>Unit III</b>	<p><b>Post Colonial Architecture in India and any two examples across the globe</b></p> <ul style="list-style-type: none"> <li>- Architectural debates associated with nation formation– early modernist architecture-</li> </ul>

	- Post-independence city planning: Chandigarh and Bhuvanesar- influences on post-independence architects- Architecture of Kanvinde, Raje, Doshi, Correa, Nari Gandhi, Raj Rewal.
<b>Unit IV</b>	Master Architects influenced by Vernacular/Regional Architecture of India

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Kenneth Frampton, (1994) <i>Modern Architecture: A Critical History</i>. London, Thames &amp; Hudson.</li> <li>2. Kenneth Frampton, Richard Ingersoll, (2000) <i>World Architecture-A Critical Mosaic 1900-2000 Vol 1</i>. New York, China Architecture and Building Press.</li> <li>3. Manfredo Tafuri, (1980) <i>Modern Architecture</i>. New York, Harry N. Abrams Inc.</li> <li>4. William Jr. Curtis, (1988) Balkrishna Doshi, <i>An Architecture for India</i>. New York, Rizzoli Publication. James Steele, (1985) <i>Hassan Fathy</i>. London, Academy Editions.</li> <li>5. Sandra Forty, (2004) <i>Architecture</i>. Rochester, Grange books</li> <li>6. Andreas C. Papadakis (1991) <i>A spirit in Architecture</i>, London</li> </ol>
<b>Websites:</b>	<a href="http://www.historiasztuki.com.pl/ARCHWSP-POSTMODERNIZ">www.historiasztuki.com.pl/ARCHWSP-POSTMODERNIZ</a> <a href="http://www.modern-architect.com">www.modern-architect.com</a> <a href="http://www.quora.com/What-are-the-main-differences-of-modern-and-post-modern-architecture">http://www.quora.com/What-are-the-main-differences-of-modern-and-post-modern-architecture</a> <a href="http://www.arthistoryarchive.com/arthistory/architecture/Architecture-UrbanCactus.html">http://www.arthistoryarchive.com/arthistory/architecture/Architecture-UrbanCactus.html</a>
<b>Journals:</b>	JSAH-Society of Architectural Historians ( <a href="http://www.sah.org/publications-and-research/jsah">www.sah.org/publications-and-research/jsah</a> ) Architectural Heritage-Edinburgh University Press( <a href="http://www.euppublishing.com/journal/arch">www.euppublishing.com/journal/arch</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>Note</b>	Based on the Assignments listed below with continuous assessment and attendance scrutiny. The final presentation in standard specified Portfolio with all written reports and graphical representations (sketches, pictures)
1	Analytical study of Post-Colonial Architecture in India with literature survey
2	Power point Presentation and discussion of Modern, Post modern, Contemporary World Architects with references to their styles, designs, technologies, materials and directions
3	Critical Analysis through book /literature survey of various architects and their buildings with relevance to vernacular architecture of India
4	Report based on field study.
5	Model making.



## Specification Writing

<b>Subject Code</b>	<b>K8306</b>	<b>Semester -V</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To develop skill of writing specifications for materials and works.

<b>Learning Outcomes:</b> students will be able to	
<b>1</b>	Write specifications with reference to building trades, materials, workmanship and performance of different items of work
<b>2</b>	Discuss specifications as integral part of contract document for building projects

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<ul style="list-style-type: none"> <li>- Specifications as part of contract document, definition, need and importance, its relationship with working drawings, bill of quantities and Schedule of rates.</li> <li>- Types of specifications, open, closed, restricted, prescriptive, performance based, or combination of above types. Use of manufacturers guide etc.</li> <li>- Specification writing method to include master list, sectional formats, page formats, general material items, tests, performance, mode of measurements etc</li> </ul>
<b>Unit II</b>	<ul style="list-style-type: none"> <li>- Methodology of writing detailed specifications including methods and forms of writing descriptive notes on materials and workmanship based on working drawings.</li> <li>- Collection of catalogues and technical information on various materials, products and specialized items.</li> <li>- Preparation of checklist for writing detailed specifications</li> </ul>
<b>Unit III</b>	<ul style="list-style-type: none"> <li>- Study of different building trades, their scope and contents.</li> <li>- Introduction to writing specifications for building services and checklist for services such as Water Supply, Drainage, Electrical and HVAC installations.</li> <li>- Writing specifications of a previous design project in full or part as final assignment</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. S. Patil (2013) <i>Civil Engineering Contracts and Estimate</i>. Anand. Orient Blackswan, Bangalore</li> <li>2. B.N.Datta (2011) <i>Estimation and Quantity Surveying</i>, UBS Publishers &amp; Distributors Ltd. Mumbai.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. SP 27 (1987) <i>Handbook of Method of Measurement of Buildings Works</i>, Bureau of Indian Standards (BIS)</li> <li>2. [CED 44: <i>Methods of Measurement of Works of Civil Engineering</i>] (first revision-2003) Bureau of India Standards.</li> <li>3. Willis, C. &amp; A. Willis (1997) <i>Specification writing for architects and surveyors</i>, Blackwell Science, United Kingdom</li> </ol>
<b>Websites:</b>	www.training@theNBS.com( National Building Specifications) www.ncarb.org
<b>Journals:</b>	National Council of Architectural Registration Boards(N.C.A.R.B) - See more at: <a href="http://www.ncarb.org/en/About-NCARB.aspx#sthash.bpyDoY2q.dpuf">http://www.ncarb.org/en/About-NCARB.aspx#sthash.bpyDoY2q.dpuf</a> International Cost Estimating and Analysis Association (ICEAA)

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper.	

## Building Services-III

<b>Subject Code</b>	<b>K8307</b>	<b>Semester -V</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To expose students to the science behind HVAC system.
<b>2</b>	To familiarize students with the various air- conditioning systems and their applications
<b>3</b>	To study various aspects of Natural Ventilation

<b>Learning Outcomes:</b> student will be able to	
<b>1</b>	Acquire knowledge of various air conditioning systems and their applications.
<b>2</b>	Address various issues in design of HVAC system
<b>3</b>	Understand various issues in natural ventilation systems in buildings

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>HVAC</b> <ul style="list-style-type: none"> <li>- Air distribution systems, ducts and ducting layout.</li> <li>- Costing data and space requirements. Integration of AC systems in Design.</li> <li>- Principles of Psychometrics and heat transfer</li> </ul>
<b>Unit II</b>	<b>Components of HVAC</b> <ul style="list-style-type: none"> <li>- Unit AC's, Central AC's split AC's.</li> <li>- Components of AC system such as chilling plant, cooling towers, air handling units, calculation of AC load.</li> <li>- Water consumption for AC</li> </ul>
<b>Unit III</b>	<b>Ventilation of buildings</b> <ul style="list-style-type: none"> <li>- Natural ventilation (passive.)</li> <li>- Ventilation functions and requirements.</li> <li>- Physical mechanism of ventilation.</li> <li>- Design factors affecting ventilation</li> </ul>
<b>Unit IV</b>	<b>Mechanical ventilation (active)</b> <ul style="list-style-type: none"> <li>- Need of mechanical ventilation                             <ol style="list-style-type: none"> <li>a) Forced ventilation – Exhaust fans, Axial flow fans, Blowers for industrial ventilation.</li> <li>b) Introduction to Air conditioning, heating and cooling</li> </ol> </li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
<b>Reference Books:</b>	1. Vasisth K.(2011) <i>Waste management</i> New Delhi, Essential books. 2. National Building Code of India, 2005 (NBC 2005)
<b>Websites:</b>	<a href="http://bst1.cityu.edu.hk/e-learning/">http://bst1.cityu.edu.hk/e-learning/</a>
<b>Journals:</b>	Building Services Engineering Research and Technology (bse.sagepub.com) Energy and buildings-Journal-Elsevier (www.journals.elsevier.com/energy-and-buildings/) Technical journals- CIBSE-(www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t)

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

### Elective- III

<b>Subject Code</b>	<b>K8308</b>	<b>Semester IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes: Student will be able to</b>	
1	Engage in systematic self study of topic they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<p><b>Barrier Free Architecture</b></p> <ul style="list-style-type: none"> <li>- Types of disabilities and its implications in Architecture, barrier free environment, access- provisions to facilities and amenities.</li> <li>- Typical barrier problems of the physically challenged people-parking, approaches to buildings travel within buildings etc.</li> <li>- Special design considerations in residential buildings, congregational buildings like auditoriums, theatres, studios, transport terminals etc, Institutional buildings, outdoor appurtenances, garden – parks etc.</li> <li>- Study of norms set by Central Government</li> </ul>
<b>2</b>	<p><b>Appropriate technology</b></p> <ul style="list-style-type: none"> <li>- Introduction to the concept of Appropriate technology and services suitable in Indian context for both rural and urban application</li> <li>- Study of theoretical and practical aspects of innovative /alternative materials and construction techniques developed in recent past.</li> <li>- Mud wall, suitability of soil for mud walls</li> <li>- Waffle and daub walls, Rammed earth walls, adobe walls</li> <li>- Walls, vaults using soil cement, compressed mud blocks, Nubian arch roof</li> <li>- Use of Bamboo as material its properties ,available in country</li> <li>- Burnt clay tile roofing, ferro cement roofing units, doubly curved tile roofing</li> </ul>
<b>3</b>	<p><b>Contemporary Design Theory( History and Design)</b></p> <ul style="list-style-type: none"> <li>- Detail study and analysis of styles of contemporary Indian and foreign Architects</li> <li>- Study of spatial order, structural, constructional and material order, manner of articulation, symbols, and meanings as these evolved in time and space.</li> <li>- Comparative study of building typologies in vernacular and architecture in modern period</li> </ul>
<b>4</b>	<p><b>Seminar II</b></p> <ul style="list-style-type: none"> <li>- Independent study and documentation of architectural and allied subjects by individual student alongwith oral and visual presentation.</li> <li>- The seminar shall be a research paper on a topic related to Architecture</li> </ul>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – VI**

## Architectural Design -VI

<b>Subject Code</b>	<b>K8309</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>8</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To explore and demonstrate ‘technology and services as major determinants of Architectural form’ and understand co-relation between function, structure, services and form.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Develop analytical skill set for understanding built and non-built spaces
<b>2</b>	Synthesize and translate the analytical understanding into Architectural Design

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Research and Analysis of innovative technologies and materials prevailing in market, state of the art services and systems.
<b>Unit II</b>	Multi-functional public buildings like IT Complex, Hospitals, Commercial Centers, High Rise Structures
<b>Unit III</b>	Extension of the large project mentioned above e.g. Design of gymnasium, bank, departmental store, operation theatre, auditorium, etc.

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Bhatt V. &amp; Seniver P., (1990), <i>Contemporary Indian Architecture: After The Masters</i>, Ahmedabad, USA, Mapin Publishing Pvt. LTD.</li> <li>2. Kanvinde A. P. &amp; Miller J. H., (1969), <i>Campus Design in India: Experience of a Developing Nation</i>, Jostens/American Yearbook Company</li> <li>3. Mehta J., (2011) <i>Rethinking Modernity</i>, New Delhi, India, Niyogi Books</li> <li>4. Pressman A., <i>Design Architecture the elements of Process</i>, USA, Routledge</li> <li>5. Pandya Y., (2005) <i>Concepts of Space in Traditional Indian Architecture</i>, India, New Jersey, Mapin Publishing.</li> <li>6. Salvadori M., &amp; Robert H., (1975), <i>Structure in architecture: the building of buildings</i>, Cornell University, Prentice-Hall</li> <li>7. Steele J., Doshi B.V., (1998) <i>The complete architecture of Balkrishna Doshi: rethinking modernism for the developing world</i>, India, Super Book House</li> <li>8. Unwin S. (4<sup>th</sup> Ed), <i>Analysing Architecture</i>, Canada, Routledge</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Design project demonstrating integration of the building components and



	technology, services, vertical circulation, byelaws etc. on any one of the following – 3-star hotel, commercial complex, hospital, civic center, convention centre etc – Drawing portfolio and models
<b>2</b>	Design Project on any one of the following – gymnasium, bank, departmental store, operation theatre, auditorium, etc. - Drawing portfolio and models

## Building Construction and Materials-VI

<b>Subject Code</b>	<b>K8310</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>6</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To introduce construction of building components in Reinforced Cement Concrete.
<b>2</b>	To introduce construction of building components in steel and its use in industrial construction
<b>3</b>	To introduce methods of the pre-engineered structures

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Explore different R.C.C components of framed construction as well as special component construction.
<b>2</b>	Discuss different steel components and its construction
<b>3</b>	Understand concept of pre-engineered construction with respect to industrial construction

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>R.C.C. Framed Construction Element study</b> <ul style="list-style-type: none"> <li>- Principles and practices of R. C. Framed construction and its components</li> <li>- R. C. C. Footing for column, Isolated footing</li> <li>- R. C. C. Plinth beams and Plinth formation</li> <li>- R. C. C. Lintels and Chajja projections</li> <li>- R. C. C. Slab – one way, two way, single span and continuous spans</li> <li>- R. C. C. Beams – singly and doubly reinforced, single and continuous spans, cantilever beams</li> <li>- R. C. C. Columns</li> </ul>
<b>Unit II</b>	<b>R.C.C. Framed Construction Special Component study</b> <ul style="list-style-type: none"> <li>- R.C.C., Balconies, Canopies, fins, parapets</li> <li>- R.C.C. its potential and application</li> <li>- Details of junctions of slab and beam, slab-beam- column, primary, secondary beams</li> <li>- Study of form work construction</li> <li>- R.C.C. Staircase</li> </ul>
<b>Unit III</b>	<b>Steel Structures</b> <ul style="list-style-type: none"> <li>- Study of portal frames, its various types &amp; connection details.</li> <li>- Study of Castellated Beam, Veradale girder, Portal Frames &amp; Lattice Construction with</li> <li>- Connection details.</li> <li>- Medium span Roof Trusses with Sheet Cladding details &amp; Rain Water Disposal details.</li> <li>- Introduction to framed steel structures using steel sections &amp; steel decking</li> </ul>
<b>Unit IV</b>	<b>Industrial Building:</b> <ul style="list-style-type: none"> <li>- Study of constructional details for industrial buildings.</li> <li>- Details for lighting, Ventilation &amp; Rain water disposal for industrial buildings.</li> <li>- Study of Machine foundation, gantry &amp; high Strength flooring etc</li> </ul>
<b>Unit V</b>	<b>Study of Materials</b>

	<ul style="list-style-type: none"> <li>- Different cladding materials with fixing details.</li> <li>- Pre engineered structures.</li> <li>- Pre-stressed and post-tensioning methods pros and cons.</li> </ul>
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<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. M.S.Shetty(1986)<i>Concrete Technology</i> New Delhi, S.Chand&amp;Co.ltd.</li> <li>2. J. S. Foster, Roger Greeno(2007)<i>Mitchell's Structure &amp; Fabric: Part 2</i>.New York,Taylor and Francis group.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Gorenc, Tinyou, Syam(2005)<i>Steel Desinger's Handbook</i>. New Delhi,CBS Publishers and Distributors.</li> <li>2. Ralph Monletta(1989)<i>Plastics in Architecture" – A guide to acrylic and Polycarbonate</i>.New York, Marcel Dekker Inc.</li> <li>3. Jack M Landers(1983)<i>Construction Materials, Methods, Careers</i> USA,Good Heart - WilCox Company,Inc Publishers, Homewood, IL.</li> </ol>
<b>Websites:</b>	<a href="http://www.slideshare.net/mvm2594/concrete-technology-12587295">www.slideshare.net/mvm2594/concrete-technology-12587295</a>
<b>Journals:</b>	Journal of Construction Engineering, Technology stmjournals.com/index.php?journal=jocetm) Master Builder -Construction Magazine, construction News( <a href="http://www.masterbuilder.co.in">www.masterbuilder.co.in</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
<b>2</b>	Field reports and Market survey of building technology topics.
<b>3</b>	Proposals of different design in industrial building for prescribed projects. (Under discretion of the subject faculty).

## Theory of Structures-VI

<b>Subject Code</b>	<b>K8311</b>	<b>Semester -IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand basic concepts for RCC foundations
<b>2</b>	To understand behavior of different soils and foundation choice
<b>3</b>	To understand different types of RCC footings

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	develop understanding of basic staircase design.
<b>2</b>	develop understanding of behaviour of footings
<b>3</b>	understand importance of prestressing structural elements

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Staircases</b> - Types based on supports, loads, design of simply supported doglegged staircase
<b>Unit II</b>	<b>Soil types and foundations</b> - Soil types and determining suitable foundation (only theory) : safe bearing capacity, shear failure, excessive settlement, differential settlement, trial pits, need of pile foundation, need of raft foundation. - Design of rcc isolated pad footing. Explain (not design)rcc details of isolated circular and sloped footing, eccentric footing. - Necessity of combined footing, behaviour of combined footing, rcc details. (no design problem)
<b>Unit III</b>	<b>Foundation for steel columns</b> - Theory.(no numerical )
<b>Unit IV</b>	<b>Prestressing</b> - Introduction to prestressed structural elements, procedures, advantages, disadvantages, simple numerical beam problem to explain the concept of prestressing

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Shah H.J. (2014) <i>Design of RCC structures part II</i> . Anand, Charotar publishing house.
<b>Reference Books:</b>	1. Dr.Shah V.L.& Dr. Karve S.R.(2014) <i>RCC Theory and Design</i> .Pune,Structures Publishers. 2. Shah H.J.(2013) <i>Design of Reinforced Concrete Structures</i> .Anand,Charotar Publishing house. 3. Sinha S.N.(2014) <i>Reinforced Concrete Design</i> .New Delhi,Tata McGraw-Hill Publishing company limited.
<b>Websites:</b>	www.bis.org.in www.nptel.ac.in
<b>Journals:</b>	IS: 456-2000 code of practice for plain and reinforced concrete SP:16-Design aids for reinforced concrete

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>
	<b>40</b>

	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Design of simply supported doglegged stair case, drawing and schedule
<b>2</b>	Design of isolated pad footing, drawing and schedule
<b>3</b>	Making a typical RCC structural drawing with column location, numbering, beams (identifying beams to be designed as simple/cantilever/continuous...slabs to be identified as one way/two way/cantilever/continuous...typical detail of each element and schedule – no design)
<b>4</b>	Photo documentation of various foundation problems and their solutions

## Working Drawings -II

<b>Subject Code</b>	<b>K8312</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand and prepare advanced drawings necessary for construction/ execution of the buildings on site

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Prepare working drawings for RCC Framed structure
<b>2</b>	Prepare Detailed drawings such as OHWT, staircase, electrical layout, toilet details
<b>3</b>	Ability to coordinate with other consulting agencies involved in the project.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Preparation of working drawing for RCC structure
<b>Unit II</b>	Details
<b>Unit III</b>	Fieldwork: Setting of structure on Site

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1.Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhoum (2011). "The Professional Practice Of Architectural Working Drawings
<b>Websites:</b>	
<b>Journals:</b>	Gawne, Eleanor. "Cataloguing architectural drawings." Journal of the Society of Archivists 24.2 (2003): 175-187

<b>Assessment</b>	<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>
	Refer To 'Rule number 6, sub point 6.2.2.'
<b>U.E.</b>	<b>University Examination</b>
	Assignments or portfolios based on entire syllabus as mentioned below.

<b>Assignment</b>	
<b>1</b>	Common project
<b>2</b>	Field assignments
<b>3</b>	Individual design translated to working drawing portfolio with all details necessary for construction.

## Landscape Architecture

<b>Subject Code</b>	<b>K8313</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To emphasis learning of architecture beyond building, in the outdoor environment and spaces
<b>2</b>	To introduce the role and importance of landscaping and site planning in enhancing and improving the quality of building environs, functionally and aesthetically.
<b>3</b>	To explain site and its context while designing of buildings
<b>4</b>	To use landscape elements to create and enhance exterior spaces and to achieve climatic control at the buildings and site level.

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Explore various aspects of site planning and relationship between built and openspaces
<b>2</b>	Understand role of landscape in architecture.
<b>3</b>	Design small scale landscape project using landscape elements.

<b>Units</b>	
<b>Unit I</b>	<p><b>Introduction to landscape architecture – Importance, need and scope</b></p> <p><b>Landscape Elements</b></p> <ul style="list-style-type: none"> <li>- Plant element: Different aspects of - trees, shrubs, lawns, climbers, hedges, Indoor plants as elements. Basic idea about plants, plant selection, planting design and care of plants. Importance and use of NATIVE vegetation</li> <li>- Land element: Different aspects –soils, topography, levels, grading, earth forms, and foundations.</li> <li>- Water elements: Fountains, waterfalls, pools, cascades, channels, irrigation etc.</li> <li>- Architectural elements: sculptures, curbs, walls, steps, fence, etc</li> </ul>
<b>Unit II</b>	<p><b>Historical and contemporary landscape practices and case studies</b></p> <p><b>Integration of indoor and outdoor spaces</b></p>
<b>Unit III</b>	<p><b>Climate</b></p> <ul style="list-style-type: none"> <li>- Macro and microclimatic consideration in landscaping; effect on landscape and microclimate</li> </ul> <p><b>Site analysis and planning</b></p> <ul style="list-style-type: none"> <li>- Methodology and process of site study. Landform analysis, site analysis techniques. Importance of site planning for landscape design and architecture.</li> </ul> <p><b>Principles of landscape design</b></p> <ul style="list-style-type: none"> <li>- Aesthetical consideration</li> </ul>
<b>Unit IV</b>	<p><b>Relation between built and open spaces</b></p> <p>Pedestrian and vehicular circulation</p> <p>Landscape construction details</p> <p>Services related to landscape</p> <ul style="list-style-type: none"> <li>- Plumbing, water supply, electrical, sewage management</li> </ul>

Learning Resources	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Jellicoe, G. A., &amp; Jellicoe, S. (1982). <i>The Landscape of Man: Shaping the Environment from Prehistory to the Present Day</i>: Van Nostrand Reinhold.</li> <li>2. Simonds, J. O. (1998). <i>Landscape Architecture: A Manual of Site Planning and Design</i>: McGraw-Hill.</li> <li>3. Booth, N. K., &amp; Hiss, J. E. (2012). <i>Residential Landscape Architecture: Design Process for the Private Residence</i>: Prentice Hall.</li> <li>4. Reid, G. W. (2007). <i>From Concept to Form in Landscape Design</i>: Wiley.</li> <li>5. Robinette, G. O. (Ed.). (1983). <i>Landscape Planning for Energy Conservation</i>. NewYork: Van Nostrand Reinhold Company.</li> <li>6. White, S., &amp; Stein, J. A. (1993). <i>Building in the garden: the architecture of Joseph Allen Stein in India and California</i>: Oxford University Press.</li> <li>7. Kanvinde, A., &amp; Miller, H. J. (1969). <i>Campus Design in India: Experience of a Developing Nation</i>: Jostens/American Yearbook Company.</li> <li>8. Lynch, K. (1984). <i>Site Planning</i> (Third ed.): M.I.T. Press</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	Journal of landscape Architecture (LA)

Assessment		Marks
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

Assignments	
<b>1</b>	Comprehensive landscape proposal( Drawing portfolio) <ol style="list-style-type: none"> <li>a) One project for Functional and Aesthetic considerations, at residence level. (Especially landscape places like interiors, courtyards, terrace gardens, window landscaping etc.)</li> <li>b) One project for campus planning including vegetation, parking, road sections, footpaths, lighting etc.</li> </ol>
<b>2</b>	Case studies of landscape project under consideration in the form of report



## Estimation and Costing

<b>Subject Code</b>	<b>K8314</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To equip students with necessary technical knowledge for calculating estimates and detailed costing for small to medium projects with developing the skill of writing specifications for materials and item works.

<b>Learning Outcomes: Students will be able to</b>	
<b>1</b>	Compute quantities of various building items for simple load bearing structures and be acquainted with various types of Estimates including mode of measurements as adopted by I.S.1200.
<b>2</b>	Compute quantities and rate analysis of various building items of R.C.C. framed structure along with building services such as water supply, sanitation and drainage, electrical installations etc

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Introduction, purpose of “Quantity Computation” i.e. estimating, types of estimates (preliminary, Detailed) - Study of I.S.-1200. - A small project in load bearing and R.C.C. frame construction or their part to work out quantities and to understand market rate of materials and labours.
<b>Unit II</b>	- Bill of quantities for single story structures - Load bearing construction system. - R.C.C. Frame construction system.
<b>Unit III</b>	- Methods of calculating quantities for building works - Preparation of Bill of Quantities (B.O.Q.) Mode of measurements of quantities. Market rates of labour and building materials. Labour requirement and norms for consumption of basic materials. - Schedule of rates
<b>Unit IV</b>	- Study of different agencies involved in construction e.g. CPWD, PWD, etc. - Rate analysis and cost index. - Study of rate of innovative building materials in the market. - General factors affecting the rate of an item .rate analysis for different components of construction. - Software for calculation of quantities of various building items

<b>Learning Resources</b>	
<b>Text Books:</b>	1. B. S. Patil(2006). Civil Engineering Contracts and Estimates (Third Edition), Orient Blackswan. 2. B.N.Datta, (2011) Estimation and quantity surveying
<b>Reference Books:</b>	1. SP 27 (1987): Handbook of Method of Measurement of 2. Buildings Works [CED 44: Methods of Measurement of Works of 3. Civil Engineering] (first revision-2003) Bureau of India Standards 4. Arthur J.Willls (1979). Specification writings for Architects and surveyor by. Published by Crosby Lockwood 5. National Building Code(N.B.C.)2005,Bureau of India Standards
<b>Websites:</b>	www.bdg.org. WDBG- National Institute of Sciences.(Cost Estimating)

	<a href="http://www.cost-estimating.com">www.cost-estimating.com</a>
<b>Journals:</b>	Specifications Consultants in Independent Practice (SCIP) International Cost Estimating and Analysis Association (ICEAA)

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

<b>Assignments</b>	
	<b>Exercises for IA</b>
<b>1</b>	To work out the quantities of a small load bearing structure having area not more than 40 sqm.
<b>2</b>	To work out the quantities of items of construction work of load bearing and R.C.C. framed structure along with presentation
<b>3</b>	To prepare the list of items in construction and work out the quantities of items as directed by instructor

## Building Services-IV

<b>Subject Code</b>	<b>K8315</b>	<b>Semester -VI</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To study different high rise systems with respect to service core designs and building automation systems.
<b>2</b>	To familiarize the students with firefighting equipment and their installation
<b>3</b>	To familiarize students with water supply and sanitation systems in high rise
<b>4</b>	To study various aspects of vertical communication systems.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Explore various services including core and building automation systems.
<b>2</b>	Understand fire safety, fire fighting, fire prevention and installations in buildings including codal requirements
<b>3</b>	Address various design issues of water supply and sanitation systems in high rise buildings.
<b>4</b>	Understand various systems of vertical communication

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Advanced Building Services</b> - Types of High Rise Buildings - Building Core Arrangements
<b>Unit II</b>	- Water distribution systems in High rise buildings- downfeed water distribution, pumped upfeed distribution, constant pressure upfeed, gravity downfeed system - Sanitation systems in High rise buildings- two pipe system, solvent system.
<b>Unit III</b>	- Vertical communication systems for high rise buildings-Types of Elevators, Sky lobby Elevator system, double- deck elevator system, Hydraulic Elevators
<b>Unit IV</b>	- Fire fighting in high rise buildings- Water fire suppression systems and other fire suppression systems, Fire detection systems - Codal provision and standards for Fire fighting
<b>Unit V</b>	- Building automation system

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
<b>Reference Books:</b>	1. "Fire Safety: National Building Code of India 1983" published by Bureau of Indian Standards. 2. Andrew H Buchanan, (2001) <i>Design for fire safety</i> .New York,John Wiley & Sons Ltd 3. Yeang K.(2002) <i>Service cores details in building</i> . New York, John Wiley and sons. 4. National Building Code of India, 2005 (NBC 2005)
<b>Websites:</b>	<a href="http://www.slideshare.net/rdpatil65/fire-fighting-presentation">http://www.slideshare.net/rdpatil65/fire-fighting-presentation</a> <a href="http://www.powershow.com">http://www.powershow.com</a>

<b>Journals:</b>	Building Services Engineering Research and Technology ( <a href="http://bse.sagepub.com">bse.sagepub.com</a> ) Energy and buildings-Journal-Elsevier ( <a href="http://www.journals.elsevier.com/energy-and-buildings/">www.journals.elsevier.com/energy-and-buildings/</a> ) Technical journals- CIBSE-( <a href="http://www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t">www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t</a> )
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<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Elective-IV

<b>Subject Code</b>	<b>K8316</b>	<b>Semester IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes; student will be able to</b>	
<b>1</b>	Engage in systematic self study of topics they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<b>Architectural Journalism</b> <ul style="list-style-type: none"> <li>- Structure of architecture Journals</li> <li>- Writing Descriptive and analytical reports</li> <li>- Editing write ups, Photo Journalism.</li> <li>- Book reviews</li> <li>- Page compositions</li> <li>- The public process</li> <li>- Electronic media</li> </ul>
<b>2</b>	<b>Theatre /Film set Design</b> <ul style="list-style-type: none"> <li>- History of set and backdrop design for performance</li> <li>- Theme based design strategies</li> <li>- Period and modern sets, Technology applications</li> </ul>
<b>3</b>	<b>Green material/advanced material</b> <ul style="list-style-type: none"> <li>- Green material Selection, factors in selection, Resources to assist in determining materials appropriateness.</li> <li>- Material consideration when using the LEED rating program</li> <li>- Finishing materials for interior and exterior</li> <li>- Insulating materials :organic binders and bitumen and tar based materials like Bitumen, tar, emulsions, mastics, waterproofing items</li> <li>- Polymer sand polymer –based materials and components, polymer based building material for walls, pipes, sanitary-ware, glues and mastics</li> <li>- Metals in advanced building systems, steel cables, structural glazing and curtain walling</li> <li>- Light weight roofing materials :asbestos, galvanized iron, acrylic, polycarbonate</li> </ul>
<b>4</b>	<b>Visual Communication</b> <ul style="list-style-type: none"> <li>- Visual communication in architecture</li> <li>- Non verbal communication –signs, symbols, metaphor.</li> <li>- General concepts of image and schema</li> <li>- Concept sketches, bubble Diagrams, Area Diagram</li> <li>- Exploring methods of presentation for design through photographs, ppt, sketching, rendering etc.</li> <li>- Built forms and environment, Way finding in architecture and space between environment</li> </ul>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – VII**

## Architectural Design -VII

<b>Subject Code</b>	<b>K8401</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>10</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To learn different visual mapping methods in architecture
<b>2</b>	To understand and analyze the urban context and respond through design of a public space /public building

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Learn methods of mapping data
<b>2</b>	Develop analytical skills responsive to the broader socio-economic & physical context of the study area
<b>3</b>	Synthesize and translate analytical understanding into Architectural Design

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Data Collection, Representation</b> <ul style="list-style-type: none"> <li>- Learning different methods of data collection, documentation and representation through mapping</li> <li>- Documenting the socio-economic &amp; physical context of the study area, understanding character and distinctive features of the same.</li> <li>- Understanding of the legislative provisions including land-use, zoning, DCR&amp; relevant acts as applicable to the study area.</li> </ul>
<b>Unit II</b>	<b>Data Analysis</b> <ul style="list-style-type: none"> <li>- Analyzing the available data to arrive at issues, concerns and design decisions based on methods like SWOT analysis.</li> <li>- Arriving at a design proposal and developing design brief based on the analysis</li> </ul>
<b>Unit III</b>	<b>Design Proposal</b> <ul style="list-style-type: none"> <li>- Design of a public space/building responsive to the context - site and people</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Alexander C., Ishikaw S., Silverstein M. &amp; Jacobson, <i>A Pattern Language, Town, Buildings, Construction</i>, Oxford University Press</li> <li>2. Alexander C., Ishikaw S., Silverstein M. &amp; Jacobson, <i>A Timeless way of Buildings</i>, Oxford University Press</li> <li>3. Bacon E. N., (1976), <i>Design of Cities</i> Revised Edition, USA, Penguin Books</li> <li>4. Jain K. B., (2011), <i>Architecture Conceptual to the Manifest</i></li> <li>5. Lang J., (1994) <i>Urban Design: The American experience</i>, John Wiley &amp; Sons,</li> <li>6. Cullen G., (1971), <i>The Concise Townscape</i>, New York, USA, Architectural Press, Routledge.</li> <li>7. Lang J. T. , Desai M. &amp; Desai Madhavi, (1997) <i>Architecture and independence: the search for identity--India 1880 to 1980</i>, USA, Oxford University Press</li> <li>8. Lynch K., (1960, 1990), <i>The Image of the City</i>, Massachusetts Institute of Technology Cambridge, Massachusetts, and London, England, The M.I.T. Press (20th Printime)</li> </ol>



<b>Websites:</b>	Atre S., <i>Comprehensive Architecture + Urban Design Studio, Architecture And Context</i> California Polytechnic State University, San Luis Obispo College of Architecture & Environmental Design, From <a href="http://www.calpoly.edu/~arch/program/fifthyr/atre.pdf">http://www.calpoly.edu/~arch/program/fifthyr/atre.pdf</a>
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment</b>	
<b>1</b>	Data collection and analysis of urban fabric of selected site
<b>2</b>	Site responsive design demonstration of the following building typologies may be encouraged — residential, industrial, museums, libraries, transportation, institutional, hospitality buildings, recreational, any public activity spaces, etc. - Drawing portfolio and 3 - d model

## Building Construction and Materials-VII

<b>Subject Code</b>	<b>K8402</b>	<b>Semester-VII</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To introduce students to the advanced construction systems.
<b>2</b>	To introduce large scale roof constructions like stadiums, industrial buildings etc, and related materials.
<b>3</b>	To introduce types of swimming pool design and construction.
<b>4</b>	To introduce student to concepts of modular design and construction.

<b>Learning outcomes: Student will be able to</b>	
<b>1</b>	Understand various typologies and technologies of long span structures.
<b>2</b>	Understand various design and construction parameters of swimming pools.
<b>3</b>	Analyze modular concept of design and construction in large scale projects.
<b>4</b>	Explore sport stadiums, their field area and support space as well as building envelopes.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Long Span Structures</b> <ul style="list-style-type: none"> <li>• Shell structure like single curvature and double curvature etc.</li> <li>• Folded slab structure</li> <li>• Tension Structures like membrane, cable net and air supported etc.</li> <li>• Grid structure and skeletal like Space frames etc.</li> </ul>
<b>Unit II</b>	<b>Multi-basement</b> <ul style="list-style-type: none"> <li>- Soil bearing capacity and excavation techniques for basement.</li> <li>- Different uses of basement, it's planning criteria, Techniques of construction techniques like retaining wall, diaphragm wall, caissons, cofferdam etc.</li> <li>- Various services related to Basement like waterproofing, drainage, Ventilation, Ramps, elevators etc.</li> </ul>
<b>Unit III</b>	<b>Auditorium</b> <ul style="list-style-type: none"> <li>- Auditorium shape and size, seating arrangements.</li> <li>- Cone of vision, sightlines, stage and back stage design.</li> <li>- Acoustical design consideration, Noise and its criteria, sound defects etc.</li> <li>- Ancillary spaces like projection room, balcony, green rooms, orchestra pit etc. required for Auditorium.</li> <li>- Services related to Auditorium like fire protection and ventilation etc.</li> </ul>
<b>Unit IV</b>	<b>Modular coordination.</b> <ul style="list-style-type: none"> <li>• Precast and prefabricated building components used for roof, wall, interior and floor construction etc.</li> </ul>
<b>Unit V</b>	<b>Study of Materials</b> <ul style="list-style-type: none"> <li>- Study of modern building materials with respect to long span roof, modular system ,Acoustics ,basement etc.</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. T.D Ahuja and G.S. Birdie (1996) <i>Fundamentals of Building Construction</i> New Delhi, Dhanpat Rai Publishing Company Pvt. Ltd
<b>Reference Books:</b>	2. J. S. Foster, Roger Greeno(2007) <i>Mitchell's Structure &amp; Fabric: Part 2.</i> New York,Taylor and Francis group. 3. Gorenc, Tinyou, Syam(2005) <i>Steel Designer's Handbook</i> New Delhi,CBS

	Publishers and Distributor. 4. Ralph Monletta (1989) <i>Plastics in Architecture</i> ” – A guide to acrylic and Polycarbonate. New York, Marcel Dekker Inc.
<b>Websites:</b>	<a href="http://roofhugger.com/ConstructionDetails.htm?utm_source=Come+See+Us+in+New+Orleans&amp;utm_campaign=Hugger+News-January+2018&amp;utm_medium=email">http://roofhugger.com/ConstructionDetails.htm?utm_source=Come+See+Us+in+New+Orleans&amp;utm_campaign=Hugger+News-January+2018&amp;utm_medium=email`</a>
<b>Journals:</b>	Journal of Construction Engineering, Technology stmjournals.com/index.php?journal=jocetm) Master Builder -Construction Magazine, Construction News(www.masterbuilder.co.in)

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Theory of Structures -VII

<b>Subject Code</b>	<b>K8403</b>	<b>Semester-VII</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand trends and challenges in contemporary building structural systems.
<b>2</b>	To understand complex building structures and large spans
<b>3</b>	To understand importance and need for structural modeling

<b>Learning Outcomes :Student will be able to</b>	
<b>1</b>	Develop connections between Design, Construction and Material.
<b>2</b>	Design Ground and First floor structures with R.C.C. and steel building with simple configuration
<b>3</b>	Apply software as tool for modeling structures

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<ul style="list-style-type: none"> <li>- Earthquake zoning, base shear, lateral forces. Introduction to IS: 1893</li> <li>- Introduction to shear wall, structural behaviour, typical details.</li> <li>- Ductile detailing: introduction to IS: 13920, typical details of beams, columns, junctions</li> </ul>
<b>Unit II</b>	<ul style="list-style-type: none"> <li>- Introduction to flat slab (beamless). Major structural actions, behaviour and RCC details.</li> <li>- Introduction to plate girders, gantry girders, castellated girders.</li> <li>- Introduction to flitched beams.</li> </ul>
<b>Unit III</b>	<ul style="list-style-type: none"> <li>- Introduction to shell roofs. Behaviour, structural actions and rcc details of spherical dome.</li> <li>- Understanding space frame and space truss (3D elements, equilibrium conditions and concepts only)</li> <li>- Introduction to long span structures: arches, open web sections, bow string girders, typical details.</li> <li>- Modelling and analysis of structure on STAAD-Pro software.</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Sarma T.S. (2014) <i>STAAD Pro V8i for Beginners with Indian Examples</i>. Chennai, Notion Press.</li> <li>2. Shah H.J.(2014)<i>Design of RCC Structures part II</i>.Anand,Charotar Publishing house.</li> </ol>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Dr.Shah V.L.&amp; Dr. Karve S.R.(2014)<i>Illustrated design of reinforced concrete buildings(design of G+3 storeyed office/residential building)</i>.Pune,Structures Publishers.</li> <li>2. Negi L.S.&amp;Jangid R.S.(2000)<i>Structural analysis</i>.New Delhi,Tata McGraw-Hill Publishing company limited.</li> </ol>
<b>Websites:</b>	<p>www.nicee.org                      www.bis.org                      www.nptel.ac.in                      INSDAG website</p>
<b>Journals:</b>	IS :1893 and IS: 13920

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment</b>	
<b>1</b>	Sketching and explaining structural behaviour of above topics.
<b>2</b>	Case study of structural systems implemented by imminent architects in their projects
<b>3</b>	Modelling and analysis of simple structure on STAAD-Pro

## Interior Design I

<b>Subject Code</b>	<b>K8404</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To make students understand various aspects of interior spaces
<b>2</b>	To make students understand qualities of interior spaces to develop skills in designing for functional and aesthetical meaningful interior spaces.

<b>Learning Outcomes: Student will be able to</b>	
<b>1</b>	Design interior spaces of buildings.
<b>2</b>	Design furniture with all necessary details.
<b>3</b>	Develop competence for working with various materials & construction techniques used in interior design

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	- Introduction to the field of interior design and various parameters. market survey of various interior materials
<b>Unit II</b>	- Market survey of various interior materials.
<b>Unit III</b>	- Case study of a small interior project. ( 100sq.m to 150 sq,m) Carpet area.
<b>Unit IV</b>	- A detailed design of the interior projects. ( 50sq.m to 100 sq,m) Carpet area.

<b>Learning Resources</b>	
<b>Text Books:</b>	1. John Coles & Naomi, (2007) The fundamentals of interior architecture/AVA Publishing SA.
<b>Reference Books:</b>	1. Mitcheil Beazley (2004), The new colour book/octopus publishing group ltd. 2. Julie Savill (2001), Good homes magazine(101 colour schemes that really works)/BBC World wide. 3. Elizabeth wilhide. (2007), Surface & Finish( Directory of materials for interiors) /Quadrille publishing Ltd. UK
<b>Websites:</b>	www.quadrille.co.in. www.theaid.in.
<b>Journals:</b>	Magazine published by IIID “Insite” International journal of interior architecture & spatial design.

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
1	Study Example report with drawings & Studio based time bound Interior design project.
2	Report on survey of materials in market (This will be referred for UE examination)
3	Drawing portfolio comprising of Individual interior design layout, elevations,

	sections and views
4	Constructional drawing of various interior components and specification of the above interior finalized project.

## Advance Landscape Architecture

<b>Subject Code</b>	<b>K8405</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To understand the complex issues related to landscape architecture and respond comprehending natural, man-made and social environment.
<b>2</b>	To understand various factors affecting landscape design at urban scale

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Respond to complex issues related to landscape architecture at macro level
<b>2</b>	Understand influences of various factors on design of landscape at urban scale

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Understanding advancements in Landscape Architecture</b> -Terrace Gardens, Roof Gardens, Vertical Landscapes, etc. -Landscape for atriums -Innovative Landscape construction techniques.
<b>Unit II</b>	<b>Understanding the process of site analysis and planning at macro level (involving complex issues such as physical, functional, environmental and socio-cultural)</b> - Physical factors such as topography, geology, site features, hydrology, surrounding land-use, buildings and soil conditions - Environmental factors such as climate, existing flora and fauna - Socio-cultural such as existing use, structures of historic or religious importance if any , - Aesthetics such as views from and within site - Storm water management
<b>Unit III</b>	<b>Understanding role of landscape for energy conservation</b> -Role of vegetation -Role of water bodies -Role of land form -Effect on temperature, air movement, noise and pollution
<b>Unit IV</b>	<b>Understanding the various factors affecting design and planning of urban open spaces and provide landscape solution for the same.</b> - Physical Factor - Social Factors - Environmental Factors - Functional Aspects

<b>Learning Resources</b>	
<b>Text Books:</b>	-----
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Jellicoe .G and Jellicoe. S (1987).The Landscape of Man, Thames and Hudson, London</li> <li>2. Simonds. J. O. (1961). Landscape Architecture, The Shaping of Man's Natural Environment. F.W. Dodge Cooperation, London</li> <li>3. Harris.C.W and Dine.N.T ; Time Saver Standards For Landscape Architecture, McGraw – Hill International Edition, Arch. Series</li> </ol>



	<p>4. Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. McGraw-Hill Professional</p> <p>5. Reid G. W: (1987) Landscape Graphics.</p> <p>6. Reid G. W: (1993) From Concept to Form: In Landscape Design. John Wiley &amp; Sons .</p> <p>7. 7.Robinette, G.O (1977) Landscape planning for energy conservation. Environmental Design Press,Reston, VA</p>
<b>Websites:</b>	-----
<b>Journals:</b>	Journal of Landscape Architecture

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Case studies based on unit I
<b>2</b>	Assignment based on unit III
<b>3</b>	Case studies or readings based on unit IV
<b>4</b>	One large scale studio project based on unit II or IV

## Urban Planning I

<b>Subject Code</b>	<b>K8406</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	To introduce students to the basic concepts of Town and Urban Planning.
2	To understand the hierarchy of planning.
3	To understand the importance of Town Planning with respect to legislative guidelines, through Acts and Byelaws
4	To introduce the subject of Urban Design in order to enable students to establish a larger context for Architectural Design

<b>Learning Outcomes: Student will be able to</b>	
1	Understand the basic concepts of Town and Urban Planning
2	Legislation and rules of Town Planning
3	Do the Subdivision of Layout, and Municipal Drawings.
4	Understand the evolution of urban form of cities

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Introduction to the subject of Urban Planning.</b> Introduction to the Basic concepts in planning like landuse, zoning, byelaws etc Need and importance of study of Rural/ Town /Urban Planning for an architect.
<b>Unit II</b>	<b>Evolution of planning in settlements from ancient to contemporary times.</b> Principles, influences on Indus cities, Egyptian cities, Greek cities, Roman cities, Industrial cities etc.
<b>Unit III</b>	<b>Planning Theories By</b> Patrick Geddes; Kevin Lynch; Clarence Perry; Frank Lloyd Wright; Ebenezer Howard; Le Corbusier, C.A. Doxiadis, Lewis Mumford. <b>Conceptual study</b> of Garden city, Satellite towns, Industrial Towns, New Towns, Planned Cities, Twin Cities, Neighbourhood Etc. <b>City plan patterns</b> -Linear, Radial, Grid Iron layout and Ribbon development
<b>Unit IV</b>	<b>Introduction to Housing and Housing Typologies</b> Characteristics of Urban housing. Study of Housing typologies based on Topographical and Social, Economics aspects. Housing scenario and its impact. Study of Housing Neighbourhoods with reference to planning concepts and principles by planners.
<b>Unit V</b>	<b>Introduction to Planning Legislation</b> Introduction to various planning related laws, their contents and provisions, viz: M.R.T.P. Act of 1966, Land Acquisition Act of 1894, Maharashtra Slum Redevelopment Act, Urban Arts Commission Act, Municipal Act etc
<b>Unit VI</b>	<b>Introduction to urban form and space</b> Urban Form and space in historical and theoretical terms.

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Kevin Lynch (1960) <i>The Image of the City</i> USA, MIT press. 2. Lewis Mumford (1972) <i>The City in History: Its Origins, Its Transformations, and Its Prospects.</i> USA, Harcourt, Inc.

	<p>3. Peter Geoffrey Hall (1996 Updated Edition) <i>Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century</i> USA, Blackwell publishing.</p> <p>4. Anthony J. Catanese, James C. Snyder (2014) <i>Urban Planning</i>. New Delhi, McGrawHill Education Private Limited.</p> <p>5. AbirBandyopadhyay, (2010) <i>Town Planning</i>, Kolkata, ArunabhaSen</p>
<b>Reference Books:</b>	<p>1. Brown A.J.(1969) <i>Introduction to town and country planning</i> Australia, Angus and Robertson publisher.</p> <p>2. P.Healey,(1981) <i>Planning Theory</i>.UK, Pergamon Press</p> <p>3. Arthur Gallion(1993)<i>The Urban Pattern</i>. New York, John Wiley and Sons</p>
<b>Websites:</b>	<p><a href="http://www.planetizen.com/websites/2014">www.planetizen.com/websites/2014</a>  <a href="http://www.unhabitat.org/@UNHABITAT">http://www.unhabitat.org/@UNHABITAT</a>  <a href="http://sustainablecitiescollective.com/@sustainablecities">http://sustainablecitiescollective.com/@sustainablecities</a></p>
<b>Journals:</b>	<p>Cities: The International Journal of Urban Policy and Planning  Urban Policy and Research  Urban Studies</p>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Building Services-V

<b>Subject Code</b>	<b>K8407</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To expose students to the various integrated services of water supply And drainage at campus level.
<b>2</b>	To familiarize students with solid waste management.
<b>3</b>	To study various Building Management Systems.

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Acquire knowledge of various integrated building services.
<b>2</b>	Address various issues of solid waste management.
<b>3</b>	Understand various Building management systems

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Water Distribution systems</b> <ul style="list-style-type: none"> <li>- For housing schemes and high rise buildings. Schematic water distribution from treatment plant to town, group housing etc.</li> <li>- Hot water supply in high rise buildings.</li> <li>- Water heaters, boilers</li> <li>- Solar water heating</li> </ul>
<b>Unit II</b>	<b>Sewage collection and disposal</b> <ul style="list-style-type: none"> <li>- For large campuses, complexes, High rise Buildings etc. Mechanical methods of removal of sewage from basements (Shone's ejector).</li> <li>- Sewage treatment, Waste water conservation, recycling, biogas etc</li> </ul>
<b>Unit III</b>	<b>Urban Drainage Systems</b> <ul style="list-style-type: none"> <li>- For private and public places.</li> <li>- Drainage ,sub drains, culverts, ditches, gutters, drop inlets and catch basins</li> <li>- Rain water Harvesting.</li> </ul>
<b>Unit IV</b>	<b>Solid waste or refuse Disposal</b> <ul style="list-style-type: none"> <li>- Refuse chutes.</li> <li>- Waste /kitchen</li> <li>- waste Managements</li> </ul>
<b>Unit V</b>	<b>Integration of Services</b> <ul style="list-style-type: none"> <li>- ETP, STP and other building management services like CCTV, PG &amp; UPS</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	1. Benjamin Stein and John Renolds.(2006) <i>Mechanical and Electrical Equipment for Building</i> , New York, John Wiley and Sons.
<b>Reference Books:</b>	1. Vasisth K.(2011) <i>Waste management</i> New Delhi, Essential books. 2. National Building Code of India, 2005 (NBC 2005)
<b>Websites:</b>	<a href="http://bst1.cityu.edu.hk/e-learning">http://bst1.cityu.edu.hk/e-learning</a>
<b>Journals:</b>	CIBSE journal <a href="http://www.cibsejournal.com/">http://www.cibsejournal.com/</a> Building Services Engineering Research and Technology ( <a href="http://bse.sagepub.com">bse.sagepub.com</a> ) Energy and buildings-Journal-Elsevier ( <a href="http://www.journals.elsevier.com/energy-and-buildings/">www.journals.elsevier.com/energy-and-buildings/</a> ) Technical journals- CIBSE-( <a href="http://www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t">www.cibse.org/knowledge/technical-journals/technical-journals-bsert-lr-t</a> )
<b>Assessment</b>	<b>Marks</b>

<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Detail services layout which includes water supply and sanitation requirements for a campus project. (Project is preferably the architectural design project which the students have already worked on)

## Elective- V

<b>Subject Code</b>	<b>K8408</b>	<b>Semester IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes: Student will be able to</b>	
1	Engage in systematic self study of topics they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<p><b>Housing</b></p> <ul style="list-style-type: none"> <li>- Housing survey and methodologies</li> <li>- Factors effecting housings</li> <li>- Housing demand, slums, Typologies, finance, etc.</li> <li>- Comparative study of various housing policies and programmes.</li> <li>- Housing case studies</li> <li>- Post Occupancy evaluation.</li> <li>- Importance of housing in urban and regional development</li> <li>- Structural concepts, use of traditional and new building materials ,self help and low cost housing</li> <li>- Role of co-operative and public and private agencies</li> </ul>
<b>2</b>	<p><b>Disaster Management</b></p> <ul style="list-style-type: none"> <li>- Study of building designs to resist following types of disasters: Earthquake; Fire; Flood; Cyclone; Tsunami; Other natural disasters</li> <li>- Post-disaster problems</li> <li>- Study of geological structure and its deformation</li> <li>- Study of behaviour of the structure in such disasters</li> <li>- design aspects and considerations for various types of buildings especially the residential, congregational and institutional buildings</li> </ul>
<b>3</b>	<p><b>Sustainable architecture</b></p> <ul style="list-style-type: none"> <li>- Study of effects of Luminous Environment on comfort condition in built space, including Analysis Techniques, Design Strategies and Evaluation Procedures</li> <li>- Introduction and Analysis of the Precedent</li> <li>- Analysis of the site and climate</li> <li>- Analysis of the building programme and use.</li> <li>- Schematic design.</li> <li>- Design development.</li> <li>- System integration</li> <li>- Various rating systems like LEED, GRIHA.</li> </ul>
<b>4</b>	<p><b>Industrial Architecture</b></p> <ul style="list-style-type: none"> <li>- Location and planning aspects of Industrial areas</li> <li>- Indoor and Outdoor working environment in Industries</li> <li>- Services essential for Industries, considerations f industrial safety (Fire)</li> <li>- Various acts applicable to construction of industries such as Factory act,</li> </ul>

	Pollution control Act etc. - Review of structural systems used for Industries with materials. - Environmental pollution as resultant of industrial activity.
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<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – VIII**



## Architectural Design VIII

<b>Subject Code</b>	<b>K8409</b>	<b>Semester -VIII</b>
<b>Credits</b>	<b>10</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	To develop understanding of present day urban/socio-economic/technological/infrastructural issues and identify redevelopment triggers.
2	To evaluate performance of a built space with respect to present day urban parameters.
3	To develop skill of feasibility analysis and design capacity in given urban context.

<b>Learning Outcomes: Student will be able to</b>	
1	Learn building Design issues such as parking, additional FSI with design and work out feasibility due to change in life style.
2	Redevelop a precinct to meet the present day needs like innovative technology
3	Study of relevant bylaws applicable for the above mentioned project.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Identify, Research and analyze urban issues such as parking/changed life style/changed urban fabric/infrastructure of a given plot of land and feasibility study.
<b>Unit II</b>	Case study of redevelopment projects
<b>Unit III</b>	Design of given plot (Redevelopment)

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Shah Jagan, 2008, Contemporary Indian Architecture, Lustre Press 2008 8 ISBN 174364463, 9788174364463 2. National Building Code of India, 2016
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b> Refer To 'Rule number 6, sub point 6.2.2.'	<b>40</b>
<b>U.E.</b>	<b>University Examination</b> Assignments or portfolios based on entire syllabus as mentioned below.	<b>60</b>

<b>Assignment</b>	
<b>1</b>	Collecting data about a project/site to be developed.
<b>2</b>	Feasibility study and formulation of design brief
<b>3</b>	Design: The project that can be taken up can be redevelopment of a plot, addition and alterations to existing structures/change of use.

## Building Construction and Material VIII

<b>Subject Code</b>	<b>K8410</b>	<b>Semester -VIII</b>
<b>Credits</b>	<b>04</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	To introduce the concept of multi-basement and its construction systems.
2	To introduce the Acoustical design considerations for Auditorium and its construction systems.
3	To introduce various considerations in Design and Construction of high rise structures.

<b>Learning Outcomes: Student will be able to</b>	
1	Understand different systems of basement constructions and its services.
2	Understand different systems of Semi- permanent structures and its installation techniques.
3	Understand different design consideration for Auditorium and its systems of construction.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Swimming Pool</b> <ul style="list-style-type: none"> <li>• Components of Swimming pool like basin, drain, filter, deck, ladder, diving board, lane and lane marking etc.</li> <li>• Types like private, public, recreational, theme based, sports etc.</li> <li>• Materials used for swimming pool like brick, concrete, fiber reinforced etc.</li> <li>• Techniques used for constructions of swimming pool like underground, above ground, elevated etc.</li> <li>- Services related to swimming pool like filtration, electrical, drainage , maintenance etc.</li> </ul>
<b>Unit II</b>	<b>Stadium:</b> <ul style="list-style-type: none"> <li>• Introduction to Components of Stadiums like stadium field area, Seating area, envelope and roof.</li> <li>• Field area and their shapes, orientation, field drainage, field protection etc.</li> <li>• Stadium Bowl design parameters like viewing distances and sightlines, gangways, vomitories, media boxes, VIP areas, player areas, facility areas like food and services.</li> <li>• Building Envelope and roof materials and their technologies.</li> <li>• Roof design considerations like wind and sun.</li> <li>• Services related to Stadium like lighting, access control, signage, toilet, maintenance etc.</li> <li>-</li> </ul>
<b>Unit III</b>	<b>Semi-permanent Structures</b> <ul style="list-style-type: none"> <li>- Need, Planning and Layout, Installation techniques used worldwide.</li> <li>- Various Semi-permanent Structural systems for floor, wall, roof etc.</li> <li>- Services related to water and sanitation layout, natural and mechanical ventilation, lighting, insulation etc.</li> </ul>
<b>Unit IV</b>	<b>High Rise Structures</b> <ul style="list-style-type: none"> <li>- Design consideration like wind and seismic, foundation, form work systems,</li> </ul>

	Construction Techniques and Building Envelope, mechanical floors. - Systems in steel and Concrete. - Structural glazing, elevators,
<b>Unit V</b>	<b>Study of Materials</b> - Study of different modern building materials with respect to Swimming Pool, Stadium, installable structures and high rise.

<b>Learning Resources</b>	
<b>Text Books:</b>	1. T.D Ahuja and G.S. Birdie (1996) <i>Fundamentals of Building Construction</i> New Delhi, Dhanpat Rai Publishing Company Pvt. Ltd
<b>Reference Books:</b>	2. J. S. Foster, Roger Greeno(2007) <i>Mitchell's Structure &amp; Fabric: Part 2</i> .New York,Taylor and Francis group. 3. Gorenc, Tinyou, Syam(2005) <i>Steel Designer's Handbook</i> New Delhi,CBS Publishers and Distributor. 4. Ralph Monletta (1989) <i>Plastics in Architecture” – A guide to acrylic and Polycarbonate</i> .New York, Marcel Dekker Inc.
<b>Websites:</b>	<a href="https://www.som.com/ideas/research/design_of_high-rise_buildings">https://www.som.com/ideas/research/design_of_high-rise_buildings</a> <a href="http://www.losberger.com/us/en_us/applications/semi-permanent-structu...">www.losberger.com/us/en_us/applications/semi-permanent-structu...</a> <a href="http://www.theatresolutions.net">www.theatresolutions.net</a> > Layouts & Design
<b>Journals:</b>	Journal of Construction Engineering, Technology <a href="http://stmjournals.com/index.php?journal=jocetm">stmjournals.com/index.php?journal=jocetm</a> ) Master Builder -Construction Magazine, Construction News( <a href="http://www.masterbuilder.co.in">www.masterbuilder.co.in</a> )

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

<b>Assignments</b>	
<b>1</b>	Portfolio of technical drawings of above mentioned topic with supporting documents of sketched booklet and pictographic presentation. (min.4drgs.)
<b>2</b>	Field reports and Market survey of building Material topics.
<b>3</b>	Proposals of different designs of swimming pool and sitting area for small scale stadia. (as per discretion of the subject faculty)

## Vocabulary and Repertoire

<b>Subject Code</b>	<b>K8411</b>	<b>Semester -VII</b>
<b>Credits</b>	<b>3</b>	<b>Subject type-Core</b>

Learning Objectives	
<b>1</b>	To express understanding of architecture writings.
<b>2</b>	To learn vocabulary to be used for analyzing Architecture.

Learning Outcomes: student will be able to	
<b>1</b>	Acquire effective verbal communication in architecture
<b>2</b>	Write essays, research papers, book reviews etc.

Units	Contents
<b>Unit I</b>	<b>Architectural expression</b> <ul style="list-style-type: none"> <li>- Form and expression</li> <li>- structural expression</li> <li>- society</li> <li>- culture and expression</li> <li>- spatial expression</li> </ul> <b>Vocabulary and grammar of form</b> <b>Glossary of technical words</b>
<b>Unit II</b>	<b>Architectural Journalism</b> <ul style="list-style-type: none"> <li>- Writing Descriptive and analytical reports</li> <li>- Book reviews</li> <li>- Page compositions</li> </ul>
<b>Unit III</b>	<b>Elements of Architecture</b> <ul style="list-style-type: none"> <li>- Basic elements of architecture</li> <li>- Modifying elements of architecture</li> </ul>
<b>Unit IV</b>	<b>Seminar on Architects Biography and Concepts in contemporary architecture</b>

Learning Resources	
<b>Text Books:</b>	Simon Unwin (2009). <i>Analysing Architecture</i> third edition, revised and enlarged. USA and Canada by Routledge.
<b>Reference Books:</b>	John Ruskin (1989). <i>The seven lamps of Architecture</i> . London, Dover Publications Neelkanth Chhaya (2014). <i>Harnessing the intangible, collected essays on the work of Balkrishna Doshi</i> , New Delhi, NIASA Council of Architecture.

Assessment	Marks
<b>I.A.</b>	<b>40</b>
<b>Internal Assessment</b>	
	Refer To 'Rule number 6, sub point 6.2.2.'
<b>U.E.</b>	<b>60</b>
<b>University Examination</b>	
	Assignments or portfolios based on entire syllabus as mentioned below.

Assignments	
<b>1</b>	Writing Journals on Theory of design
<b>2</b>	Any one Book review and Any one Architects Biography

## Interior Design II

<b>Subject Code</b>	<b>K8412</b>	<b>Semester -VIII</b>
<b>Credits</b>	<b>04</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	In this subject students will apply their skills, knowledge gained in the previous interior design studio for more complex interior design projects with all details of services.
2	The students will also understand the complex interior designing process, specification, various detailing and tentative estimate of to fulfill the needs of client.

<b>Learning Outcomes: Student will be able to</b>	
1	Acquire knowledge of various high end interior building materials their specification its cost and its application in interior design project.
2	Design complex Interior spaces with services, construction details with cost consideration to suit its function and aesthetics in a Systematic cad presentation with all detail drawings.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Introduction to the field of interior design with respect to services.
<b>Unit II</b>	Market survey of application of various finishing interior materials and techniques.
<b>Unit III</b>	Detailed Case study of a medium scale interior project. ( 150 sq.m to 250 sq.m.)
<b>Unit IV</b>	A detailed design of the medium scale interior projects showing all necessary services, specifications and costing. Carpet Area ( 150 sq.m to 250 sq.m.)

<b>Learning Resources</b>	
<b>Text Books:</b>	Office Spaces – Crane Dixon, Architectural Data Sheets
<b>Reference Books:</b>	Corporate Interiors – Kogek Yee, Office Interiors – Alan Phillips
<b>Websites:</b>	www.quadrille.co.in. www.theaid.in.
<b>Journals:</b>	Architectural Digest, Elle Décor, Home and Design, Interior Design etc.

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignment</b>	
<b>1</b>	Report based on Market survey of interior Materials
<b>2</b>	Live Case Study of a completed Interior Project
<b>3</b>	Detailed drawings of the Interior Design project of the following – residential, public, commercial etc with thrust on services, specification and tentative

	estimate etc.
<b>4</b>	Design of the decorative ceiling, paneling, lightings, floor details, toilet details etc for the above projects.
<b>5</b>	Detailed design of two furniture units with specification and construction/ joinery details.

## Urban Planning II

<b>Subject Code</b>	<b>K8413</b>	<b>Semester -VIII</b>
<b>Credits</b>	<b>03</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
1	To introduce students to the advanced concepts of Town and Urban Planning.
2	To understand the planning procedures at various levels of planning.
3	To understand the holistic relationship of planning with various other aspects of physical developments.
4	To develop an urban vocabulary required to understand urban form and public spaces

<b>Learning Outcomes: Student will be able to</b>	
1	Understand the interrelated concepts of Town and Urban Planning
2	Exposure to the various laws and rules for planning and balanced development.
3	Understand the effects of various policies on physical development.
4	Understand urban form and space

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Introduction to the process of formulation and implementation of :</b> Regional Plan, Development Plan and Town Planning Schemes. Study of various Planning agencies and their role in planning like HUDCO, CIDCO, HDFC, MHADA etc.
<b>Unit II</b>	Role and relevance of Transport Planning, Landscape and Environmental issues, Heritage etc in Urban Planning.
<b>Unit III</b>	<b>Introduction to various planning tools.</b> Methodology of conducting town planning surveys, types of surveys (physical, social, and economical, Aesthetic Surveys etc) and analysis of data collected.
<b>Unit IV</b>	<b>Urbanization and Its Impacts.</b> Introduction to Study of Contemporary Issues of Urban Development and concerns in the City.
<b>Unit V</b>	<b>Policies and legal framework for contemporary planning development:</b> National Missions, Schemes for funding various planning activities, infrastructure development schemes like JNNURM, HRIDAY, SMART CITY etc.
<b>Unit VI</b>	<b>Introduction to urban design terminologies and definitions</b> To understand the urban form derived from theories as well as empirical evidence.

<b>Learning Resources</b>	
<b>Text Books:</b>	6. Kevin Lynch (1960) <i>The Image of the City</i> USA, MIT press. 7. Lewis Mumford (1972) <i>The City in History: Its Origins, Its Transformations, and Its Prospects</i> .USA, Harcourt, Inc. 8. Peter Geoffrey Hall (1996 Updated Edition) <i>Cities of Tomorrow: An Intellectual History of Urban Planning and Design in the Twentieth Century</i> USA, Blackwell publishing. 9. Anthony J. Catanese, James C. Snyder (2014) <i>Urban Planning</i> . New Delhi, McGrawHill Education Private Limited.

	10. AbirBandyopadhyay, (2010) <i>Town Planning</i> , Kolkata, ArunabhaSen
<b>Reference Books:</b>	4. Brown A.J.(1969) <i>Introduction to town and country planning</i> Australia, Angus and Robertson publisher. 5. P.Healey,(1981) <i>Planning Theory</i> .UK, Pergamon Press 6. Arthur Gallion(1993) <i>The Urban Pattern</i> . New York, John Wiley and Sons
<b>Websites:</b>	<b>www.planetizen.com/websites/2014</b> <a href="http://www.unhabitat.org/">http://www.unhabitat.org/</a> / @UNHABITAT <a href="http://sustainablecitiescollective.com/">http://sustainablecitiescollective.com/</a> / @sustaincities
<b>Journals:</b>	Cities: The International Journal of Urban Policy and Planning Urban Policy and Research Urban Studies
<b>Assessment</b>	
<b>I.A.</b>	<b>Internal Assessment</b>
	Refer To 'Rule number 6, sub point 6.2.2.'
<b>U.E.</b>	<b>University Examination</b>
	Theory paper
	<b>Marks</b>
	<b>40</b>
	<b>60</b>



## Research Skills

<b>Subject Code</b>	<b>K8414</b>	<b>Semester -VIII</b>
<b>Credits</b>	<b>04</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To inculcate in students methodical process to approach an architectural design project holistically.
<b>2</b>	To develop research skills necessary to provide approach and directions in design of architectural project.
<b>3</b>	To develop a systematic approach of research for application in Architectural Design Project.
<b>4</b>	To develop skill sets of writing research paper

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Develop primary skills to conduct research in Architecture
<b>2</b>	Demonstrate Visual Research Methods.
<b>3</b>	Demonstrate acquired research skills through the topic selected for Architectural Design Project.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Introduction to Research Skills , Types of research , Methods of data collection , Ethics ,and Referencing
<b>Unit II</b>	Visual Research Methods in Design Imageability Environmental mapping – Direct observation and direct communication Visual representation Environmental behaviour
<b>Unit III</b>	Selection of topic for Architectural Design project giving overview of introduction, background, context, relevance, scope and limitation, methodology and identification of case studies.
<b>Unit IV</b>	Demonstration of Case study and its analysis (Minimum two Book /live case studies) to understand the Project. Literature review minimum three research papers relevant to the research project
<b>Unit V</b>	Research Paper Writing

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	1. Robert Bechtel et al (eds). Methods in Environmental and Behavioral Research, NY:VanNostrand Reinhold, 1987. 2. Gary T Moore et al. Environmental Design Research Directions: Process and Prospect. New York: Preager Publishers, 1985. 3. Henry Sanoff. Visual Research Methods in Design. New York: Van Nostrand Reinhold, 1991
<b>Websites:</b>	
<b>Journals:</b>	

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Synopsis of Architectural design project.
<b>2</b>	Literature review.
<b>3</b>	Case studies and its analysis (minimum two).
<b>4</b>	Research Paper Writing.
<b>5</b>	Seminar presentation of components level research areas based on selected Architectural Design Project .

## Elective- VI

<b>Subject Code</b>	<b>K8415</b>	<b>Semester IV</b>
<b>Credits</b>	<b>2</b>	<b>Subject type-Elective</b>

<b>Learning Objectives</b>	
1	To give students an opportunity to develop their skills in a subject they may opt for further studio.
2	To study the selected topic in depth of a particular subject that student is interested.
3	To prepare a technical base for students through in depth study.

<b>Learning Outcomes: Student will be able to</b>	
1	Engage in systematic self study of topics they feel interested in.

<b>Students can select one elective from the following list</b>	
<b>1</b>	<p><b>Real Estate Management</b></p> <ul style="list-style-type: none"> <li>- Real estate development: Fundamental concepts and techniques, recognizing institutional and entrepreneurial elements, issues encountered in various phases of development like site evaluation and land procurement, development team assembly,</li> <li>-market study and development scheme, construction &amp; project management, project marketing and hand-over of completed projects.</li> <li>-Development &amp; project financing: Project Feasibility, Development Financing, Asset Disposal and Redevelopment Options,</li> <li>-Analyses of Development Sites and Case Studies, integrated case study on a specific development project, which requires reviewing, analyzing and resolving the problems or strategic issues.</li> <li>- Urban policy &amp; real estate markets : Impact of Government Regulations and Public Policies on Real Estate Markets, include urban land rent and location theories, land use structures, community and neighbourhood dynamics, degeneration and renewal in urban dynamics, private-public participation, government policies on 95 public and private housing, and urban fiscal policy including property taxation, local government finance.</li> <li>- Corporate real estate asset management: Strategic plans to align real estate needs with corporate business plans;</li> <li>-Performance measurement techniques to identify asset acquisition or disposal; methods for enhancing value through alternative uses, efficient space utilization or improving user satisfaction.</li> <li>- Commercial real estate appraisals: Determination of the capitalization rates across different types of properties;-Appraisal of freehold and leasehold interests;</li> <li>-Critical analysis of the valuation approaches adopted for securitized real estate; Asset pricing models; investment flexibility and future redevelopment opportunities.</li> </ul>
<b>2</b>	<p><b>Architectural Conservation</b></p> <ul style="list-style-type: none"> <li>- History and theory of conservation</li> <li>- Philosophy of conservation</li> </ul>

	<ul style="list-style-type: none"> <li>- Pioneers of conservation</li> <li>- Definition of conservation, preservation, restoration, reconstruction ,Adoption</li> <li>- Broad concepts of terms such as Reuse, Rehabilitation, Revitalization, Regeneration, Up gradation etc.</li> <li>- Value and ethics</li> <li>- Traditional building materials and their decaying characteristics. Environmental influences: thermal effect, corrosion and oxidation.</li> <li>- Preparation of Inspection reports.</li> <li>- Cultural Heritage</li> <li>- Conservation methods</li> <li>- Classifications</li> <li>- Management of historic sites</li> <li>- Studies of various charters.</li> </ul> <p>Role of INTACH,UNESCO, ECOMOS and other organizations</p>
<b>3</b>	<p><b>Digital architecture</b> (can be a combination of seminar and workshop - project and practice based course)</p> <ul style="list-style-type: none"> <li>-Compare approaches of design processes - conventional process focused on architects' style and contemporary process influences by digital tools</li> <li>-Introduce the new tools of design, production and fabrication in architecture that affect various stages of architectural production, from conception and visualization to development and manufacturing</li> <li>-Provide opportunities to integrate the use of the computer for design, production, and presentation with the help of individual projects</li> <li>-Provide understanding of software packages, and modeling techniques</li> </ul>
<b>4</b>	<p><b>Architectural Software</b></p> <ul style="list-style-type: none"> <li>-Provide hands-on exposure to various software packages to work on design, modelling, and simulations used in architectural design</li> <li>-Use of various (relevant at the time) 2D drafting and 3D modeling tools for rendering and architectural presentation</li> <li>-Use of various software packages for analysing building systems and services performance (this can be for passive and/or active measures relevant to the semester focus)</li> <li>-Options</li> </ul> <p>Advanced AutoCAD Advanced SketchUp with various plugins Revit</p>

Assessment		Marks
<b>I.A.</b>	<b>Internal Assessment</b>	<b>100</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>Note</b>	<b>There is no 'University Examination' for this subjects</b>	

## **Semester – IX**

## Practical Training

<b>Subject Code</b>	<b>K8501</b>	<b>Semester -IX</b>
<b>Credits</b>	<b>30</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To acquaint students with prevalent purview and procedure of architectural and allied practice
<b>2</b>	To invite practitioners participation in the education of the 'would-be entrants' to the profession for up datedness of information and orientation
<b>3</b>	To boost the dialogue between 'practice' and 'academics' of architecture for progressive learning of a student

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Develop skills in professional behavior
<b>2</b>	Explore different facets of office management including preparation of working drawings, detailed drawings, perspectives, study of filing systems of documentation, preparation of tender documents etc.
<b>3</b>	Gain site experience in respect of supervision of construction activity, observation, layout on site, taking the measurements and recordings.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<p><b>Indoor activities, office administration</b></p> <ul style="list-style-type: none"> <li>- Routine correspondence with client's local authorities, contractors and other agencies dealing in building industries</li> <li>- Systematic filing and registering office correspondence for easy re-reference.</li> <li>- Regular maintenance of work-diaries with notes on principal's instructions, interviews with various agencies, indoor and/or outdoor work and time-spent</li> <li>- Systematic filing and indexing of technical catalogues and price lists for handy reference.</li> <li>- Systematic ordering and use of office library</li> </ul>
<b>UnitII</b>	<p><b>Indoor activities, drawing and designing</b></p> <ul style="list-style-type: none"> <li>- Making of preliminary designs and drawings accountably by requisite prior study, research, and case studies.</li> <li>- Preparing 'Presentation' 'statutory ', 'working' and 'detailed' drawings of customary contents and format by understanding their propriety and logic</li> <li>- Reading and making use of 'Contour Plans' while at VI &amp; VII above</li> <li>- Dependably efficient handling of auxiliary routine operations like taking off and codified rendering of prints and electronic and/or computerized communication, drafting, copying etc</li> <li>- Briefing with various technical consultants and co-coordinating their drawings.</li> <li>- Preparation of 'study' and 'Presentation' models of buildings and/or development lay-outs in different levels and chromatic material-textures</li> </ul>
<b>Unit III</b>	<p><b>Outdoor activities:</b></p> <ul style="list-style-type: none"> <li>- Attending routine meetings with clients, local authorities, contractors and other trade representatives</li> <li>- Checking of lining-out of buildings on site</li> <li>- Systematic surveying of sites and/or existing buildings of moderate size and complexity in conventionally comprehensive format</li> <li>- Architecturally monitoring the work-progress on site/s through periodic</li> </ul>

	supervisions, instructions and reports thereon
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<b>Learning Resources</b>	
<b>Reference</b>	<b>Architects Drawings</b>

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment-</b> Refer To ‘Rule number 6, sub point 6.2.2.’	<b>40</b>
<b>1</b>	<b>The Log-Book</b> duly filled in and authenticated by the said responsible registered architect- member of the employer-organization. (one member-signatory throughout Log-Book)	<b>15</b>
	<b>Diary-</b> The day to day hand-written preformed Work-Diary maintained by the student during the period of ‘training’ (as stipulated hereinabove) and certified by the said responsible registered architect-member of the employer-organization- one and the same members signatory who authenticates the Log-Book. (preferably initialed per day)	15
	<b>Work report-</b> The manually laboured ‘Work-Report’ structured as herein after prescribed under ‘Term work’ and authenticated too only by the said responsible registered architect-member of the employer organization. (One member-signatory who certifies Log-Book and Work-Diary).	10
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
	Portfolios consisting of drawings prepared by the student as intern in the office

<b>Details of training</b>	<p>-The practical training of minimum duration of 15 to 18 working weeks (90 work days) shall be carried out in the office of an architect or an organization Operating in an allied field of practice or research, duly approved by the institution, under mentorship of an architect having experience of at least 5 years.</p> <p>-Training in Foreign Country shall be done under the Registered Architect of that Country and to be approved and monitored by the Head of the Institution.</p>
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## **Semester – X**



## Architectural Design Project

<b>Subject Code</b>	<b>K8502</b>	<b>Semester-X</b>
<b>Credits</b>	<b>16</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To inculcate in the students methodological process to approach an architectural project holistically.
<b>2</b>	To prepare students to handle large scale complex architectural projects individually.

<b>Learning Outcomes: student will be able to</b>	
<b>1</b>	Include intensive study of relevant literature, case studies, climatology and analysis of problems concerned with development of functional organisation of space form and structure.
<b>2</b>	Study based on correlation and interpretation of the social, economic and physical data.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	The architectural project should consist of 2 parts: A. Technical Report: well documented report consisting of hypothesis formulation, data acquisition, verification, and analysis by following qualitative and quantitative research methods. B. Design Solution: Self explanatory drawings, covering various aspects of construction, function, technology, services, and site planning etc. few suggested buildings types are institutional projects, civic amenities, commercial, industrial, sports and recreation, administrative, transportation facilities, housing, specialized building, etc.
<b>Unit II</b>	<b>Technical report:</b> - A hard bound copy of original report shall be submitted, which will be certified and signed by the college authorities as authentication of the work and by the guide who has guided the work - Size: Project Report size A4 Sized '120 Mm x 297 mm portrait with embossed title necessarily on the spine and front page. - Total Pages: There Shall Be Maximum 50 Pages with double side printing excluding drawings. - Printing: Font type like Arial/ Times New Roman With 12-point size shall be used for regular typing with 15- point size shall be used for captions. The typing shall be done with 1.5 lines spacing throughout. - The presentation copy shall be necessarily a hard bound copy. Number of copies shall be as prescribed by the college. (1 copy for the student, 1 original copy for the college library and 1 soft copy on a CD.)
<b>Unit III</b>	<b>Design solution:</b> Graphically presented design solution with minimum 5000 Sq.M Built up area shall be in form of a drawing portfolio. It shall consist sufficient number of architectural drawings (manually drawn / computerized) with models, etc. Since the architectural project is the culmination of five years of learning in various aspects of architecture, it is expected that student demonstrates an ability of holistic and comprehensive thinking in the areas of, - Site Planning - Structural considerations

	<ul style="list-style-type: none"> <li>- Space Designing</li> <li>- Landscape Design</li> <li>- Building Services</li> <li>- Climate Responsive, Energy Efficient and Exhibiting Qualities of sustainable architecture.</li> <li>- Architectural Detailing.</li> </ul> <p>The portfolio will consist of drawings (minimum of 10 and maximum of 15) sufficiently in detail to demonstrate consideration given to above mentioned attributes. The emphasis shall be given to prepare self-explanatory drawings.</p>
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**Learning Resources:** As required by individual project.

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	The Internal Assessment of “Architectural Project shall be carried out stage wise as decided by the subject Coordinator for the year which shall be announced to the students at the beginning of the semester.	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	The final assessment in the examination shall be done by both internal and external examiners in which the student will display his/her work and answer all the queries raised by the examiner.	

## Capstone Project

<b>Subject Code</b>	<b>K8503</b>	<b>Semester -X</b>
<b>Credits</b>	<b>06</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To study interrelationship of all subjects that a student has learned in the curriculum of architectural studies.
<b>2</b>	To understand the architecture as a “craft”.

<b>Learning Outcomes; Student will be able to</b>	
<b>1</b>	Develop competence in transforming architectural drawing to professional working document
<b>2</b>	Prepare documents of building design project minimum 500 Sq.M. such as Presentation drawings, Working drawings, Specifications, Quantities, Estimates, and Tender document.

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	Preparation of working drawing, municipal drawing of the above
<b>Unit II</b>	Preparation of Specifications and Bill of Quantities (BOQ)
<b>Unit III</b>	Preparation of Contract Document

<b>Learning Resources</b>	
<b>Text Books:</b>	
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Wakita, Osamu A., Richard M. Linde, and Nagy R. Bakhom (2011) "The Professional Practice of Architectural Working Drawings.</li> <li>2. Reference drawings from an ISO certified architect’s office</li> <li>3. Handbook of Professional Documents: 2011, Council of Architecture, New Delhi, India</li> <li>4. Indian Institute of Architects, Handbook</li> </ol>
<b>Websites:</b>	
<b>Journals:</b>	Gawne, Eleanor. "Cataloguing Architectural Drawings." Journal of the Society of Archivists 24.2 (2003): 175-187.

<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To ‘Rule number 6, sub point 6.2.2.’	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Assignments or portfolios based on entire syllabus as mentioned below.	

<b>Assignments</b>	
<b>1</b>	Assignment I: Preparation of Presentation Drawings with rough estimates
<b>2</b>	Assignment II: Preparation of Set of Working Drawings, Specifications, BOQ, and Contract Document

## Professional Practice

<b>Subject Code</b>	<b>K8504</b>	<b>Semester -X</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To introduce aspects of professional conduct, duties and responsibilities, legal rights and procedures of architectural profession.
<b>2</b>	To enable student to acquaint with various responsibilities of professional architect.
<b>3</b>	To acquaint students with documentation and procedures for execution of building work/projects as well as with management aspects

<b>Learning Outcomes</b>	
<b>1</b>	Visualise various working situations that may arise in practice as an architect
<b>2</b>	Manage his/her professional environment towards fair practice
<b>3</b>	Understand ethics of architectural profession
<b>4</b>	Learn to work with various agencies in practice

<b>Units</b>	<b>Contents</b>
<b>Unit I</b>	<b>Laws, Rules and Guidelines related to Architectural Practice</b> <ul style="list-style-type: none"> <li>- Architects Act 1972 - brief overview, introduction to nature, scope and functions of Council of Architecture</li> <li>- Detailed study of professional conduct regulation</li> <li>- Comprehensive architectural services, scale of professional fees as framed by Council of Architecture</li> <li>- Architectural competitions guidelines by Council of Architecture</li> <li>- Architects Liability</li> </ul>
<b>Unit II</b>	<b>Setting up architectural practice as profession, tax liabilities</b> <ul style="list-style-type: none"> <li>- Nature of profession, difference between trade, business and profession</li> <li>- Emerging Role of architectural profession</li> <li>- Accounting and taxation</li> <li>- Organization of architects office and different models of business</li> </ul>
<b>Unit III</b>	<b>Land tenures and contracts</b> <ul style="list-style-type: none"> <li>- Introduction to valuation, land tenures and easements and dilapidations</li> <li>- Architects role in construction contracts</li> </ul>

<b>Learning Resources</b>	
<b>Text Books:</b>	RoshanNamavati (1968). Professional Practice: Estimating and Valuation, , Universal Book Corporation
<b>Reference Books:</b>	MadhavDeobhakta, MeeraDeobhakta (2007) Architectural Practice in India, , Council of Architecture, New Delhi Handbook of Professional Documents: 2011, Council of Architecture, New Delhi, India Indian Institute of Architects, Handbook Standard Contracts, International Federation of Consulting Engineers (FIDIC) The Architect's Handbook of Professional Practice- 2013, American Institute of Architects, John Wiley & Sons.
<b>Websites:</b>	

<b>Journals:</b>	
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<b>Assessment</b>		<b>Marks</b>
<b>I.A.</b>	<b>Internal Assessment</b>	<b>40</b>
	Refer To 'Rule number 6, sub point 6.2.2.'	
<b>U.E.</b>	<b>University Examination</b>	<b>60</b>
	Theory paper	

## Self Study

<b>Subject Code</b>	<b>K8505</b>	<b>Semester -X</b>
<b>Credits</b>	<b>4</b>	<b>Subject type-Core</b>

<b>Learning Objectives</b>	
<b>1</b>	To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to cross-disciplinary subjects
<b>2</b>	To facilitate the students to learn cross-disciplinary subjects.

<b>Learning Outcomes</b>	
<b>1</b>	Engage in systematic self study.

<b>Units</b>	<b>Contents</b>
	Under this, the student can select any one subject related the parent course or other than the parent course. The choice of the subject is not restricted. If a student is interested in a subject of a particular discipline he/she has to inform accordingly to the Principal and academic Co-ordinator of that department.

**Learning Resources:** As required by subject.

<b>Assessment</b>		<b>Marks</b>
<b>U.E.</b>	<b>University Examination</b>	<b>100</b>
	Based on Reports and evidences of the course	



**Proposed Draft Structure for CBCS-2020  
For  
Bachelor of Architecture (B. Arch) Programme**


(Structure Semester I & X and Contents Semester I & II)

To be implemented from Academic Year 2020-21

Bharati Vidyapeeth (Deemed to be University)  
College of Architecture, Pune







**Prof. Dr. Shivajirao Kadam**  
M.Sc., Ph.D.  
Chancellor

**Prof. Dr. M. M. Salunkhe**  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor


## Bharati Vidyapeeth

(Deemed to be University)  
Pune, India.

**Founder Chancellor : Dr. Patangrao Kadam**

★ Accredited with 'A' Grade (2017) by NAAC ★  
★ Category-I University Status by UGC ★  
★ NIRF Ranking - 66 ★

"Social Transformation Through Dynamic Education"

Celebrating  
  
and Beyond  
SHRADDHA YOGA

**Dr. Vishwajeet Kadam**  
B.Tech., M.B.A., Ph.D.  
Pro Vice Chancellor

**G. Jayakumar**  
M.Com., D.P.M., Ph.D.  
Registrar

**NOTIFICATION NO. 1055**

It is hereby notified for the information of all concerned that the proposal to revise the course structure, syllabus and rules of examinations of B.Arch. programme proposed by the concerned Board of Studies and recommended by the Faculty of Engineering and Technology is considered by the authorities of the University.

The authorities of the University have approved the course structure, rules of examinations and 1st year syllabus of B.Arch. programme offered under the Faculty of Engineering and Technology to be implemented from the academic year 2020-21 :

Ref. No. BVDU/ 2020-21/1786  
Date : November 5, 2020

*G. Jayakumar*  
Registrar

- ✓ 1. The Principal, College of Architecture, Pune 43
2. The Dean, Faculty of Engineering and Technology, Pune 43
3. The Controller of Examinations, BVDU
4. The IT Cell for uploading in the Website.

*Adm/Syllabus/Exam/CA File*

Bharati Vidyapeeth (Deemed to be University) College of Architecture, Pune-43.	
Inward No.:	181
Date:	11/11/2020
Sign:	



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## **VISION OF BV (DU) UNIVERSITY**

“To be a world class University for Social Transformation through Dynamic Education”

## **MISSION OF BV (DU) UNIVERSITY**

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency, and accountability for social community, economic and environmental conditions.

## **VISION OF BV (DU) COLLEGE OF ARCHITECTURE PUNE**

“Inculcate Sensitivity towards Sustainable Built Environment through Architectural Education”

## **MISSION OF BV (DU) COLLEGE OF ARCHITECTURE PUNE**

The institution shall strive

- To inculcate knowledge, skills, values and ethics to create ‘**socially responsible**’, ‘**environmentally sensitive**’, ‘**economically conscious**’, architectural professionals.
- To promote innovations and research for sustainable built environment.

## **PROGRAMME: BACHELOR OF ARCHITECTURE (B.ARCH)**

### **Programme Objectives:**

- To develop creative, capable, future ready architectural professionals.
- To create responsible and dedicated individuals who are intellectually mature, emotionally sensitive and self-motivated towards sustainable built environment.
- To orient courses and course content in order to develop holistic learners, for taking up challenging responsibilities in the respective field.
- To offer courses which help the graduates to emerge as competent professionals fully aware of their commitment to the society and nation.

### **Programme Outcomes:**

The graduates will be able to:

- Imbibe the fundamental knowledge of built environment.
- Identify and analyze current architectural issues.
- Create and envision built environment responding to physical, social, cultural, economical and environmental context.
- Communicate effectively in verbal, written and graphical form.
- Use modern architectural tools, technology and software for analysis, design and construction.
- Imbibe ethics and values as learners and professionals.
- Develop research ability and promote experiential learning.
- Function effectively as individual; work cooperatively and responsibly as team.
- Encourage interdisciplinary learning.
- Prepare for professional, societal and environmental challenges.
- Promote managerial, entrepreneur and leadership qualities in profession.

## **SALIENT FEATURES OF SYLLABUS**

- Imparting '**Outcome Based Education**'.
- Included programme outcome, programme specific outcome, course outcome and intended learning outcome.
- Categorisation of courses focusing on development of 'Cognitive', 'Affective' and 'Psychomotor' domains of learning and learners.
- Offered wide range of electives in every semester, which facilitates choice to learners in selecting courses of their own interests. Introduced open electives at First year B.Arch
- Skill enhancement facilitated through professional skill courses as well as open electives.
- Practical training incorporated in VIII semester which helps for students in achieving research ability by providing consecutive courses such as Research projects and Architectural design Project in IX and X semesters respectively.
- Social and environmental awareness through 'Audit Courses'.
- Vertical progression and horizontal integration of courses considering the stage of development of learning.

## RULES FOR FIRST TO FIFTH YEAR B. ARCH

### ❖ Rule No.1: Eligibility for Admission

**Eligibility Criteria:** Students seeking admission to First year of Bachelors Degree Course in Architecture must fulfil the eligibility criteria laid down by Council of Architecture, New Delhi, India and the University as applicable from time to time.

### ❖ Rule No.2: Duration of the course (as per Council of Architecture)

The Architecture course shall be of minimum duration of 5 academic years/ 10 semesters of approximately 15 to 18 working weeks (90 work days)each, inclusive of one semester of approximately 16 working weeks of Practical Training during Semester-VIII in a Professional's office.

### ❖ Rule No.3: Scheme of Assessment

A candidate to be eligible for the degree of Bachelor of Architecture will be required to appear for and pass all examinations as under:

- Semester I Examination in Architecture (First Year Semester-I)
- Semester II Examination in Architecture (First Year Semester-II)
- Semester III Examination in Architecture (Second Year Semester-III)
- Semester IV Examination in Architecture (Second Year Semester-IV)
- Semester V Examination in Architecture (Third Year Semester-V)
- Semester VI Examination in Architecture (Third Year Semester-VI)
- Semester VII Examination in Architecture (Fourth Year Semester-VII)
- Semester VIII Examination in Architecture (Fourth Year Semester-VIII)
- Semester IX Examination in Architecture (Final Year Semester-IX)
- Semester X Examination in Architecture ( Final Year Semester-X)

### ❖ Rule No. 4: Granting of Academic Term

Each semester shall comprise of Eighteen weeks (Minimum 90 working days).

The candidate will be permitted to appear for semester examination only if he/she has,

**-75 % attendance in each course that constitute a head of passing as prescribed by the university.**

- **Satisfactory completion of the sessional work as prescribed in the syllabus.**
- 

**Good conduct:** The Principal/ Director of the institution shall have the right to withhold the student from appearing for examination of a specific course if the above requirements are not fulfilled.

### ❖ Rule No. 5: Progression Requisite

As general rule, a student shall be allowed to keep the next year of study of the course, if he/she has a backlog of not more than “**Six heads of passing**” in the preceding year.



Furthermore,

- A student shall be allowed to get admitted to Second Year B. Arch. course, if he/she has a backlog of not more than “**Six heads of passing**” at First year B. Arch (semester I and II considered together).
- A student shall be allowed to get admitted to Third Year B. Arch course, if he/she has cleared all the heads of passing at First year B.Arch and if he/she has a backlog of not more than “**Six heads of passing**” at Second Year B.Arch (semester III and IV considered together).
- A student shall be allowed to get admitted to Fourth Year B.Arch course, if he/she has cleared all the heads of passing at Second Year B.Arch (Semester III and IV considered together) and if he/she has a backlog of not more than “**Six heads of passing**” at Third Year B.Arch (semester V and VI considered together).
- A student shall be allowed to get admitted to Final Year B.Arch course, if he/she has cleared all the heads of passing at Third Year B. Arch (Semester V and VI considered together), and if he/she has a backlog of not more than “**Six heads of passing**” at fourth Year B.Arch (semester VII and VIII considered together).

## ❖ Rule No 6: Examinations

### 6.1. Conduct of Examinations

The university examinations for all the 10 semesters shall be conducted at the end of each semester by the University.

### 6.2. Pattern of Examination: The evaluation scheme for B.Arch comprises of --

University Examination (UE) -60 marks (for courses having IA and UE both)

Internal Assessment (IA)- 40 marks (for courses having IA and UE both)

Internal Assessment (IA) - 100 marks (for courses having only IA)

**UE and IA will constitute two separate heads of passing.**

#### 6.2.1 University Examination (UE)

- UE will be conducted by the University and will be based on the entire syllabus.
- UE shall be assessed jointly by the internal and external examiners from amongst the panel approved by the University in equal weight-age. An examiner for any of the courses of examinations shall have a minimum of 5 years teaching or 5 years of professional experience in his/her field of study. However, an external examiner for Semester-X Architectural Design Project shall have minimum of 10 years teaching/ professional experience after Council of Architecture registration.

- The nature of assessment will vary depending upon the course and its delivery and whether it is studio-based or theory based. **Refer to detailed syllabus for individual courses.**
- Work done by the student which is assessed for UE i.e Sessional (SS) or Sessional + Oral (SO) will be based on entire syllabus.
- Number of assignments for UE will be minimum **three** and a maximum **five** .
- UE may be undertaken through following suggestive form of assignments (but not restricted to):
  - Portfolio
  - Models
  - Reports

**University Examination (UE) head will constitute ANY ONE of the following:**

**a. Sessional(SS)** : Assessment by internal & external examiner in equal weight-age of the sessional , that is ,work done by the student during the semester and certified by the course teacher.

**b. Sessional + Oral(SO):** Assessment by internal & external examiner in equal weight-age of the sessional ,that is, work done by the student during the semester and certified by the course teacher along with oral of the student is to be conducted (i.e provided that the student appears for UE).

**c. Terminal paper(TP):** Assessment by internal & external examiner in equal weight-age of total maximum marks.(Duration of paper: 2-1/2 hrs for theory paper & 3 hrs. for drawing paper.)

### **6.2.2: Internal Assessment (IA)**

IA will be conducted by the Institution imparting B.Arch course. IA will be done by the teacher teaching the course through a continuous assessment system that is spread through the duration of course and weight-age will be for the sessional , that is, work done by the student during the semester & assessed by the course teacher covering the entire syllabus. The marks assigned for attendance in IA weight-age will be 5(five) only. Number of assignments for IA will be minimum **three** and a maximum **five** .

There will be 15(fifteen) teaching and 3(three) assessment weeks in a semester.

Individual faculty member shall have the flexibility to design the continuous assessment assignments in a manner so as to evaluate student's capabilities across knowledge, skills and attitudes. IA may be undertaken through any or combination of the methods stated below:

The following components can be used-

- Seminar presentation
- Written Test /Open Book
- Reviews
- Essays

Final Draft B.Arch CBCS 2020 Course

- Short answer questions
- Study of best practices /precedent study/field study
- Multiple choice questions/Quiz
- Projects/group projects/Dissertation
- Reflective Practical assignments
- Drawing Portfolios
- Report writings
- Learning logs/diaries
- Hands on workshops and participation

For IA, in case of courses having Terminal paper (TP), it is mandatory to conduct minimum one class- test as a form of assignment.

The faculty shall announce in advance the units based on which continuous assessment shall be conducted. Detailed records of continuous assessment shall be maintained by the teaching faculty and these will be submitted to the institute at the end of the semester.

## ❖ Rule No. 7: Credits

**The total credits for B.Arch degree programme are 296 credits.**

Semester-wise distribution of credits is as follows:

Semester	I	II	III	IV	V	VI	VII	VIII	IX	X
Credits	30	30	30	30	30	30	30	30	28	28

### **7.1. Evaluation criteria for additional credits:**

Credit may also be given for participation in extra-curricular/co-curricular activities. There will be maximum of **10 credits at UG level. 25-30 hours** of extra-curricular/ co-curricular work may be considered as one credit.

Participation in these activities at national/ international/state level can be claimed to earn maximum 10 extra credits which are over and above the minimum number of credits the student has to complete for award of the degree. These credits would be awarded for type of activity undertaken from the joining of course till end of course. Students have to submit the necessary documents at the end of Semester-X.

### **7.2. Award of extra credits per participation**

Sr.No	Type of Activity	Credits Awarded
1	Publication in International/ National Journal(for 1st or 2nd author only)	01
	Publication in Scopus/ Referred Journal	02
2	Participation with presentation in seminar, workshop, conference, etc (national/ international/state/	01

3	Participation in seminar, workshop, conference, etc (national/ international /state/ local)	0.5
4	Sending entry to design competition held at state / national / international level	01
5	Winning award at the contest mentioned above	02
6	Publication of Final year Architectural Design Project in International/ National Journal under guidance & co-	1
7	MOOC Courses with certificate:	
	1. 4 hr/week course	1
	2. 12 hr/week course	3

The student has to accumulate and submit the respective documents to the Principal, to become eligible for getting the credits as mentioned above.

### 7.3. *Non-credit courses -Audit Courses:*

Audit Courses will be conducted in Semester-IV and Semester-VI as per the syllabus. University will conduct examination and it is mandatory for students to pass in these courses. Passing in these courses is by clearance. **Audit courses are Non-credit courses**

### 7.4. *Credit Transfer:*

Credit transfer option may be made available to students on exchange with other universities under MoUs if any after verifying the equivalency for particular courses on case to case basis.

## ❖ **Rule No.8: Criteria for Passing**

To pass in every semester examination and earn minimum grade point , a candidate must obtain minimum 50% marks in each head of passing and 50% marks in aggregate.

### **8.1. For all courses, both UE and IA constitute separate heads of passing.**

- In order to pass in such courses and earn minimum grade point.
- The student must obtain minimum grade point of 6.0(50% marks) at UE and also minimum grade point of 6.0 (50%) marks at IA.
- A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

**8.2.**Students with backlog in IA will have to present themselves and their work for continuous assessment throughout the semester for which they intend to appear.

**8.3.**In case of backlog courses, a student can work on same topic of assignment for two more chances. Even after two chances in case he/she fails, the course teacher may change or modify the topic of assignment.

## ❖ Rule No.9: Grading system

The grading system will be 10-point absolute grading system.

### 9.1 Award of Grades (Ten point Grading systems):

The assignment of score obtained by the candidate (out of maximum 100) to a grade may be done as follows:

Range of % of marks	Grade Point	Grade Letter
80<= Marks <100	10	O
70<= Marks <80	9	A+
60<= Marks <70	8	A
55<= Marks <60	7	B+
50<= Marks <55	6	B
Marks <50	0	D

### 9.2 Performance

The performance of a student will be evaluated in terms of two indices, viz

- Semester Grade Point average (SGPA) is calculated separately after every end-semester examination.
- Cumulative Grade point average (CGPA) is calculated across all the semesters at the end of the programme.

### 9.3 Semester Grade point average (SGPA)

SGPA measures the cumulative performance of a learner in all courses in a particular semester. SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where  $C_k$  the credit-value is assigned to a course and  $GP_K$  is a GPA obtained by the learner in the course.

The SGPA shall be calculated up to two decimal place accuracy.

### 9.4 Cumulative Grade point average (CGPA)

CGPA measures the cumulative performance of a learner in all courses since his/her enrolment. CGPA is calculated by the formula

$$CGPA = \frac{\sum C_k \times GP_K}{\sum C_k}$$

Where  $C_k$  is the credit-value assigned to a course and  $GP_K$  is a GPA obtained by the learner in the course.

The CGPA shall be calculated up to two decimal place accuracy.

#### ❖ Rule No.10: Award of Degree (B.Arch)

A student who has completed the minimum grade point specified for the programme and obtains required CGPA as prescribed (in the table below) shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed within the time permissible by the University & as per COA Rules prescribed.

The criteria for the award of **Degree (B.Arch)** are as given in table below:

Range of CGPA	Final Grade	Letter Grade
$9.50 \leq CGPA \leq 10.00$	O	Outstanding
$9.00 \leq CGPA \leq 9.49$	A+	Excellent
$8.00 \leq CGPA \leq 8.99$	A	Very Good
$7.00 \leq CGPA \leq 7.99$	B+	Good
$6.00 \leq CGPA \leq 6.99$	B	Satisfactory
CGPA Below 6.00	F	Fail

#### Degree Requirements:

A candidate who has successfully completed all the Core and Elective courses and obtains required CGPA as prescribed (in the table above), shall be eligible to receive the Degree.

Registration (as an Architect) will only be given by Council of Architecture, New Delhi, India as per the prevailing rules .

University & Council of Architecture, New Delhi may frame additional rules and regulations or modify these rules if needed and once approved they would be binding on the students.

#### ❖ Rule No.11: Introduction of this Curriculum

The new curriculum for the degree course in architecture B.Arch will be introduced from Academic Session 2020 -2021

- First year B.Arch Course from June 2020

Final Draft B.Arch CBCS 2020 Course

- Second year B.Arch Course from June 2021
- Third year B.Arch Course from June 2022
- Fourth year B.Arch Course from June 2023
- Final year B.Arch Course From June 2024

### ❖ Rule No.12: Course Code

Code used for serial numbers of the courses in the structure for B.Arch course shall be as follows :

**12.1. First Character:** will be Faculty and for Engineering Faculty BVDU has assigned K character.

**12.2. Second Character:** will be for BoS to which that course belongs (H for Architecture)

**12.3. Third character:** relates to Department for which course is to be conducted (M for Architecture)

**12.4. Fourth character:** will be for UG or PG course (U for UG in Architecture)

**12.5. Fifth Character:** will stand for Semester No.

Semester Code :

1. First Semester
2. Second Semester
3. Third Semester
4. Fourth Semester
5. Fifth Semester
6. Sixth Semester
7. Seventh Semester
8. Eighth Semester
9. Ninth Semester
10. Tenth semester

**12.6. Sixth character:** will be serial no. of course in that semester structure from 1 to 9.

### ❖ Rule No.13: Maximum period for duration of course

Students have to qualify for a degree within the period prescribed by the University Grants Commission. If the student could not, he/she will be allowed two more years beyond prescribed period. In exceptional cases, further extension of one more year, may be considered by the University. University & Council of Architecture, New Delhi may frame additional rules and regulations or modify these rules if needed and once approved they would be binding on the students.

In case a candidate is not able to complete the course in the prescribed duration, the university or institution may provide an exit option for the candidate if has completed and earned all credits for the first three years of study.

## STRUCTURE OF B.ARCH DEGREE PROGRAMME

Structure of B.Arch degree programme is proposed to be implemented from academic year 2020-21, to provide students centric educational philosophy.

### A. Course Categories:

Under CBCS, the degree programme will consist of the following categories of courses, in the framework of council of Architecture:

1. Professional Core Courses (PC)
2. Building Science and Applied Engineering (BS& AE)
3. Enhancement Course
4. Skill Enhancement Courses (SEC)
5. Professional Ability Enhancement Courses (PAEC)
6. Elective Courses
  - a. Open Electives (OE)
  - b. Professional elective (PE)

In addition, a student should satisfactorily complete Audit courses (AC) minimum 2 Nos prescribed in the curriculum. Audit courses are non credit courses.

#### A.1. Compulsory courses consisting of

- a. **Professional Core (PC)** ) courses introducing the students the foundation of architectural topics
- b. **Building Science and Applied Engineering (BS& AE)** courses informs the Professional Core courses
- c. **Skill Enhancement (SEC)** Courses nurtures skill of the
- d. **Professional Ability Enhancement (PAEC)** Courses

**A.2. Elective Course** enables students to take up a course of their own interest and facilitates students a freedom in selecting courses.

- a. **Open Elective** Courses enables an exposure to some other discipline
- b. **Professional Elective** Courses supportive to the core discipline of the study or provides an extended scope; may be very specific; specialized; advanced.

#### A.3. Audit Course courses consisting of

- a. Disaster Management
- b. Environmental Studies

### B. Credits:

Credits are the weightages are assigned to the courses based on the following general pattern:

- |   |          |
|---|----------|
| 1. lecture period   | 1 credit |
| 2. Periods Lab/Workshop/ Tutorial                             | 1 credit |
| 3. Period of Design/ Construction/ Practical Training/ Thesis | 1 credit |



**B.1.**The curriculum for B. Arch. Programme is designed to have a minimum of 296 credits + 2Non CGPA credits distributed across ten semesters of study for the award of degree.

**B.2.**A student must earn a minimum number of credits under each category as shown in Table 1 and also a minimum total of credits (296 credits + 2 Non CGPA courses) for the award of B. Arch degree.

**Table1: Distribution of credits**

No.	Category	Code	Credits	Percentage
1	Professional Core	PC	149	50.34%
2	Building Science and Applied Engineering	BSAE	60	20.27%
3	Skill Enhancement Course	SEC	17	05.74%
4	Professional Ability Enhancement Courses	PAEC	34	11.49%
5	Open Elective	OE	10	03.38%
6	Professional Electives	PE	26	8.78%
	<b>Total Credits</b>		296	100.00%
		NON CGPA		
	Audit courses		----	---

## Structure & Examination Pattern of First Year B.Arch

Semester I							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Course	Teaching Scheme				Examination Scheme (Marks)				Credits	
			(in hours/week)				IA	UE				Total
			L	SP	W	Total			TP	SO	SS	
KHMU11	PC	Architectural Design-I	2	2	2	6	40	-	60	-	100	6
KHMU12	BSAE	Building Construction and Material-I	2	-	4	6	40	-	60	-	100	6
KHMU13	BSAE	Theory of Structures-I	1	-	1	2	40	-		60	100	2
KHMU14	PC	History of Architecture –I	2	-	1	3	40	60	-	-	100	3
KHMU15	PC	Architecture Drawings and Graphics-I	1	-	4	5	40	60	-	-	100	5
KHMU16	PC	Workshop	1	-	2	3	40	-	-	60	100	3
KHMU17	PC	Basic Design-I	1	-	2	3	40	-	60	-	100	3
KHMU18	OE	Elective I	1	-	1	2	100	-	-	-	100	2
		<b>Total</b>				<b>30</b>	<b>380</b>	<b>120</b>	<b>180</b>	<b>120</b>	<b>800</b>	<b>30</b>
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination TP- Terminal Paper ,SS-Sessional ,SO -Sessional Oral												
PC: Professional Core Course; BSAE: Building Science and Applied Engineering Course ,OE: Open Elective												

## Structure & Examination Pattern of First Year B. Arch

<b>Semester-II</b>							<b>Total Duration-30 hrs/Week</b>					
							<b>Total Credits -30</b>					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU21	PC	Architectural Design-II	2	2	2	6	40	-	60	-	100	6
KHMU22	BSAE	Building Construction and Material-II	2	-	4	6	40	-	60	-	100	6
KHMU23	BSAE	Theory of Structures-II	1	-	1	2	40	-	-	60	100	2
KHMU24	PC	History of Architecture –II	2	-	1	3	40	60	-	-	100	3
KHMU25	PC	Architecture Drawings and Graphics-II	1	-	4	5	40	60	-	-	100	5
KHMU26	PC	Climatology	2	-	1	3	40	-	-	60	100	3
KHMU27	PC	Basic Design -II	1	-	2	3	40	-	60	-	100	3
KHMU28	OE	Elective II	1	-	1	2	100	-	-	-	100	2
		<b>Total</b>				<b>30</b>	<b>380</b>	<b>120</b>	<b>180</b>	<b>120</b>	<b>800</b>	<b>30</b>
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, OE: Open Elective												

## Structure & Examination Pattern of Second Year B.Arch

<b>Semester-III</b>							<b>Total Duration-30 hrs/Week</b>					
							<b>Total Credits -30</b>					
Course Code	Course Category	Courses	Teaching Scheme (hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU31	PC	Architectural Design -III	1	4	1	6	40	-	60	-	100	6
KHMU32	BSAE	Building Construction and Material-III	2	-	4	6	40	-	60	-	100	6
KHMU33	BSAE	Theory of structures-III	2	-	-	2	40	60	-	-	100	2
KHMU34	PC	History of Architecture-III	2	-	1	3	40	-	60	-	100	3
KHMU35	PC	Architecture Drawings and Graphics-III	1	-	4	5	40	-	-	60	100	5
KHMU36	PC	Building services-I	2	-	1	3	40	60	-	-	100	3
KHMU37	SEC	Computer Applications in Architecture-I	1	-	2	3	100	-	-	-	100	3
KHMU38	PE	Elective-III	1	-	1	2	100	-	-	-	100	2
		<b>Total</b>				<b>30</b>	<b>440</b>	<b>120</b>	<b>180</b>	<b>60</b>	<b>800</b>	<b>30</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional elective												

## Structure & Examination Pattern of Second Year B.Arch

Semester-IV							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits Total	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU41	PC	Architectural Design-IV	1	4	1	6	40	-	60	-	100	6
KHMU42	BSAE	Building Construction and Material-IV	2	-	4	6	40	-	60	-	100	6
KHMU43	BSAE	Theory of Structures-IV	2	-	-	2	40	60	-	-	100	2
KHMU44	PC	History of Architecture-IV	2	-	1	3	40	-	60		100	3
KHMU45	BSAE	Surveying and Levelling	1	-	4	5	40	-	-	60	100	5
KHMU46	BSAE	Building Services-II	2	-	1	3	40	60	-	-	100	3
KHMU47	SEC	Computer Applications in Architecture-II	1	-	2	3	100	-	-	-	100	3
KHMU48	PE	Elective-IV	1	-	1	2	100	-	-	-	100	2
	AC	Environmental Studies	-	-	-	-	-	-	-	-	-	-
		<b>Total</b>				<b>30</b>	<b>440</b>	<b>120</b>	<b>180</b>	<b>60</b>	<b>800</b>	<b>30</b>

Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises

IA: Internal Assessment, UE: University Examination, TP- Terminal Paper, SS-Sessional, SO -Sessional Oral  
 PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective, AC: Audit Course

## Structure & Examination Pattern of Third Year B. Arch

Semester-V							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU51	PC	Architectural Design-V	1	6	1	8	40	-	60	-	100	8
KHMU5	BSAE	Building Construction and Material-V	2	-	3	5	40	60	-	-	100	5
KHMU53	BSAE	Theory of Structures-V	1	-	1	2	40	-	-	60	100	2
KHMU54	PC	Specification Writing	2	-	1	3	40	60	-	-	100	3
KHMU55	PC	Landscape Architecture -I	1	1	1	3	40	-	60	-	100	3
KHMU56	BSAE	Building Services-III	2	-	1	3	40	-	-	60	100	3
KHMU57	SEC	Working Drawing -I	1	-	3	4	40	-	60	-	100	4
KHMU58	PE	Elective-V	1	-	1	2	100	-	-	-	100	2
		<b>Total</b>				<b>30</b>	<b>380</b>	<b>120</b>	<b>180</b>	<b>120</b>	<b>800</b>	<b>30</b>
Notations: L-Lectures, SP-Studio project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course; BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective												

## Structure & Examination Pattern of Third Year B. Arch

Semester-VI							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU61	PC	Architectural Design-VI	1	6	1	8	40	-	60	-	100	8
KHMU62	BSAE	Building Construction and Material-VI	2	-	3	5	40	60	-	-	100	5
KHMU63	BSAE	Theory of Structures-VI	1	-	1	2	40	-	-	60	100	2
KHMU64	PC	Estimation and Costing	2	-	1	3	40	60	-	-	100	3
KHMU65	PC	Landscape Architecture -II	1	1	1	3	40	-	60	-	100	3
KHMU66	BSAE	Building Services-IV	2	-	1	3	40	-	-	60	100	3
KHMU67	SEC	Working Drawing- II	1	2	1	4	40	-	60	-	100	4
KHMU68	PE	Elective-VI	1	-	1	2	100	-	-	-	100	2
	AC	Disaster Management	-	-	-	-	-	-	-	-	-	-
		<b>Total</b>				<b>30</b>	<b>380</b>	<b>120</b>	<b>180</b>	<b>120</b>	<b>800</b>	<b>30</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, BSAE: Building Science and Applied Engineering Course, SEC: Skill Enhancement Course, PE: Professional Elective, AC: Audit Course												

## Structure & Examination Pattern of Fourth Year B. Arch

Semester-VII							Total Duration-30 hrs/Week					
							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU71	PC	Architectural Design-VII	1	8	1	10	40	-	60	-	100	10
KHMU72	PC	Interior Design	1	2	1	4	40	-	60	-	100	4
KHMU73	PC	Urban Planning	1	-	2	3	40	-	60	-	100	3
KHMU74	PAEC	Research in Architecture	2	-	2	4	40	-	-	60	100	4
KHMU75	SEC	Advance Computer Applications in Architecture	1	-	2	3	40	-	60	-	100	3
KHMU76	PE	Elective-VII	1	-	2	3	40	-	-	60	100	3
KHMU77	PE	Elective-VIII	1	-	2	3	40	-	-	60	100	3
		<b>Total</b>				<b>30</b>	<b>280</b>	<b>Nil</b>	<b>240</b>	<b>180</b>	<b>700</b>	<b>30</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course; PAEC: Professional Ability Enhancement Course, SEC: Skill Enhancement Course, PE: Professional Elective												



## Structure & Examination Pattern of Fourth Year B. Arch

Semester-VIII							Total Credits -30					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)					Credits Total
			L	SP	W	Total	IA	UE			Total	
								TP	SO	SS		
KHMU81	PAEC	Practical Training	-	-	-	-	-	-	100		100	24
KHMU82	OE	Self-Study	-	-	-	-	-	-		100	100	6
							<b>Nil</b>	<b>Nil</b>	<b>100</b>	<b>100</b>	<b>200</b>	<b>30</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PAEC: Professional Ability Enhancement Course, OE: Open Elective												
Note 1: For practical training, a student has to undergo 16 weeks of training per semester.												
Note 2: The work from practical training will be assessed after the student completes the internship in this semester.												
Note 3: Validity of training shall be only for a year after completion of training.												

## Structure & Examination Pattern of Fifth Year B. Arch

Semester-IX							Total Duration-28 hrs/Week					
							Total Credits -28					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU91	PC	Advanced Architectural Design	2	6	4	12	40	-	60	-	100	12
KHMU92	PC	Capstone Project	1	2	1	4	40	-	60	-	100	4
KHMU93	PAEC	Research Project	1	-	3	4	40	-	-	60	100	4
KHMU94	PAEC	Professional Practice	1	-	1	2	40	-		60	100	2
KHMU95	PE	Elective-IX	1	-	2	3	40	-	60	-	100	3
KHMU96	PE	Elective-X	1	-	2	3	40	-	60	-	100	3
		<b>Total</b>				<b>28</b>	<b>240</b>	<b>Nil</b>	<b>240</b>	<b>120</b>	<b>600</b>	<b>28</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, PAEC: Professional Ability Enhancement Course, PE: Professional Elective												

## Structure & Examination Pattern of Fifth Year B. Arch

Semester-X							Total Duration-28 hrs/Week					
							Total Credits -28					
Course Code	Course Category	Courses	Teaching Scheme (in hours/week)				Examination Scheme (Marks)				Credits	
			L	SP	W	Total	IA	UE				Total
								TP	SO	SS		
KHMU101	PC	Architectural Design Project	1	12	5	18	40		60		100	18
KHMU102	PC	Seminar in Architecture	1	-	3	4	100				100	4
KHMU103	PE	Elective-XI	1	-	2	3	40		60		100	3
KHMU104	PE	Elective-XII	1	-	2	3	40		60		100	3
		<b>Total</b>				<b>28</b>	<b>220</b>	<b>Nil</b>	<b>180</b>	<b>Nil</b>	<b>400</b>	<b>28</b>
Notations: L-Lectures, SP-Studio Project, W-Workshop/Studio Exercises												
IA: Internal Assessment; UE: University Examination, TP: Terminal Paper, SS-Sessional, SO -Sessional Oral												
PC: Professional Core Course, PE: Professional Elective												

## LIST OF ELECTIVES

Following is the list of electives under various streams for each semester to facilitate choice to learners in selecting courses of their own interest. However, the list given is only suggestive and can expand or modify it for enrichment of the course. The college will offer electives based upon the availability of resources in the college, provided minimum 20 students choose the particular elective. However colleges have to ensure that the student does not repeat a particular elective. Wide range of 'Open Electives are offered for Sem I , II & VIII as below. Students have to choose any one from the list.

Semesters	Open Electives
<b>Sem-I</b>	Physical Education and Yoga
	Performing Arts
	Culinary Art
	Stress Management
	Community Engagement
	Pottery
<b>Sem-II</b>	Architectural Photography
	Personality development and Communication Skills
	Foreign Languages
	Calligraphy Techniques
	Ayurveda as a lifestyle
	Cyber Security
<b>Sem.VIII</b>	Certificate Course
	Study in their interest area

For Sem. VIII students can take up certificate course such as MOOC, SWAYAM etc. It could be online course, or conduct study in their interest area.

From Sem-III to Sem X, students can choose electives as per structure of the syllabus from any of the three streams (Professional Electives) mentioned in the table below. A student may adhere to a particular stream of elective of his/her choice and nurture his/her area of interest and develop his/her expertise across semesters. In the semesters where two electives are offered per semester, students have to choose them from two different streams.

<b>Semesters</b>	<b>Design</b>	<b>Technology and Management</b>	<b>Allied (Art, legalities, culture, environment, etc)</b>
Sem-III	Vernacular Architecture	Alternative Building Materials and	Sketching
	Theory of Design	Presentation Techniques in Architecture	Horticulture
Sem-IV	Climate Responsive Building Design	Modular Co-ordination	Visual Communication
	Vastu Shastra	Glass in Architecture	Study of Iconography in Temples
	Graphic Design	Sustainable Water Management	Introduction to Indology
Sem-V	Universal Design	Building Automation	Rural development
	Light in Architecture	Sustainable Waste Management	Architectural Journalism
	Water in Architecture	Cost Effective Construction	Ekistics
Sem-VI	Furniture Design	Auditorium Acoustics and Services	Affordable Housing
	Gendered Spaces	Fenestrations in Buildings	Building Economics
	Architects and Their Philosophies	Facility Management	Introduction to Archaeology
Sem-VII	Product Design	Long Span Structures	Gender in Architecture
	Architectural Conservation	Disaster Resistance Structures	Behaviour Psychology
	Healthcare Design	Pre-Fabricated and Pre-Stressed Structures	Ergonomics
	Critical Thinking of Modern Architecture	Steel Structures	Housing Laws and Policies
Sem-IX	Set Design	Office Management	Study of Cities
	Hospitality Design	Real Estate Management	Intellectual Property Rights
	Urban Design	Fire Fighting Systems in Buildings	Art in Architecture
	Landscape Urbanism	Pneumatic Structures	Urban Infrastructure Planning
Sem-X	Digital Architecture	Construction Management	Cultural Landscapes
	Industrial Design	Intelligent Building Systems	Geographic Information System
	Modular Furniture Design	Valuation	Legalities in Architectural Profession
	Specialized Architecture(Defence/	Specialized Services in Buildings	Green Building Rating Systems

## **GUIDELINES FOR PAPER-SETTING SYLLABUS CBCS-2020**

1. Question paper to cover questions from entire syllabus.
2. All UE theory papers are for maximum 60 marks.
3. Duration:
  - a. 2&1/2 hrs. for writing papers
  - b. 3hrs. for drawing papers.
4. There will be Two sections of max. marks 30 each.
  - a. Section-I from Units-I,II& III of syllabus
  - b. Section-II from Units-IV,V& VI of syllabus
5. There will be Four questions in each section of 10 marks each.
6. Maximum marks for each question will be in whole numbers & not in fractions.
7. In each Section following pattern will be followed:

Section –I

  - a. Question no. 1 is compulsory
  - b. Attempt any Two questions out of Question no. 2,3,4.

Section –II

  - a. Question no. 5 is compulsory
  - b. Attempt any Two questions out of Question no. 6,7,8.
8. In each section 20% marks will be assigned for Analytical questions i.e in each section out of 30 marks 6 marks are assigned for Analytical component. This component will be in compulsory question i.e Question no.1 and Question no.5.

## **SEMESTER I**

## First Year B Arch.

## Architectural Design-I

Course Code:KHMU11	Course Category: Professional Core		Semester: I
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	2	Sessional Oral (SO	60marks
Workshops or studio exercises / week	2	Sessionals (SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

### Course Objectives:

1. To apply knowledge gained in other subjects and present them in graphic form using manual medium.
2. To imbibe the importance of pre-study in design process
3. To provide knowledge and understanding of design with special attention to design fundamentals and orientation

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Define</b> anthropometry and <b>recognize</b> the importance of cardinal directions in design.
2.	Understanding	<b>Comprehend</b> design fundamentals in relation to space design.
3.	Applying	<b>Develop</b> visualization of liveable spaces by understanding relationship between the activities and spaces through case studies and site visits.
4.	Analyzing	<b>Analyze</b> the aspects related to function, space, structure, and aesthetics
5.	Evaluating	<b>Relate</b> knowledge in the domain of fundamentals of design
6.	Creating	<b>Design</b> a single activity space and <b>create</b> final project and model



**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Study of Design Fundamentals</b> <ul style="list-style-type: none"> <li>- Study of anthropometry, ( study of basic human activities in Indian and Global context)</li> <li>- Study of function and circulation (Relationship between function and space)</li> </ul>	12
Unit -II	<b>Study of orientation of buildings</b> <ul style="list-style-type: none"> <li>- Study of cardinal and ordinal directions</li> <li>- Study of building orientation with respect to basics of sun and wind</li> <li>- Understanding the preferred/ non preferred, favorable/ non favorable orientation with respect to cardinal directions and climate</li> </ul>	12
Unit -III	<b>Pre-study: Learning from primary and secondary resources</b> <ul style="list-style-type: none"> <li>- Case-studies and site visits</li> <li>- Books, reports, articles</li> <li>- Films and documentaries</li> </ul>	24
Unit-IV	<b>Architectural Design</b> <ul style="list-style-type: none"> <li>- Single activity architectural design project (approximately 50 sqm.), with application of the learning's from study of design fundamentals, study of cardinal directions, climate, and the pre-study.</li> </ul>	30
Unit-V	<b>3-D models</b> <ul style="list-style-type: none"> <li>- Study models</li> <li>- Physical model of the final design proposal with site development</li> </ul>	12
<b>Total Contact Hours</b>		<b>90</b>

**Learning Resources:**

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
3.	Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i> , New Jersey, John Willy and
4.	Krishnan Arvind (2017), <i>Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings</i> , McGraw Hill Education

5.	Neufert Ernst (1970) <i>Neufert Architects data</i> , Bauwelt-Verlag (German 1 <sup>st</sup> Ed.), Lockwood (English 1 <sup>st</sup> Ed.)
6.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
7.	Pandya Yatin (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing
8.	Pramar V. S. (1973) <i>Design Fundamentals in Architecture</i> , Somaiya Publication
9.	Rapoport Amos (1969), <i>House, form and culture</i> , Pearson
10.	Thakkar Jay, Morrison Skye, (2008) <i>Matra: Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , SID research Cell, CEPT University

## First Year B Arch.

## Building Construction and Material-I

CourseCode:KHMU13	Course Category: BSAE		Semester: I
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	60marks
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

### Course Objectives:

1. To enable students to understand materials, principles and methods of construction
2. To cover the breadth of students including components and systems of buildings

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Define</b> various components of building and <b>know</b> technical terms, different materials available for masonry work
2.	Understanding	<b>Understand</b> the concept of load transmission and <b>distinguish</b> load bearing and framed structure
3.	Understanding	<b>Describe</b> purpose ,methods and types of finishes
4.	Applying	<b>Apply</b> knowledge gained in Theory of Structure and <b>develop</b> understanding about basic principles of construction method
5.	Analyzing	<b>Analyze</b> different materials in terms of properties, types, application in design ,market forms available ,advantages and disadvantages etc
6.	Evaluating	<b>Compare</b> different types of materials in masonry work
7.	Creating	<b>Design</b> masonry element and entrance gate applying alternative materials and methods of construction
8.	Creating	<b>Create</b> drawings, models and <b>relate</b> structural behaviourism and construction techniques

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<p><b>Introduction</b> Introduction to building construction as course and its relevance to Architectural design.</p> <ul style="list-style-type: none"> <li>- Introduction to various components of building from foundation to roof.</li> <li>- Structural elements of load bearing and framed structure and its differences</li> </ul>	7
Unit -II	<p><b>Materials</b></p> <ul style="list-style-type: none"> <li>- Properties, sustainability aspects, various types, cost, application in buildings, defects and strengths, market survey of bricks , stones ,cement, sand, aggregates, mortar and lime.</li> </ul>	7
Unit -III	<p><b>Finishes</b></p> <ul style="list-style-type: none"> <li>- Pointing: Purpose and types</li> <li>- Plastering: Method and types i.e. neeru faced, sand faced, rough cast, pebble finish and all proprietary types.</li> </ul> <p>Innovative materials used for pointing and plastering</p>	7
Unit-IV	<p><b>Foundation</b></p> <ul style="list-style-type: none"> <li>- Excavation: purpose and types, plinth formation</li> <li>- Introduction to shallow foundation</li> <li>- Strip foundation for a load bearing structure in stone and brick upto plinth level including plinth formation</li> <li>- Foundation for brick piers, entrance steps, compound walls.</li> </ul>	21
Unit-V	<p><b>Masonry</b></p> <ul style="list-style-type: none"> <li>- Fundamentals, principles of load bearing construction for medium rise structures using brick, stone, concrete blocks, solid blocks, hollow blocks, cavity blocks etc.</li> <li>- Introduction to various types of brick masonry.</li> <li>- Bonds: English, Flemish, header, stretcher, garden wall, rat trap and other types.</li> <li>- Junctions: Tee, crossed and right angled</li> <li>- Introduction to stone masonry and its types : dry rubble, uncoursed rubble, random rubble, squared, polygonal, etc.</li> <li>- Composite masonry</li> </ul>	31
Unit-VI	<p><b>Entrance gate and Fencing</b></p> <ul style="list-style-type: none"> <li>- Entrance gate - Constructional details of entrance gate in a compound wall of following types: Sliding Gate with floor channel, Sidehung , side hung with wicket gate.</li> <li>- Fencing - Construction in different materials like Barbed wire, Chain link, Wire mesh, R.C.C. Grills, M.S. Grills etc.</li> </ul>	17
<b>Total Contact Hours</b>		<b>90</b>

**Learning Resources:**

1.	Rangwala S.C.(2007) Engineering Materials, Gujarat, Charator Publication House
2.	Duggal S.K.(2009) Building materials, New Delhi, New Age International
3.	Varghese P.C. (2005) Building Materials, New Delhi, Prentice Hall of India Pvt. Ltd.
4.	Duggal S.K. (1997) Building Materials, New Delhi, Oxford and IBH publishing Co.Pvt. Ltd.
5.	Spence R.F. and Cook D.J.(1983) Building Materials in Developing Countries, New York, John Wiley and Sons.
6.	W.B. McKay(1981) Building construction Vol. II, UK, Longmans Green and Co.
7.	Barry(1958) The construction of buildings, Vol.I, Blackwell science
8.	Roy Chudley, Goger Greeno (1988), Buildings Construction handbook, Routledge

## First Year B Arch

## Theory of Structures-I

CourseCode:KHMU13	Course Category: BSAE		Semester: I
Credits :	2	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises/ week	1	Sessionals(SS)	60marks
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	6 Hours

### Course Objectives:

1. To understand the structural concepts and behaviour of structural element

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Recognize</b> the significance of the main structural elements in structural analysis
2.	Understanding	<b>Explain</b> structural concepts, fundamentals of structure and <b>describe</b> of the various loading conditions acting on the structure
3.	Understanding	<b>Illustrate</b> the concept of free body diagram of structures and structural elements
4.	Applying	<b>Calculate</b> self weight, resolution of forces, centre of gravity, moment of inertia, material constants for all types of structures, and stress calculations of structural members having different material properties
5.	Applying	<b>Develop</b> an ability to analyse internal response of structure
6.	Analyzing	<b>Compare</b> response of structural system for various materials
7.	Evaluating	<b>Evaluate</b> the behaviour of structural elements of ancient and modern structures
8.	Creating	<b>Design</b> stepped foundation, wall of uniform thickness and variable thickness and <b>relate</b> principals of this subject to the other subjects such as Building Construction, Architectural design, Architectural drawing and graphics, History of Architecture

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Introduction to fundamental concepts of structure:-</b> Introduction to fundamental concepts of Applied Mechanics relevant to structures and characteristics of material like unit weight, elasticity, plasticity, ductility, hardness. Understanding of rigid body, deformable body, force systems, characteristics of forces, transmissibility, types of structures. Concept of tension, compression in structures	04
Unit -II	<b>Resolution of forces :-</b> Types of loads and moment a) calculation of self weight based on density for load bearing elements. b) Resultant of concurrent force system with simple practical examples. c) Concept of moment and resultant of non concurrent force system with simple practical examples	06
Unit -III	<b>Equilibrium of forces acting on beam:-</b> Introduction to i) Equilibrium conditions of force systems. ii) Types of loads - point loads, uniformly distributed load(udl), uniformly varying load(uvl), types of supports (hinge, simple, roller, fixed) , types of beams (simply supported, cantilever, overhanging, fixed, continuous) iii) Support reactions in beams.	06
Unit-IV	<b>Centroid &amp; Centre of Gravity:</b> Importance and application of centroid and centre of gravity for plane sections like Rectangle, circle, semicircle, triangle.iii) Calculation of centroid for shapes-- C,T,L,I	04
Unit-V	<b>Moment of Inertia:</b> Moment of Inertia For standard sections, Parallel axis theorem, Perpendicular axis theorem, Radius of gyration. Moment of Inertia of sections considered for center of gravity (Unit IV).Importance and Application	04
Unit-VI	<b>Simple stress &amp; Strain:-</b> Concept of Simple stress and strain. Calculation of self weight for load bearing elements and downward soil pressure due to the same. Simple numerical based composite (modular ratio) and compound elements. Behaviour of ductile and brittle material in terms of stress and strain curve. Introduction to elastic constants and its significance. Definition of fatigue, creep. Introduction to flinched beams	06
Total Contact Hours		30

**Learning Resources:**

1.	Beer and Johnston,(2008).Mechanics of Materials.NewDelhi,Tata McGraw-Hill
2.	Mario Salvadori.(1980).Why buildings stand up:The strength of architecture. McGraw-Hill
3.	S.B.Junnarkar&Dr.HJ Shah,(2012).Mechanics of Structures Vol. I &II.Anand,CharotarPublishing
4.	KhurmiR.S.(2014).Strength of Materials.NewDelhi,S.Chand& Company Ltd
5.	DongreA.P.(2011).Strength of Materials.Pune/Hyderabad,Scitech Publications



## First Year B Arch.

## History of Architecture-I

CourseCode:KHMU14	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60marks
Studio Projects per week	-	Sessional Oral (SO)	-
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	9 Hours

### Course Objectives:

1. To learn from the wisdom of traditional knowledge systems.
2. To imbibe the fundamental knowledge of the built environment
3. To study history of architecture as a response to climate, culture and socio political conditions.

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Identify</b> issues with reference to cultures, civilizations and settlements across the world at different periods of time
2.	Remembering	<b>Know</b> technology and its impact on built environment and building for
3.	Understanding	<b>Understand</b> the development of architecture as a process through a holistic approach of contextual and cultural evolution
4.	Understanding	<b>Differentiate</b> between various styles and elements of development and <b>describe</b> prominent historic buildings
5.	Applying and Analyzing	<b>Develop</b> ability to <b>analyze</b> the evolutionary aspects of stage of progress
6.	Evaluating	<b>Compare</b> architectural style across culture of that time with reference to location -geography , Social Systems, Religion ,climate, art etc.
7.	Creating	<b>Derive</b> materials ,construction techniques in design from historic civilization

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<p><b>Prehistoric</b>                      Housing forms in the initial phase: Cave shelters- (suggestive examples at Lascaux, Terra Amata etc)                      Community structures: (suggestive examples Menhir , dolmen, gallery and passage graves, Stonehenge, Ggantija Malta etc )</p>	6
Unit -II	<p><b>River Valley Civilizations –Asia</b>                      Introduction to development of the settlements - location, social and cultural aspects, climate, construction techniques, building materials, building typologies and architectural characteristics, settlement principles etc - Yellow River, Indus River</p>	9
Unit-III	<p><b>Vedic Architecture</b>                      Vedic culture and settlement planning layouts, City Planning in later Vedic period and Buildings and construction techniques.  <b>Buddhist Architecture</b>                      Introduction to the Evolution and development of Major typologies like Stambha, Chaitya, Vihara ,Stupa. Development of Chaitya arch(suggestive examples Ashokan Stambhas, Lomas Rishi Cave,The Great Stupa at Sanchi, Chaitya Hall at Karli, Chaitya and Viharas at Verul and Ajanta etc )</p>	7
Unit-IV	<p><b>River Valley Civilizations -Western</b>                      Introduction to development of the settlements - location, social and cultural aspects, climate, construction techniques, building materials, building typologies and architectural characteristics, settlement principles etc - Nile River ,Tigris River</p>	7
Unit-V	<p><b>Greek Civilization</b>                      Introduction to the, Social and cultural Systems, political scenario, History and evolution of Architectural typologies, Characteristics of Buildings, construction technology and elements evolved like Classical Orders, Optical corrections etc.                      (suggestive examples Acropolis, City of Athens Temples, Theatres, Agora, Stoa, Council Halls etc )</p>	8
Unit-VI	<p><b>Roman Civilization</b>                      Introduction of the History, evolution and characteristics Elements of special attributes.                      Introduction to the, Social and cultural Systems, political scenario, History and evolution of Architectural typologies, Characteristics of Buildings, construction technology and elements evolved like Arches, arcuated construction, bridges, aqueducts, etc(suggestive examples</p>	8

	City of Rome ,Temples- Pantheon, Basillica at Trajan, Amphitheatre, Hippodrome, Circus, Palaces-hydrian’s villa , Thermae at Carcalla etc	
Total Contact Hours		45

**Learning Resources:**

1.	Sir Banister Fletcher, (1999) A History of Architecture, Indian Edition. Delhi, CBS Publications.
2.	Percy Brown,(1983) Indian Architecture (Hindu And Buddhist). Bombay, Taraporevala and Sons
3.	Denis Montagnon, (2001) Rome . ISBN 3-8228-5870-6. Germany, TashchenGmnH Satish Grover, (2003) The Architecture of India (Buddhist and Hindu Period). New Delhi, Vikas Publishing Housing Pvt. Ltd.
4.	Leland M Roth ,(1994) Understanding Architecture: Its Elements, History and Meaning. Craftsman House;
5.	Pier Luigi Nervi, General Editor, (1972) History of World Architecture – Series. New York, Harry N. Abrams Inc. Pub
6.	Burns, Ralph, Lerner, Meacham, (1991) World Civilizations. First Indian Edition, Delhi, Goyl Saab Publishers and Distributors.
7.	Roger Smith, (1987) An Illustrated history of Architectural Styles. Omega Books Ltd. Sebastiano Serlio,(1982) The five books on architecture. New York, Dover Publication Inc.
8	Sebastiano Serlio,(1982) The five books on architecture. New York, Dover Publication Inc
9	Satish Grover, (2003) The Architecture of India (Buddhist and Hindu Period). New Delhi, Vikas Publishing Housing Pvt. Ltd.

## First Year B Arch.

## Architectural Drawing and Graphics-I

CourseCode:KHMU15	Course Category: Professional Core		Semester: I
Credits :	5	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60marks
Studio Projects per week	-	Sessional Oral (SO)	-
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	90 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	75Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	15 Hours

### Course Objectives:

1. To develop visualization and presentation skills as tools for creative thinking and representation of ideas and concepts
2. To acquire effective communication in graphical form in Architecture
3. To impart basic knowledge and skill to draft a drawing manually.

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Know</b> architectural drawing techniques using drafting tools.
2.	Remembering	<b>Acquire</b> vocabulary and grammar such as scale, annotations, labelling ,dimensioning etc.
3.	Understanding	<b>Understand</b> the concept of orthographic projection, surface development.
4.	Applying	<b>Use</b> freehand techniques for preparing drawings and <b>develop</b> perception and presentation of different forms
5.	Analyzing and Evaluating	<b>Analyze and relate</b> Architectural Drawing Graphics with Architectural Design, Building Construction, Working Drawing etc
6.	Creating	<b>Create</b> conceptual and presentation drawings for various purposes

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Introduction to graphic language and its components</b> <ul style="list-style-type: none"> <li>- Introduction to instruments</li> <li>- Line types: meaning and application</li> <li>- Architectural lettering and dimensioning techniques and their role and application in composition of drawings with various examples</li> <li>- Architectural annotations and conventions</li> </ul>	12
Unit -II	<b>Orthographic Projections</b> <ul style="list-style-type: none"> <li>- Geometrical construction, planar geometry</li> <li>- Method of Orthographic projections</li> <li>- Drawing 2-dimensional drawings from 3-dimensional objects</li> </ul>	18
Unit -III	<b>Surface Development</b> <ul style="list-style-type: none"> <li>- Surface Development of various three-dimensional objects</li> </ul>	13
Unit-IV	<b>Study of Graphical Scales</b> <ul style="list-style-type: none"> <li>- Introduction to graphic scale and their applications</li> <li>- Scaled enlargement and reduction of simple objects and site plans of complex shapes</li> <li>- Scaled drawings (plan/s section/s and elevation/s) of complex objects/ simple building of sufficient size to demonstrate use of various scales, conventions and standard annotations</li> </ul>	9
Unit-V	<b>Sketching</b> <ul style="list-style-type: none"> <li>- Introduction to architectural sketching and principles of free hand sketching such as proportions, light and shade: with primary thrust on sketching of building elements and built/un-built environment.</li> </ul>	8
Unit-VI	<b>Sections: from simple geometrical elements to complex architectural elements</b> <ul style="list-style-type: none"> <li>- Graphical and visual communication through sections of geometrical forms along with the understanding of the line weights, material indications, etc.</li> <li>- Graphical and visual communication through sections of architectural elements / building along with the understanding of the line weights, material, indications, etc</li> </ul>	15
<b>Total Contact Hours</b>		<b>75</b>

**Learning Resources:**

1.	F. D K. Ching (2009) Architectural Graphics, New Jersey, John and Wiley and Sons.
2.	Manual of Section, David J. Lewis, Marc Tsurumaki, and Paul Lewis.
3.	Architectural Drawing Course: Tools and Techniques for 2D and 3D Representation, by <i>Mo</i>
4.	N.D.Bhatt (2012) Engineering Drawing, Gujrat, Charotar Publishing House.
5.	Hugh C. Browning (1996) The Principles of Architectural Drafting, New York, Watson-
6.	Calvin F. Schmid, Stanton E. Schmid, (1954) Handbook on Graphic Presentation, New York,
7.	David Littlefield (2012) Matric Handbook, London and New York, Routledge Taylor and
8.	Sleeper R.( 2000)Architectural Graphic Standards, New York, John Wiely and Sons.

## First Year B Arch.

## Workshop

CourseCode:KHMU16	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	2	Sessionals(SS)	60
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

### Course Objectives:

1. To introduce various types of models at appropriate scales such as site model, study model, block model, finished presentation models
2. To introduce students to various materials, tools and techniques used in making architectural models.
3. To introduce students to various skills such as joinery, cutting, finishing in carpentry, smithy.

### Course Outcomes:

CO No.	Psychomotor levels	On successful completion of course the learner will be able to:
1.	Imitation	<b>Observe</b> the nature and texture of different materials
2.	Manipulation	<b>Replicate</b> forms in drawing by making models
3.	Precision	<b>Choose</b> tools and joinery techniques required for model making
4.	Precision	<b>Integrate</b> two dimensional drawing and three dimensional form
5.	Articulation	<b>Construct</b> or Compose three dimensional forms using different model making materials and equipment in different scale
6.	Naturalisation	<b>Make</b> everyday objects, some building elements ,building forms with a wide variety of available materials and <b>handle</b> simple tools in carpentry

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Materials for model making:</b> Introduction to various materials like various types of papers, mount boards, softwood (balsa), cork, clay etc for architectural model making.	6
Unit -II	<b>Tools and techniques in model making</b> Introduction to various tools and techniques cutting, scoring, folding and gluing techniques, using templates, measuring aids, to build surfaces and simple/ solids such as cubes, prism, cylinders, pyramids, cones, spheres etc or interpenetrated forms.	9
Unit-III	<b>Adv. Materials, methods and tools:</b> Using materials such as plastics, films, plaster of paris, clay, acrylic, wax, metals, glass, fabric etc and their moulding, scooping, cutting, joining methods etc	6
Unit -IV	<b>Wood and metal work:</b> Exercises in cutting and joinery with planers, saw, lathe, and jigs; Joinery details in wood, metal, blocks, pipes, plates, etc, composition of basic and complex geometrical forms.	9
Unit-V	<b>Finishing:</b> Exercises in finishing with planers, sander; Finishing surfaces with various protective coats, paints, varnishes, oils etc	9
Unit-VI	<b>Prototyping and advanced modelling:</b> Introduction to model making using machines - explore laser cutting, acid etching, stereo lithography, 3D printing, etc. Introduction to various types of model making for Architectural studies like block model, working models, contour models, site models ,openable models, service models etc.	6
<b>Total Contact Hours</b>		<b>45</b>

**Learning Resources:**

1.	Engel, P. (1989). Folding the Universe: Origami from Angelfish to Zen. Vintage.
2.	Janke, R. (1978). Architectural models/Architekture modelle (No. 72.027). Academy Editions,.
3.	Mills, C. B. (2011). Designing with models: a studio guide to architectural process models. John Wiley & Sons.
4.	Taylor, J. R., & Taylor, J. R. (1971). Model building for architects and engineers. McGraw-Hill Companies.



## First Year B Arch.

## Basic Design -I

CourseCode:KHMU17	Course Category: Professional Core		Semester: I
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	60marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

### Course Objectives:

1. To develop the basic understanding of the fundamentals of design
2. To provide knowledge and understanding of elements and principals of design; its importance

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Know</b> elements of Design
2.	Understanding	<b>Understand</b> effects of scale, the concept of form, space and structure through creative thinking
3.	Applying	<b>Develop</b> lateral thinking <b>and apply</b> the principles of design
4.	Analyzing	<b>Analyse</b> aspects of form, space and aesthetics
5.	Evaluating	<b>Appraise</b> design forms in terms of visual character and <b>critique</b> basic design composition
6.	Creating	<b>Create</b> two dimensional and three dimensional composition with various media

### Course Contents:

Units	Contents of The Course	Hours
Unit -I	<b>Elements of Design:</b> Introduction to: - Different Elements of design - Fundamentals of Design	08

Unit -II	<b>Scale, Proportion:</b> <ul style="list-style-type: none"> <li>- Proportion &amp; scale: Material proportions, structural proportions</li> <li>- Golden Section</li> <li>- Anthropometry</li> </ul> Visual Scale and Human Scale	08
Unit -III	<b>Principles of Design</b> <ul style="list-style-type: none"> <li>- Introduction to Principles of Design</li> <li>- Theory on Lateral Thinking and exercise on generation of alternatives</li> <li>- Explorations of Principles of Design through 2D and 3D compositions</li> </ul>	09
Unit-IV	<b>Volume , Form &amp; Space</b> <ul style="list-style-type: none"> <li>- Properties of Form</li> <li>- Subtractive &amp; additive forms</li> <li>- Degree of enclosure – Planes</li> <li>- Volumetric Study of Spaces – positive and negative spaces</li> </ul>	08
Unit-V	<b>Organization:</b> <ul style="list-style-type: none"> <li>- Organization of Form &amp; Space</li> <li>- Spatial Relationships</li> <li>- Spatial Organizations</li> <li>- Explorations of Organization through 3D compositions</li> </ul>	08
Unit-VI	<b>Indian Aesthetics:</b> Introduction to all art forms including architecture as a holistic sacred domain with reference from Vishudharmottar purana. ·Introduction to Art in India as a way of life, as a ritual, as a socio-cultural expression, and more, e.g. Rangoli, Mehendi, Serving of food, ornamentation, arrangement of puja, and so on.	04
<b>Total Contact Hours</b>		45

**Learning Resources:**

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Bacon E.N. (1974) <i>Design of Cities</i> , England, Penguin Books
3.	Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i> , Australia, Watson-Guptill
4.	Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i> , New Jersey, John Willy and
5.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
6.	Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books

7.	Gupta Neerja (2017), <i>A Student's Handbook of Indian Aesthetics</i> , Cambridge Scholars
8.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
9.	Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami Book</i> ,
10	ShirishVasantBapat (1993) <i>Basic Design and Anthropometry</i> , Pune, Bela Books
11	Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i> , London, Grange Book Plc
12	Yatin Pandya (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing

## First Year B Arch.

## Elective -I

CourseCode:KHMU18	Course Category: Open elective		Semester: I
Credits :	2	Internal Assessment	100 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	06 Hours

### Course Objectives:

1. To facilitate the students to learn out of a pool of specialized courses, which provides extended scope or which enables exposure to discipline-centric courses as well as cross-disciplinary courses.
2. To encourage interdisciplinary learning and imbibe values as learners
3. To give students an opportunity to develop their attitudes and skills in a subject they may opt for making carrier

### Course Outcomes:

CO No.	Affective levels	On successful completion of course the learner will be able to:
1.	Receiving	<b>Identify and describe</b> the aspects or issues of offered contents
2.	Responding	<b>Report</b> case study
3.	Valuing	<b>Justify</b> their ideas /opinions in relation to contents of elective
4.	Organization	<b>Document and present</b> the data collected in systematic way.
5.	Internalizing	<b>Display</b> a technical base through in depth study

### Course Contents:

Units	Contents of The Course	Hours
	The detail course contents will vary as per options selected for elective and expert teaching the course will frame the contents at the beginning of semester along with objectives, outcomes, references and details for assignments.	
Total Contact Hours		

### Learning Resources:

1.	As per topic chosen
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## **SEMESTER-II**

## First Year B Arch.

## Architectural Design -II

CourseCode:KHMU21	Course Category: Professional Core		Semester: II
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	2	Sessional Oral (SO	60 Marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

### Course Objectives:

1. To make the students familiar with design and the architectural design process as a synthesis of factors such as climate, comfort, land, technology
2. To equip the students with communication and presentation skills
3. To inculcate sensitivity towards environment through climate responsive design

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Represent</b> built/un-built spaces in graphic form
2.	Understanding	<b>Understand</b> the concept of form, space and structure through documentation
3.	Applying	<b>Use</b> isometric, axonometric, and rendering techniques and <b>demonstrate</b> their ideas and observations graphically as well as verbally
4.	Applying	<b>Develop</b> understanding to respond to the climate in order to achieve human comfort
5.	Analyzing	<b>Analyze</b> measured drawing with respect to structure ,form ,material, climate etc.
6.	Creating	<b>Design</b> multi activity space
7.	Creating	<b>Make</b> 3D views of design proposal

**Course Contents:**

Units	Contents of The Course	Hours
Unit -I	<b>Documentation</b> Measured drawing of a well-articulated structure with its surrounding context	18
Unit -II	<b>Pre-study: place, climate, scale, people and their activities</b> - Study of place and climate - Site analysis, activity and/or function analysis (Learning from primary and secondary resources such as case-studies and site visits, books, reports, articles, films and documentaries, etc.)	12
Unit -III	<b>Analysis</b> Analysis and presentation of measured drawing with respect to structure, material, planning, context, climate, geography, resources, form, function, elements of design, aesthetics, etc.	18
Unit-IV	<b>Architectural Design</b> - Context based multi-activity architectural design project (approximately 300 sq. m.)	30
Unit-V	<b>Time bound project</b> - Single-activity architectural design project: this project shall be based on values in architecture (e.g. universal design, etc.)	12
<b>Total Contact Hours</b>		90

**Learning Resources:**

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and Sons
3.	Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i> , New Jersey, John Willy and Sons
4.	Krishnan Arvind (2017), <i>Climate Responsive Architecture: A Design Handbook for Energy Efficient Buildings</i> , McGraw Hill Education
5.	Neufert Ernst (1970) <i>Neufert Architects data</i> , Bauwelt-Verlag (German 1 <sup>st</sup> Ed.), Lockwood (English 1 <sup>st</sup> Ed.)
6.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
7.	Pandya Yatin (2014) <i>Elements of Space Making</i> , Ahmedabad, Mapin Publishing
8.	Pramar V. S. (1973) <i>Design Fundamentals in Architecture</i> , Somaiya Publication
9.	Rapoport Amos (1969), <i>House, form and culture</i> , Pearson
10	Thakkar Jay, Morrison Skye, (2008) <i>Matra: Ways of Measuring Vernacular Built Forms of Himachal Pradesh</i> , SID research Cell, CEPT University

## First Year B Arch.

## Building Construction and Materials -II

CourseCode:KHMU22	Course Category: BSAE		Semester: II
Credits :	6	Internal Assessment	40 Marks
Lectures per week	2	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	60 Marks
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	108 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	90 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	18 Hours

### Course Objectives:

1. To enable students to understand materials, principles and methods of construction
2. To introduce timber construction and its elements in detail.

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Know</b> timber as materials in depth and its elements in building construction.
2.	Remembering	<b>Define</b> terms of different timber elements
3.	Understanding	<b>Describe</b> different flooring and roofing materials and understand the concept of spanning for roof element
4.	Applying	<b>Apply</b> appropriate type of timber elements such as door windows, staircase, floor and roof in design considering form..
5.	Analyzing	<b>Classify</b> different timber elements used in construction and <b>compare</b> different types of materials for roofing ,flooring etc
6.	Evaluating	<b>Evaluate</b> suitable joinery for openings
7.	Creating	<b>Summarise</b> knowledge gained in this subject to the architecture design and <b>create</b> drawings and models



**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Introduction</b> <ul style="list-style-type: none"> <li>· Introduction to timber construction</li> <li>· Properties, strength, defects and preservation of timber.</li> <li>· Various timber joints : widening joints, halved joints, cogged joints, bearing joints, oblique joints, etc.</li> </ul>	7
Unit -II	<b>Materials</b> <ul style="list-style-type: none"> <li>· Mud blocks ,rammed earth blocks</li> <li>· Roofing materials - types, purpose, characteristics, advantages and disadvantages</li> <li>· Flooring and paving - different flooring and paving materials</li> </ul>	7
Unit -III	<b>Timber doors and windows</b> <ul style="list-style-type: none"> <li>· Terminology and construction aspects of doors and windows</li> <li>· Timber doors &amp; Partitions - Design consideration and construction for single and double shutters, partly glazed and partly panelled, fully glazed, fully panelled, flush doors, ledged, braced and battened doors.</li> <li>· Timber windows -Design considerations, principles and construction for sash types-panelled, fixed, partly glazed, fully glazed and louvered.</li> <li>· Timber windows -Types of opening- centrally pivoted, top hung, side hung, casement, bay window and sliding.</li> <li>· Hardwares used for doors and windows</li> </ul>	28
Unit-IV	<b>Timber roofs and trusses</b> <ul style="list-style-type: none"> <li>· Timber roofs - Types of roof construction with respect to slope, span and spanning members</li> <li>· Terminology of sloping roof and members</li> <li>· Need and types of sloping roofs : lean to roof, couple roof, close couple roof and collar roof.</li> <li>· Timber trusses – Principles and considerations of trusses. Forces in truss members. Construction of trusses such as king post, queen post truss, ,mansard roof and trusses for various spans</li> </ul>	28
Unit-V	<b>Timber floors</b> <ul style="list-style-type: none"> <li>· Timber flooring - General idea of timber floors in relation to spans, load transmission</li> <li>· Types :Single joist, double joist, triple joist</li> </ul>	15
Unit-VI	<b>Staircase</b> <ul style="list-style-type: none"> <li>· Design Consideration and components</li> <li>· Types of staircase</li> <li>· Timber staircase</li> </ul>	5
<b>Total Contact Hours</b>		<b>90</b>

**Learning Resources:**

1.	Rangwala S.C.(2007) Engineering Materials, Gujarat, Charator Publication House
2.	Duggal S.K.(2009) Building materials, New Delhi, New Age International
3.	Don A. Watson,(1972) Construction Materials and Processes, New York, McGraw Hill
4.	W.B. Mckay(1981)Building Construction Vol. I,II, UK,Longmans Green and Co.
5.	Barry(1958)The construction of buildings, Vol.I,II, Blackwell science
6.	Roy Chudley, Goger Greeno (1988), Buildings Construction handbook, Routledge

## First Year B Arch.

## Theory of Structures -II

CourseCode:KHMU23	Course Category: BSAE		Semester: II
Credits :	2	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	60 Marks
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	6 Hours

### Course Objectives:

1. To understand the structural concepts and behaviour of structural element
2. To introduces forces acting on members in structures

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Recognize</b> the significance of shear force and Bending moment diagram in structural analysis
2.	Understanding	<b>Categorize</b> the forces acting on members in structural analysis
3.	Applying	<b>Develop</b> an understanding of stresses and strain on members
4.	Analyzing	<b>Analyze</b> the behaviour and response of structural system to various load consideration
5.	Evaluating	<b>Justify</b> the dimensions assigned to structural elements of structure for serviceability and safety criteria
6.	Creating	<b>Calculate</b> the load for various load combinations and nature of load (Dead load, Live load)

### Course Contents:

Units	Contents of The Course	Hours
Unit -I	Introduction to Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) for Simply supported, cantilever, and overhang. Definition of Shear Force (SF), Bending Moment (BM), Sign convention, sagging ,hogging, Point of contra flexure, contra shear, effect of couple on beams	04

Unit -II	Details of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD). Details for simply supported, cantilever, overhang beam for a combination of uniformly distributed load(UDL) and point load.	06
Unit -III	Theory of Simple Bending:- Theory of simple bending and bending stress. Details based on standard section with bending stress distribution diagrams.	06
Unit-IV	Shear Stress of Beam:- Shear stress. Details based on standard section with shear stress distribution diagram. Introduction to shear centre.	06
Unit-V	Slope And Deflection:- slope and deflection in beams based on standard cases (no derivations).	04
Unit-VI	Arches:- Introduction to arches as structural element, two hinged, three hinged and fixed.	04
<b>Total Contact Hours</b>		<b>30</b>

#### Learning Resources:

1.	S B Junnarkar&Dr. H J Shah,(2012).Mechanics of Structures Vol. I &II.Anand,Charotar Publishing
2.	Deo S.S.(2013).Engineering Mechanics.Pune, NiraliPrakashan
3.	Deo S.S.(2013).Strength of Materials.Pune,NiraliPrakashan
4.	Ramamrutham S. Narayan.R.(2014) <i>Theory of Structures (for Engineering Degree ,Diploma)</i> .New Delhi, Dhanpatrai Publications P.Ltd
5.	Timoshenko Stephen.(2002) <i>Strength of materials part I. (elementary theory and problems) IIIrd ed.</i> New Delhi, CBS Publishers..Timoshenko Stephen.(2002) <i>Strength of materials part II (elementary theory and problems) IIIrded.</i> NewDelhi,CBS Publishers.

## First Year B Arch.

## History of Architecture -II

CourseCode:KHMU24	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60 Marks
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

### Course Objectives:

1. To learn from the wisdom of traditional knowledge systems.
2. To imbibe the fundamental knowledge of the built environment
3. To study history of architecture as a response to climate, culture and socio political conditions.

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Identify</b> issues with reference to cultures, civilizations and settlements across the world at different periods of time
2.	Remembering	<b>Know</b> technology and its impact on built environment and building fo
3.	Understanding	<b>Understand</b> evolution of various styles of art and architecture
4.	Understanding	<b>Differentiate</b> between various styles and elements of development and <b>describe</b> prominent historic buildings
5.	Applying and Analyzing	<b>Develop</b> ability to <b>analyze</b> the evolutionary aspects of stage of progress
6.	Evaluating	<b>Compare</b> architectural style across culture of that time with reference to location -geography , Social Systems, Religion ,climate, art etc.
7.	Evaluating	<b>Appraise</b> structures as a developmental process rather than simply as a product and <b>critique</b> building forms, structure
8.	Creating	<b>Design</b> buildings in historic architectural styles

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<p><b>Evolution of -Hindu Temple Architecture</b></p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamentation style and other architectural elements during.</p> <ul style="list-style-type: none"> <li>- Gupta period (suggestive examples Temple no 17 , Sanchi, Dasavatara Temple Deogarhetc )</li> <li>- Early and later Chalukyan Temple Development at Aihole , Badami Pattadakal. (suggestive examplesLadkhan and Durga temples-Aihole , Cave temple-Badami, Virupaksha and Papanath temple- Pattadakal, etc)3.</li> <li>- Temple Development by Rashakutas. (suggestive example Kailash Temple Ellora)</li> <li>- Temple Development by Pallava - Rock cut and Structural Temples (suggestive examples Rathas, Rock cut caves, Shore temple at Mamallapuram etc)</li> </ul>	9
Unit -II	<p><b>Introduction to Dravidian style (Development in South India)</b></p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamental style and other architectural elements during</p> <ul style="list-style-type: none"> <li>- Hoysala Temple Development.(suggestive example Keshava temple at Somnathpur)</li> <li>- Temple development by Cholas. (suggestive example - Brihadeshwara temple, ThanjavoreEtc</li> <li>- Development of gopuram during Pandya Period.</li> <li>- Vijayanagara Period. (suggestive example -Vitthalaswami temple, Hampi, column orders etc )</li> <li>- Development of Temple cities during Madura period. (suggestive examples - Meenaksi temple atMadurai, Sriranganathaswami temple at srirangametc )</li> </ul>	9
Unit -III	<p><b>Introduction to Nagara style (Development in North India)</b></p> <p>Evolution of architectural style, principles and major influences on development of form, Spatial organisation, structural development and ornamental style and other architectural elements in</p> <ul style="list-style-type: none"> <li>- Orissa -(suggestive examples Mukteshwar Temple, Lingaraja temples at Bhubaneswar, Sun temple at Konark )</li> <li>- Khajuraho- (suggestive examples –Kandariya Mahadeo temple, Khajuraho etc )</li> <li>- Western regions of Gujarat -(suggestive example Sun temple, Modheraetc )</li> <li>- Jain Temple Development in Western India. (suggestive</li> </ul>	9

	examples Vimal Shah at Mount Abu, Chaumukh Temple at Ranakpuretc )	
Unit-IV	<p><b>Early Christian and Byzantine Architecture</b></p> <p>Introduction to the social systems, aspects of Spatial organization, structural development, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like timber trusses, clerestory, pendentives, dome construction, surface treatment, materials of construction etc. (suggestive examples -St. Peters at Rome (earlier one) Hagia Sophia at Constantinople etc )</p>	6
Unit-V	<p><b>Romanesque</b></p> <p>Introduction to the social systems, aspects of Spatial organization, structural development, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like Wall passages, raking arcades, triforium gallery, vaulting systems etc(suggestive examples – St. Michelle Pavia, Campus at Pisa etc )</p>	6
Unit-VI	<p><b>Gothic Phase</b></p> <p>Introduction to the Spatial organization, planning principles and ornamentation elements in the Evolution of Church form.</p> <p>Introduction to the special elements like buttresses with Structural innovations, pointed arches, vaulting systems, window traceries, flying buttresses etc.(suggestive examples -Amines Cathedral, Notre dame cathedral, Salisbury cathedral, West Ministers Abbey, castles etc)</p>	6
<b>Total Contact Hours</b>		<b>45</b>

**Learning Resources:**

1.	Percy Brown, (1983) Indian Architecture (Hindu And Buddhist). Bombay, Taraporevala and Sons.
2.	Henri Stierlin, (2002) Hindu India. ISBN 3-8228-1767-8. Taschen GmbH.
3.	George Michell, (1995) Architecture of the Islamic World. London, Thames and Hudson Ltd.
4.	Sandra Forty, (2004) Architecture. Rochester, Grange books
5.	Sir Banister Fletcher, (1996) A History of Architecture. Delhi, CBS Publishers.
6.	DhanpatRai Publications (P) Ltd, 16th Reprint

## First Year B Arch.

## Architectural Drawing and Graphics -II

CourseCode:KHMU25	Course Category: Professional Core		Semester: II
Credits :	5	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	60 Marks
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	4	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	90Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	75 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	15 Hours

### Course Objectives:

1. To introduce various techniques of three-dimensional presentation of simple , complex objects and building elements.
2. To enable the students to understand and express Composite three-dimensional built forms through additive and interpenetrated elements using various graphical projection systems through sections
3. To understand scale proportions in buildings and communication through architectural drawings

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Recognize</b> , three dimensional drawing and its importance in architectural drawing
2.	Understanding	<b>Understand</b> interpenetration of solids and <b>explain</b> concept of isometric, axonometric projections
3.	Applying	<b>Develop</b> understanding of sciography and <b>apply</b> in plan and elevations of design
4.	Analyzing Evaluating	<b>Analyze</b> and <b>relate</b> the graphics content with Architectural Design
5.	Creating	<b>Create</b> 3D views using isometric and axonometric



**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Advanced orthographic projections</b> <ul style="list-style-type: none"> <li>- To draw and compose composite solids and its orthographic projection</li> <li>- Drawing Plan/s, Section/s, Elevation/s of building elements by using methods of orthographic projection</li> </ul>	15
Unit -II	<b>Three dimensional drawings-I</b> <ul style="list-style-type: none"> <li>- Drawing of isometric, axonometric and oblique views of solid objects and their compositions</li> </ul>	15
Unit-III	<b>Three dimensional drawings - II</b> <ul style="list-style-type: none"> <li>- Drawing of isometric, axonometric and oblique views of building elements</li> </ul>	10
Unit -IV	<b>Interpenetration of objects</b> <ul style="list-style-type: none"> <li>- Intersection and interpenetration of solid geometric objects and their compositions</li> <li>- Intersection and interpenetration of architectural elements and their compositions</li> </ul>	15
Unit-V	<b>Introduction to Sciography</b> <ul style="list-style-type: none"> <li>- Introduction to sciography of simple objects</li> <li>- Representation of shade and shadows in plans and elevations</li> </ul>	8
Unit-VI	<b>Architectural drawings.</b> <ul style="list-style-type: none"> <li>- Learning to make architectural drawings of Master Architect's building drawings (referred from books) in terms of plans, elevations and sections.</li> <li>- Architectural representation of trees, hedges, foliage, human figures, cars, etc.,</li> <li>- Building Elements: Techniques of representing building elements such as doors, windows, steps, chajja, porch, canopy, etc.</li> </ul>	12
<b>Total Contact Hours</b>		<b>75</b>

**Learning Resources:**

1.	F. D K. Ching (2009) Architectural Graphics, New Jersey, John and Wiley and Sons.
2.	Manual of Section, David J. Lewis, Marc Tsurumaki, and Paul Lewis.
3.	Architectural Drawing Course: Tools and Techniques for 2D and 3D Representation, by Mo
4.	N.D.Bhatt (2012) Engineering Drawing, Gujrat, Charotar Publishing House.

5.	Hugh C. Browning (1996) The Principles of Architectural Drafting, New York, Watson-Guptill
6.	Calvin F. Schmid, Stanton E. Schmid, (1954) Handbook on Graphic Presentation, New York,
7.	David Littlefield (2012) Matric Handbook, London and New York, Routledge Taylor and
8.	Sleeper R.( 2000)Architectural Graphic Standards, New York, John Wiley and Sons.
9.	Gill R.W.(2011) Rendering with Pen and Ink, London, Thames &Hudson ltd.

## First Year B Arch.

## Climatology

CourseCode:KHMU26	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	-
Workshops or studio exercises / week	2	Sessionals(SS)	60 Marks
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching + Sessional Work	15	No.s of Hours for Teaching + Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

### Course Objectives:

- |   |
|---|
| 1. To understand climate and its impact on Architectural Design |
| 2. To encourage sensitivity towards environments                |

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Outline</b> elements of climate, nature of climate and its zone and <b>recognize</b> importance of climate in architecture
2.	Understanding	<b>Understand</b> the climatic influences on built environment and comfort conditions for inhabitants
3.	Applying	<b>Use</b> the surrounding environment as one of the strategic design parameters
4.	Applying	<b>Employ</b> solar charts and sun path and <b>apply</b> fundamentals of climatology in building design
5.	Analyzing	<b>Analyse</b> characteristic of climatic zone in India
6.	Evaluating	<b>Justify</b> opening position, its size in building design by considering air movement
7.	Creating	<b>Relate</b> climate, other environmental parameters and built form at individual and settlement level
8.	Creating	<b>Design</b> climate responsive building

**Course Contents:**

<b>Units</b>	<b>Contents of The Course</b>	<b>Hours</b>
Unit -I	<b>Introduction:</b> <ul style="list-style-type: none"> <li>- Climate, weather, earth- sun relationship</li> <li>- Elements of climate: Temperature, rainfall, humidity, wind, solar radiation etc.</li> <li>- Importance of climate in Architecture</li> <li>- Global, Macro and Micro climate</li> </ul>	6
Unit -II	<b>Human Comfort:</b> <ul style="list-style-type: none"> <li>- Human heat balance and comfort</li> <li>- Thermal comfort and means of thermal comfort</li> <li>- Heat stress, Effective temperature</li> </ul>	6
Unit -III	<b>Comfort conditions:</b> <ul style="list-style-type: none"> <li>- Bioclimatic chart</li> <li>- Subjective variables</li> <li>- Thermal Comfort Indices</li> <li>- Active &amp; Passive means of thermal control</li> <li>- Degree of control.</li> </ul>	9
Unit-IV	<b>Solar charts &amp; Sun-path:</b> <ul style="list-style-type: none"> <li>- Study of Sun-path, Azimuth &amp; Altitude Angle</li> <li>- Structural control : Sun control and shading devices</li> </ul>	9
Unit-V	<b>Ventilation &amp; Air movement:</b> <ul style="list-style-type: none"> <li>- Study of ventilation &amp; its functions in buildings</li> <li>- Air flow through buildings</li> <li>- Position &amp; size of opening</li> </ul>	6
Unit-VI	<b>Study of Climatic zones &amp; Built environment:</b> <ul style="list-style-type: none"> <li>- Study of nature of climate, its physiological objectives and design criteria</li> <li>- Planning Principles of internal and external spaces, surface treatments and openings etc. for various climatic zones</li> </ul>	9
<b>Total Contact Hours</b>		<b>45</b>

**Learning Resources:**

1.	Koenigsberger, Ingersoll, Mayhew, Szokolay, (1996) Manual of Tropical Housing and Building - Climatic Design, Orient Longman Limited
2.	G. Z. Brown and Mark Dekay, John Wiley and Sons, (2001) Sun, Wind and Light, 2nd Edition, New York
3.	Baruch Givoni, (1976) Man, Climate and Architecture, U.K., Applied science Publishers, 2nd Edition
4.	T. N. Sheshadri, (2001) Climatological and Solar Data for India, Meerat, Sarita Prakashan
5.	A. Krishan, (2001), Climate Responsive Architecture, Tata Mcgraw Hill

## First Year B Arch.

## Basic Design-II

CourseCode:KHMU27	Course Category: Professional Core		Semester: II
Credits :	3	Internal Assessment	40 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO)	60 Marks
Workshops or studio exercises / week	2	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	54 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	45 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	09 Hours

### Course Objectives:

1. To introduce to the design process as a synthesis of a variety of factors, analysed and studied.
2. To enhance creative thinking skill

### Course Outcomes:

CO No.	Cognitive levels	On successful completion of course the learner will be able to:
1.	Remembering	<b>Acquire</b> ,creative thinking and theory of Rasa
2.	Understanding	<b>Understand</b> various techniques for improving creativity
3.	Applying	<b>Use</b> the sources of inspiration for creating concepts for design
4.	Analyzing	<b>Select</b> tools for concept Building
5.	Evaluating	<b>Decide</b> inspiration for concept Building
6.	Creating	<b>Synthesis</b> knowledge gained in this subject with Architectural Design

### Course Contents:

Units	Contents of The Course	Hours
Unit -I	<b>Techniques for improving Creativity I:</b> <ul style="list-style-type: none"> <li>- Theories by Edward De Bono: Six thinking hats, lateral thinking</li> <li>- Brainstorming,</li> <li>- Random Combinations</li> <li>- Tree of Possibilities</li> </ul>	08

Unit -II	<b>Techniques for improving Creativity II</b> - Abstraction - Transformation - Matrix of Ideas	08
Unit -III	<b>Sources of inspiration for Creativity:</b> - Role of experience - Mimesis - Literature	08
Unit-IV	<b>Inspiration for concept building:</b> - Material - Geometry - History	08
Unit-V	<b>Tools for Concept building:</b> - Nature and geometry - Visual Memory - Association with other arts	08
Unit-VI	<b>Indian Aesthetics:</b> Introduction to theories of Indian aesthetics specifically the ‘Rasa’ theory by Abhinavgupta, Bharatmuni, Abhinavbharati, etc., with examples from Natyashastra	05
<b>Total Contact Hours</b>		<b>45</b>

### Learning Resources:

1.	Akiko Busch (1991) <i>The Art of Architectural Models</i> , Hong Kong, Design Press
2.	Bacon E.N. (1974) <i>Design of Cities</i> , England, Penguin Books
3.	Barry A Berkus (2000) <i>Architecture, Art – Parallels and Connections</i> , Australia, Watson-
4.	Ching Francis, D. K. (2007) <i>Architecture: Form Space &amp; Order</i> , New Jersey, John Willy and
5.	Ching Francis, D. K. (1999) <i>Visual Dictionary of Architecture</i> , New Jersey, John Willy and
6.	Edward De Bono (1990) <i>Lateral Thinking</i> , London, Penguin Books
7.	Gupta Neerja (2017), <i>A Student’s Handbook of Indian Aesthetics</i> , Cambridge Scholars
8.	Nick Bunn (2010) <i>Architectural Model Making</i> , London, Laurence King Publishing
9.	Paul Jackson, Angela A Court, Marion Elliot (1993) <i>The Ultimate Papercraft and Origami</i>
10.	ShirishVasant Bapat (1993) <i>Basic Design and Anthropometry</i> , Pune, Bela Books
11.	Thompson I (1999) <i>Frank Lloyd Wright: A Visual Encyclopedia</i> , London, Grange Book Plc

## First Year B Arch.

## Elective-II

CourseCode:KHMU28	Course Category: Open Elective		Semester: II
Credits :	2	Internal Assessment	100 Marks
Lectures per week	1	Terminal Paper	-
Studio Projects per week	-	Sessional Oral (SO	-
Workshops or studio exercises / week	1	Sessionals(SS)	-
No.s of Weeks in Semester	18	No.s of hours in Semester	36 Hours
No.s of Weeks for Teaching+ Sessional Work	15	No.s of Hours for Teaching+ Sessional Work	30 Hours
No.of weeks for Assessment	3	No.of Hours for Assessment	06 Hours

### Course Objectives:

1. To facilitate the students to learn out of a pool of specialized courses, which provides extended scope or which enables exposure to discipline-centric courses as well as cross-disciplinary courses.
2. To encourage interdisciplinary learning and imbibe values as learners
3. To give students an opportunity to develop their attitudes and /or skills in a subject they may opt for making carrier

### Course Outcomes:

CO No.	Affective levels	On successful completion of course the learner will be able to:
1.	Receiving	<b>Identify and describe</b> the aspects or issues of offered contents
2.	Responding	<b>Report</b> case study
3.	Valuing	<b>Justify</b> their ideas /opinions in relation to contents of elective
4.	Organization	<b>Document and present</b> the data collected in systematic way.
5.	Internalizing	<b>Display</b> a technical base through in depth study

### Course Contents:

Units	Contents of The Course	Hours
	The detail course contents will vary as per options selected for elective and expert teaching the course will frame the contents at the beginning of semester along with objectives, outcomes, references and details for assignments.	
Total Contact Hours		

### Learning Resources:

1.	As per topic chosen
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# Contents

REVISED  
**CBCS 2018 COURSE**  
FOR  
POST GRADUATE DEGREE PROGRAMME  
IN  
**M. ARCH. (Sustainable Architecture)**



## Sustainable Development

<b>Subject Code : SA 101</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks

### Aim:

To enable students to understand the impact of development activities on the state of environment and need for sustainable development.

### Learning Outcome:

At the end of semester the student will understand:

- The impact of human activity on the environment
- The concept and practice of sustainable development
- Ways of reducing and repairing environmental damage and related laws.
- Principles of sustainable site planning and role of landscape in energy conservation

Unit I	<b>Environment and sustainability</b>	10 hours
	<ul style="list-style-type: none"> <li>• Basic concepts of Ecology, ecosystems</li> <li>• Biodiversity- types and value of biodiversity,</li> <li>• Environmental Degradation,</li> <li>• Need for sustainable development,</li> <li>• Basic principles of sustainable development.</li> </ul>	
Unit-II	<b>Global Environmental Concerns and Mitigation Measures</b>	08 hours
	<ul style="list-style-type: none"> <li>• Global environmental concerns,</li> <li>• Clean development mechanism</li> <li>• Methodologies for sustainable development</li> <li>• Sustainable development Goals (SDG 11 specifically goals towards built environment)</li> </ul>	
Unit III	<b>Environmental Laws, Impact Assessment and management</b>	12 hours
	<ul style="list-style-type: none"> <li>• Environmental impact assessment – Characteristics, methodologies and process</li> <li>• Environmental clearance process in India</li> <li>• Laws – Air Act, water Act, Environmental Protection Act</li> <li>• Protection and preservation of trees rules 2009</li> <li>• National green tribunal Act 2010</li> <li>• Wastewater Management Authority Act</li> <li>• Solid waste management and handling rules</li> <li>• MOEF guidelines for Eco sensitive zones</li> </ul>	
Unit IV	<b>Sustainable Cities</b>	12 hours
	<ul style="list-style-type: none"> <li>• Urbanization and Environment</li> <li>• Urban Environmental Issues (such as air and noise pollution, water pollution, transport, urban heat island, urban green</li> </ul>	

	<p>spaces, solid waste management)</p> <ul style="list-style-type: none"> <li>• Status of Environment, Sustainable development for built environment</li> <li>• Concept of Sustainable Cities and Framework for Sustainable Cities</li> <li>• Smart City And its Components</li> </ul>	
Unit V	<b>Sustainable Site Planning</b>	10 hours
	<ul style="list-style-type: none"> <li>• Site and microclimate</li> <li>• Site potential and constraints</li> <li>• Site planning principles and assessment</li> <li>• Checklist for sustainable site planning</li> <li>• Green campus policies and planning-case studies</li> </ul>	
Unit VI	<b>Sustainable Landscapes</b>	08 hours
	<ul style="list-style-type: none"> <li>• Slope analysis, Topography and Drainage</li> <li>• Landscape and microclimate</li> <li>• Water conservation with respect to site only</li> <li>• Role of vegetation in energy conservation, selection of plants</li> <li>• Green roofs and terraces, vertical gardens</li> </ul>	
Sessional work: Unit tests and assignments based on above content		
IA: Please refer to the guidelines given in the annexure		
Text Books and References		
<ul style="list-style-type: none"> <li>• <a href="http://www.smartcities.gov.in/">www.smartcities.gov.in/</a></li> <li>• UN(2013)World Economic and Social Survey 2013</li> <li>• Global Sustainable Development Report 2015</li> <li>• Basic Ecology, Odum E. P. 1983, Holt-Seunders intl. ed. Japan</li> <li>• Miller T.G.Jr. Environmental Science, Wadsworth Publishing Co. (TB)</li> <li>• Understanding Sustainable Development-John Belwitt</li> <li>• Stephen Schneider, Armin Rosencranz, Michael Mastrandrea, eds., 2010.</li> <li>• Bert Metz, 2010. Controlling climate change, Cambridge University Press.</li> <li>• Canter L.W. (1996) <i>Environmental Impact Assessment</i>, 2nd Edn. New York, McGraw Hill</li> <li>• Trivedy R.K., Handbook of Environmental Law, Acts, Guidelines, Compliances and Standards, Volume Environment Media, 1996.</li> <li>• Mohanty S. K., Environment and Pollution Law Manual, Universal Law Publishing Company Ltd., 3<sup>rd</sup> edition, 2002</li> <li>• Pollution Control Acts, Rules and Notifications, Pollution Control Law Series – Volume – I, Central Pollution Control Board, 1992</li> <li>• Dr. P. Khanna ,Premier on Environment Management, 2001, multi- tech publishing co.</li> <li>• <a href="#">Robinette, G.O (1977)</a> Landscape planning for energy conservation. Environmental Design Press,Reston, VA</li> <li>• Starke .B and Simonds. J. O. (2013) Landscape Architecture: A Manual of Site Planning and Design. McGraw-Hill Professional</li> <li>• TERI (2009) Sustainable Building, Design Manual, Volume I and Volume II</li> </ul>		

## Energy Management and Audit

<b>Subject Code : SA 102</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> Introduction of various Aspects of Energy Management and Audit to assess the energy performances of built spaces.			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• General aspects of Energy in buildings</li> <li>• Energy Management and Conservation Opportunities in Buildings</li> <li>• Energy Audits</li> </ul>			
Unit I	<b>General Aspects of Energy and Energy Scenario</b>		12hours
	Classification of Energy, Primary and Secondary Energy, Commercial and Non-commercial Energy, Renewable and Non-Renewable Energy, Global Primary Energy Reserves and Commercial Energy Production of Coal, Oil, Natural Gas, Global Primary Energy Consumption, Final Energy Consumption, Indian Energy Scenario Coal, Oil, Natural Gas, Electrical Energy Supply, Sector wise Energy Consumption, Energy Needs of Growing Economy, Energy Intensity, Energy Pricing in India, Long term Energy Scenario in India, Energy Security and Energy Independence, Energy Conservation and Energy Efficiency.		
Unit-II	<b>Basics of Energy and Various Forms of Energy</b>		6 hours
	Forms of Energy-Potential and Kinetic, Electrical Energy, Basics of Thermal Energy, Energy Content in Fuels, Heat Transfer, Steam Properties, Laws of Thermodynamics, Energy Units & Conversion, Concept of Fuel Pricing and Electricity Bill		
Unit III	<b>Energy Conservation Acts, Related Policies, Electricity Act and Energy Conservation Building Code</b>		12hours
	Salient Features of The Energy Conservation Act 2001 & The Energy Conversion (Amendment) Act 2010, Salient Features of The Electricity Act 2003, Present Status of Implementation, Introduction to Energy Conservation Building Code 2007 and 2017, energy performance index, determining EPI ratios		
Unit IV	<b>Energy Audit</b>		14 hours
	Definition & Objectives of Energy Audit and Management, Definition of Energy Audit, Need for Energy Audit, Types of Energy Audit & Approach, Technical and Economic Feasibility of ENCON Measures, Energy Audit Report, Energy Costs, Benchmarking, Energy Performance, Fuel and Energy Substitution, Need for		

	measurement parameters and Instruments, Scope and Coverage of Energy Audit of Commercial and Residential Buildings.	
Unit V	<b>Energy Management</b>	8 hours
	Concepts of Material and Energy Balance, Sankey Diagram. Key Elements and Principles of Energy Management, Energy Policy & Planning, Force Field Analysis of Energy Management, Implementation of Energy Management.	
Unit VI	<b>Financial Management and Management of Energy Efficiency Projects</b>	8 hours
	Investment in Energy Efficiency and Appraisal Criteria for Investment, Financial Analysis Techniques, Simple Payback Period, Return on Investment, Time Value of Money, Net Present Value, Internal Rate of Return, Salvage value, Energy Performance Contracting and Energy Service Companies and Case Study What is an Energy Efficiency Project? Pre-planning, Planning project implementation, Project evaluation, Measurement and Verification of Energy Efficiency Project.	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Books Published by Bureau of Energy Efficiency, New Delhi – Book -1.</li> <li>• Energy Conservation Building Code Document Issued by Bureau of Energy Efficiency, New Delhi</li> <li>• Encyclopedia of Energy – McGraw Hill publication</li> <li>• Handbook of E. Engineering – The Fairmont Press Inc. Albert Thumann</li> <li>• E. Handbook, Van Nostrand Reinhold Co. – Robert L. Loftness.</li> <li>• Cleaner Production – E. E. Manual for GERIAP, UNAP, Bangkok, Prepared by National Productivity Council.</li> <li>• B. P. Statistical Review of World Energy, June 2003.</li> <li>• International Energy Outlook, March 2002, Energy Information admin., Office of integrated analysis and forecasting, U. S. DOE, Washington.</li> <li>• Indian Planning Commission statistics.</li> <li>• The Energy and Resources Institute (TERI). Web sites – <a href="http://www.bp.com/centres/energy">www.bp.com/centres/energy</a>, <a href="http://www.eia.doe.gov">www.eia.doe.gov</a> <a href="http://www.epa.org">www.epa.org</a></li> <li>• Training material on “Environmental Concerns” NPC.</li> <li>• Parivesh – October 2002, Central Pollution Board.</li> <li>• Web sites – <a href="http://www.uneptie.org">www.uneptie.org</a> , <a href="http://www.cpcb.nic.in">www.cpcb.nic.in</a> , <a href="http://www.wri.org">www.wri.org</a> , <a href="http://www.safeclimate.net">www.safe climate.net</a> , <a href="http://www.globalwarming.org">www.globalwarming.org</a></li> <li>• E. Dictionary – Van Nostrand Reinhold, V. Daniel Hunt Co. New York.</li> <li>• Web sites <a href="http://www.eia.doe.gov/kids/btundef.html">www.eia.doe.gov/kids/btundef.html</a> <a href="http://www.calculator.org/properties.html">www.calculator.org/properties.html</a> ,</li> </ul> <p><a href="http://www.katmarsoftware.com">www.katmarsoftware.com</a></p>		

**Sustainable Design Studio-I**

<b>Subject Code : SA 103</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	10 hours/week	Credits	10
Teaching hours/ semester	150 hours	University examination (UE)	60 marks
Hours for Internal Assessment	30 hours	Internal Assessment (IA)	40 marks
<b>Aim :</b>			
To translate sustainable design principles into architectural design concepts and application of environmental modeling and simulation tools and techniques to building design.			
<b>Learning Outcome:</b>			
At the end of the semester the student will be able review different approaches of solar passive architecture in building design.			
Unit I	<b>Studio :Project Description</b>		120 hrs
	<p>Design project of Area between range of 3000-5000 sq.m. built up to respond to Thermal Environments using scientific methods of design namely analysis techniques, design strategies and system integration and evaluation procedures.</p> <p>Or</p> <p>Design Studio to apply the Solar Passive Principles at all scales for their Graduation Thesis project.</p> <p>Students shall also perform Energy Simulation exercise for their design solution using energy simulation software e. g. Ecotect or similar.</p> <p>Design Methodology:</p> <ol style="list-style-type: none"> <li>1. Completion of data collection / basic graphic work related to climate and site</li> <li>2. Data base &amp; data processing, analysis, projection &amp; graphic presentation of climate and site</li> <li>3. Formulating Approach / parameters for proposed design / plan / model</li> <li>4. Design / plan / model proposals and details</li> <li>5. Implementation/application solar passive strategies with calculations both manual and simulation</li> <li>6. Evaluation, conclusion including cost - benefit appraisal for relevance of the work.</li> </ol> <p>The entire work will be contained in a comprehensive report and portfolio for final evaluation by the concerned faculty.</p>		
Unit-II	<b>Building Energy Modeling and Passive Design simulation</b>		30 hrs
	Introduction to environmental performance assessment and use of scientific tools and simulation software's for assessment of thermal and lighting processes in built forms and outdoor spaces. Building simulations for analysis of sustainable designs, software's for		

	simulation of passive building design and real time daylight calculations	
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Sessional work</b>		
	<ol style="list-style-type: none"> <li>1. A report containing data collection, climate analysis , calculations and case studies, etc.</li> <li>2. A1/A2 size portfolio explaining the complete design scheme</li> </ol>	
<b>Text Books and References</b>		
	<ul style="list-style-type: none"> <li>• Man climate and architecture – <i>B. Givoni, Applied science pub. Ltd., U.K.</i></li> <li>• Manual of tropical housing and building – <i>Koenigsberger et al, Orient Longman, 1973.</i></li> <li>• Climate Design: Energy Efficient building principles and practices by <i>Watson Donalt</i></li> <li>• Climate responsive architecture- a design handbook for energy efficient buildings, <i>Tata McGraw-hill Publishing Company Limited -2000</i></li> <li>• Sun, Wind &amp; Light – <i>G.Z. Brown, Mark Dekay, John Wiley &amp; Sons, 2001.</i></li> </ul>	



## Energy Conservation I (Thermal Environment)

<b>Subject Code : SA 104</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	6 hours/week	Credits	6
Teaching hours/ semester	90 hours	University examination (UE)	60 marks
Hours for Internal Assessment	18 hours	Internal Assessment (IA)	40 marks

<b>Aim:</b> Demonstrate knowledge and understanding the effects of thermal environment (climate) on comfort condition in built spaces.		
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Climate parameters, climates zones and thermal comfort parameters</li> <li>• Building physics and thermal comfort</li> <li>• Building design and solar passive techniques</li> </ul>		
Unit I	<b>Introduction to Thermal Environment</b>	6 hours
	Introduction to need of Passive design and energy conservation. Introduction to climate and its elements Characteristics of Various climate zones Physics of Heat transfer in Buildings-Thermal Quantities, Heat exchange of Buildings, Periodic Heat Flow Thermal comfort factors	
Unit-II	<b>Climate and buildings : Analysis techniques</b>	18 hours
	<i>Climate as a context</i> : sun, wind, sun and wind, light, and comfort.	
Unit III	<b>Analysis Techniques to understand thermal behavior of buildings: Building Program and use, Building form and Envelope</b>	18 hours
	<i>Building program and use</i> : occupancy heat gain, electric lighting heat gain, equipment heat gain <i>Form and envelope</i> : skin heat flow, window solar gain, ventilation/ infiltration gains and losses <i>Combining Climate, program and form</i> : Building bioclimatic chart, Shading calendar, Total heat gains and losses, balance point temperatures and balance point profiles.	
Unit IV	<b>Thermal Design Strategies at Site, Building Scale and Component Scale</b>	24 hours
	Analysis, selection, formulation and evaluation of thermal design strategies at various scales.	
Unit V	<b>Strategies by Climate type and Energy Intentions.</b>	18 hours
	<i>Design decisions</i> : Making strategy bundles for neighborhoods, buildings and rooms. <i>Combined bundles</i> : single topical issues ( heating, cooling, lighting, ventilation or energy) Multiple integrated topical issues ( heating, cooling, lighting,	

	ventilation or energy liked across various scales)	
Unit VI	<b>High performance Buildings</b>	6 hours
	Net zero and peak zero buildings , net positive buildings, carbon neutral buildings etc.	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Sun, Wind &amp; Light – G.Z. Brown, Mark Dekay, John Wiley &amp; Sons, 2001. (Second edition)</li> <li>• Sun, Wind &amp; Light – G.Z. Brown, Mark Dekay, John Wiley &amp; Sons, 2001. (Third edition)</li> <li>• Inside out – G. Z. Brown et al, John Wiley and Sons, 1992.</li> <li>• Man climate and architecture – B. Givoni, Applied science pub. Ltd., U.K.</li> <li>• Manual of tropical housing and building – Koenigsberger et al, Orient Longman, 1973.</li> <li>• Mechanical and electrical equipment for building – Stein, Benjamin and Reynolds, John Wiley and Sons, 1991.</li> <li>• Energy efficient buildings in India – Milli Mujumdar, TERI, MONES, 2001.</li> <li>• Managing energy efficiently in hotels and commercial buildings – Pradeep kumar, Amitkumar Tyagi, TERI, New Delhi, 2002.</li> <li>• Energy Conservation Building Code, Bureau of Energy Efficiency</li> <li>• Introduction to Architectural Science-the basis of sustainable design— Steven.V.Szololay, published by Elsevier 2008</li> <li>• Climate responsive architecture- a design handbook for energy efficient buildings, Tata McGraw-hill Publishing Company Limited -2000</li> </ul>		

**Sustainable Materials and Technology**

<b>Subject Code : SA 105</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> To study various contemporary and traditional materials, assess their performance and methods of sustainable construction for energy efficiency			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Significance of contemporary and traditional materials in buildings</li> <li>• Characteristics of specific materials and their sustainably managed alternatives</li> <li>• Traditional and advanced efficient building techniques.</li> </ul>			
Unit I	<b>Introduction to sustainable materials</b>		6 hours
	Environmental impact of building materials, Materials-related impacts of sustainable building materials, examples of “green” materials, issues related to “sustainable” materials, future of “sustainable” materials, characteristics of sustainable materials and energy efficiency in materials.		
Unit-II	<b>Life cycle analysis and Life cycle cost analysis</b>		6 hours
	Introduction of LCA and LCC, embodied energy of materials, material life cycle, process of calculation and relevance in sustainable building material selection and construction techniques , Eco Labeling of Materials		
Unit III	<b>Traditional Building Materials</b>		12 hours
	Application, treatment and implementation of various materials like soil identification and testing, stabilized soil blocks, rammed earth, cob and adobe , bamboo , stabilized earth blocks etc. Traditional materials for interior		
Unit IV	<b>Contemporary Building Materials</b>		12 hours
	Application, treatment and implementation of various materials like fly ash blocks and bricks ferrocement, ferrocete, glass, insulation, steel structures, building materials from solid wastes, recycled materials, gypsum, eco-boards etc. Contemporary materials for interior		
Unit V	<b>Sustainable Construction Technologies - Traditional</b>		
	Walling , flooring and Roofing techniques; composite walls, rammed earth walls, hollow block constructions, cavity walls, masonry domes vaults and arches, bamboo wall and roof construction, thatch & mud plaster etc. Traditional technologies for Interior Design		12 hours

Unit VI	<b>Sustainable Construction Technologies – Contemporary</b>	12 hours
	Advanced walling , flooring and roofing techniques; pre-Stressed and pre- cast construction, Pre-fabrication and Modular etc, precast waffle construction, precast hollow planks for flooring and roofing elements etc.)	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Green Building Materials; <i>Ross Spiegel and Dru Meadows</i></li> <li>• Sustainable building technical manual: Green building design, construction and operations, Abraham L.E. et al, 1996, Washington D.C. U.S. Green building council and Public Technology, Inc.</li> <li>• Earth Construction, <i>Houben Hugo</i></li> <li>• Directory of Indian building materials, BMTPC, 2003, LHM publication</li> <li>• National building code of India, BOS, Govt. of India, 2001</li> <li>• Energy Efficient Buildings in India by Milli Mujumdar</li> <li>• Green Architecture, Design for a sustainable future</li> <li>• Energy efficient buildings by Wagner Walter</li> <li>• Architecture, Engineering and Environment by Hawkes Dean and Foster Wayne</li> <li>• Publications from - CBRI - Roorkee             <ul style="list-style-type: none"> <li>- IDC - Mumbai</li> </ul> </li> <li>• - NID - Ahmedabad</li> </ul>		

**Elective I**

<b>Subject Code : SA 106</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	2 hours/week	Credits	2
Contact hours/ semester	30 hours	University examination (UE)	-
Hours for Internal Assessment	6 hours	Internal Assessment (IA)	100 marks
<p><b>Aim:</b> To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to discipline-centric' subjects as well as cross-disciplinary subjects.</p>			
<p><b>Learning Outcome :</b> At the end of semester the student will understand:</p> <ul style="list-style-type: none"> <li>• Application of knowledge in solving a real life problem in an analytical and scientific way.</li> </ul>			
<p><b>Description</b></p> <p>The student can select any one subject in semester I from the list of subjects prepared by the department. A comprehensive list of subjects to be included under three broad areas of study namely; Core, Allied and Open Electives A selected subject expertise be arranged to provide for necessary syllabus formulation and guidance to students.</p> <p><b>Sessional work :</b> The students are expected to study the selected topic in depth under the guidance of the expertise, undertake case-studies and necessary site visits, and collect all the relevant information and present an exhaustive study report in a group.</p>			

**IA: Please refer to the guidelines given in the annexure**

## Green Building Assessment & Certification

<b>Subject Code : SA 201</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks

<b>Aim:</b> To acquaint students with different Green Building Rating Systems prevailing in India namely GRIHA, LEED – IGBC and codes.		
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>Established practices and emerging concepts in green buildings</li> <li>Various evaluation and assessment systems</li> </ul>		
<b>Unit I</b>	<b>Introduction to green rating systems</b>	<b>8 hours</b>
	Objectives and characteristics of National & International rating systems, facilitation and simulation for green rating systems , assessment criteria's for green rating, process of certification. Time line of GBRS	
<b>Unit II</b>	<b>Green Rating for Integrated Habitat Assessment</b>	<b>16 hours</b>
	Introduction to GRIHA, Role of GRIHA in recognizing environment-friendly initiatives, Concept of Green Buildings. GRIHA- National Green Building Rating System- its context, challenges, benefits, development and operation process and basic features. Process of rating buildings- registration and documentation, GRIHA evaluation process Criteria for rating in detail and Scoring points for GRIHA	
<b>Unit III</b>	<b>Leadership in Energy and Environmental Design</b>	<b>16 hours</b>
	LEED Green Building Rating System- Introduction, History of LEED, Features of LEED Introduction to USGBC LEED USGBC – Vision of USGBC, USGBC Structure and Services offered, USGBC rating systems focus areas, rating systems for different types of Buildings, registration and certification process, details of credits, process to achieve rating. LEED NC overview and process- use of LEED NC, Registration, Credit Interpretation Ruling, Application, Review and Certification.  LEED IGBC – Vision of IGBC, IGBC Structure and Services offered, IGBC rating systems focus areas, rating systems for different types of Buildings, registration and certification process, details of credits, process to achieve rating.	

Unit IV	<b>Design Base Green Rating System</b>	8 Hours
	Process of rating buildings- registration and documentation, IGBC evaluation process Criteria for rating in detail and Scoring points for IGBC Compliance of IGBC rating system for any building typology (Ongoing actual Project).	
Unit V	<b>Introduction to other green rating systems</b>	6 Hours
	BRE Environmental Assessment Method (BREEAM) BREEAM, drivers and users of BREEAM, Key Benefits of Users, Different Stages of BREEAM, BREEAM Criteria, Environmental Issues, History of BREEAM, Current Versions of BREEAM, Certification Process. Green Globe Systems- Canada, Green Star (Australia)	
Unit VI	<b>Standards and Codes for green rating systems</b>	6 Hours
	ASHRAE and ISHRAE Codes, ECBC 2017 ECBC compliance and approach, Compliance requirements, compliance documents, calculation of energy consumption of proposed and standard design, whole building compliance method	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Relevant Code Books for ASHRAE and ISHRAE</li> <li>• National Building Code India</li> <li>• National rating system (GRIHA) – GRIHA Manual I</li> <li>• LEED IGBC Reference Guide: <u>LEED-INDIA-NC Abridged Version 1.0</u></li> <li>• BREEAM New Construction, Non-domestic buildings, Technical Manual SD5073- 2.0:2011</li> <li>• GREEN GLOBES FOR NEW CONSTRUCTION-Technical Reference Manual-Version 1.3 February 19th, 2014</li> </ul>		

**Energy Systems and Utilities**

<b>Subject Code : SA 202</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks

**Aim:**

To make students aware about different aspects of Thermal & Electrical Utility Systems.

**Learning Outcome :**

At the end of semester the student will understand:

- Application of thermal systems in building industry and Energy Conservation Opportunities.
- Application of electrical systems in building industry and Energy Conservation Opportunities.
- HVAC systems and their types, their application and Energy Conservation Opportunities

Unit I	<b>Fuels and Combustion</b>	6 hours
	Introduction to Fuels, Properties of Liquid Fuels, Properties of Coal, Properties of Gaseous fuels, Properties of Agro Residues, Combustion Process – Principles and Three “T”s of combustion, Draft systems, Combustion controls.	
Unit-II	<b>Boilers and Steam Systems</b>	6 hours
	Boiler Specification, Indian Boiler Regulation, Boiler systems, Boiler types and Classification, , Boiler Performance Evaluation – Direct & Indirect methods, Energy Conservation Opportunities and Waste Heat Recovery Systems in Boilers. Properties of Steam, Steam distribution system, Efficient Steam Utilization, Benefits of Condensate Recovery, Insulation of Steam Pipelines and Hot Process Equipment, Energy Efficient Steam Utilization and Energy Saving Opportunities	
Unit III	<b>Insulation</b>	4 hours
	Purpose of Insulation, Insulation - Types and Application, Economic thickness of insulation, Hot and Cold Insulation. Introduction to Waste heat recovery process, Classification of Waste heat recovery and Application, Benefits of Waste heat recovery.	
Unit IV	<b>Electrical Systems and Major Electrical Equipment</b>	20 hours
	Introduction to Electrical Power Supply Systems - Generation, Transmission, Transmission & Distribution System losses and Efficiency, Industrial Consumer and Typical Industrial Distribution System, Electricity billing, Concept of Maximum Demand, Electrical load management and Maximum Demand Control, Power factor Improvement and benefits, Automatic Power Factor Controller, Distribution losses in Industrial systems and reduction in Losses.	



	<p>Types of Transformers, Transformer Rating, Location, Transformer Efficiency and Losses, Efficient Operation of Transformers and Labeling.</p> <p>Types of Electric Motor Characteristics and Efficiency, Energy Efficient Motors, Motor load survey, Star Labeling of Energy Efficient Motors, Energy Conservation in Motors</p> <p>Types of Fans in Buildings, Energy Efficient Ceiling Fans and Labeling of Roof top Turbo Ventilators. Calculation of number of Turbo Ventilators for Built Spaces.</p> <p>Pumps for Buildings, Characteristics of Pumps, System Characteristics of Pumps, Energy Savings in Pump Operation, Level Controller, Energy Efficient Pumps and Star Labeling</p>	
Unit V	<b>Air Conditioning &amp; Refrigeration Systems and Cooling Towers</b>	20 hours
	<p>Introduction, Types of Refrigeration systems, Vapor Compression, Vapour Absorption System, Radiant Cooling Systems, Solar Air Conditioning Systems, Commonly used Refrigerants, Compressor Types and Applications, Selection of Refrigeration system. Energy Efficiency Ratio, COP, Performance assessment, Factors affecting Performance and Energy Efficiency of AC / Refrigeration Plants, Standards and Energy Labeling of Room Air Conditioners, Energy Saving Opportunities.</p> <p>Cooling tower introduction, Types of Cooling Towers,, Components of Cooling Tower &amp; materials, Cooling Tower Performance, Energy Conservation Opportunities</p>	
Unit VI	<b>Energy Conservation Building Code (ECBC-2007 and 2017)</b>	4 hours
	<p>ECBC for Building Utilities ,HVAC, Service Water, Lighting And Electric Power &amp; Motors</p> <p><b>Building Utilities</b></p> <p>HVAC – Mandatory Requirements – Natural Ventilation, Minimum Equipment Efficiencies, Controls, and Piping and Ductwork, System balancing, Condensers, Economizers, Variable Flow Hydronic Systems</p> <p>Service Hot Water &amp; Pumping – Mandatory Requirements – Solar Water Heating, Equipment Efficiency, Supplementary Water Heating Systems, Piping Insulation, Heat Traps, Swimming Pools, Compliance requirements</p> <p>Lighting – Mandatory Requirements for Lighting control, Exterior Lighting Power Calculations by Building Area Method and Space Function Method, Exterior Lighting Power</p> <p>Electric Power – Mandatory Requirement for Transformers, Energy Efficient Motors, Power Factor Correction , Check Metering and Power distribution system losses</p>	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		

Energy Conservation Building Code – 2017 Document Issued by Bureau of Energy Efficiency, New Delhi

Boilers and Fuels:

- Combustion Engineering and Fuel Technology – Oxford and IBH publishing Co. – A. K. Saha.
- Web sites – [www.pkra.org](http://www.pkra.org) .
- Efficient Operation of Boilers – NPC.
- Web sites – [www.eren.doe.gov](http://www.eren.doe.gov) , [www.oit.doe.gov/bestpractices](http://www.oit.doe.gov/bestpractices)

Steam Systems:

- Improving Steam System Performance – A Source book for Industry by Office of Industrial Technologies, Energy Efficiency and renewable Energy, U.S. Department of Energy.
- Web sites - [www.iclei.org](http://www.iclei.org) , [www.pkra.org](http://www.pkra.org)  
[www.armstrong-intl.com](http://www.armstrong-intl.com)  
[www.engineeringtoolbox.com](http://www.engineeringtoolbox.com)

Insulation and Waste Heat Recovery:

- Thermal Insulation And Refractories – PCRA
- Web Sites - [www.pkra.org](http://www.pkra.org)
- Heat recovery systems – D. A. Reay, E. and F. N. Span, London 1979

Electrical

- Technology menu on energy efficiency – NPC.
- NPC – In house case studies.
- Electrical energy conservation modules of AIP – NPC, Chennai.
- Managing energy efficiently in hotels and commercial buildings – Pradeep Kumar, Amitkumar Tyagi, TERI, New Delhi, 2002.
- Technology Menu for Energy Efficiency – NPC.
- ASHRAE Handbook.

**Sustainable Design Studio-II**

<b>Subject Code : SA 203</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	10 hours/week	Credits	10
Teaching hours/ semester	150 hours	University examination (UE)	60 marks
Hours for Internal Assessment	30 hours	Internal Assessment (IA)	40 marks
<b>Aim :</b> To translate sustainable design principles into with the Application Procedure of relevant Analysis Techniques, Design Strategies and Evaluation Procedures for Thermal and Luminous Environment, into Architectural Design Problem and application of environmental modeling and simulation tools and techniques to building design.			
<b>Learning Outcome:</b> At the end of the semester the student will be able review different approaches of thermal and lighting design in buildings.			
Unit I	<b>Studio :Project Description</b>		8 hrs/week
	<p>A large scale project of area from 5000 -20,000 sq.m. built up to respond to Thermal and Luminous Environments using scientific methods of design namely analysis techniques, design strategies and system integration and evaluation procedures. An area up to 5000sq.m of the same project could be taken as a small project for detail lighting design.</p> <p>The project sites should be selected by the students having different orientations, ground conditions, urban infrastructure and vegetation along with a set of six different climates of the Indian sub-continent.</p> <p>Students shall also perform Energy Simulation, day lighting and artificial lighting exercise for their design solution using energy simulation software e. g. Ecotect , radiance or similar.</p> <p>Design Methodology:</p> <ol style="list-style-type: none"> <li>1. Completion of data collection related to climate, site and day lighting</li> <li>2. Analysis of the building Programme and use for thermal and luminous environment.</li> <li>3. Data base &amp; data processing, analysis, projection &amp; graphic presentation of climate, site and day lighting</li> <li>4. Formulating Approach / parameters for proposed design / plan / model – Schematic Design</li> <li>5. Design / plan / model proposals and details</li> <li>6. Implementation/application thermal and lighting</li> </ol>		

	<p>calculations both manual and simulation</p> <p>7. Evaluation, conclusion including cost - benefit appraisal for relevance of the work.</p>	
Unit-II	<b>Building Energy Modeling and lighting simulation</b>	2 hrs/week
	<p>Introduction to environmental performance assessment and use of scientific tools and simulation software's for assessment of lighting processes in built forms and outdoor spaces.</p> <p>Building simulations for analysis of sustainable designs, software's for simulation of day lighting, artificial lighting and real time daylight calculations</p>	
<p><b>Sessional work</b></p> <p>1. A report containing data collection, climate analysis , calculations and case studies,etc</p> <p>2. A1/A2 size portfolio explaining the complete design scheme</p>		
<p><b>IA: Please refer to the guidelines given in the annexure</b></p>		
<p><b>Text Books and References</b></p>		
<ul style="list-style-type: none"> <li>• Man climate and architecture – <i>B. Givoni, Applied science pub. Ltd., U.K.</i></li> <li>• Manual of tropical housing and building – <i>Koenigsberger et al, Orient Longman, 1973.</i></li> <li>• Climate Design: Energy Efficient building principles and practices by <i>Watson Donalt</i></li> <li>• Climate responsive architecture- a design handbook for energy efficient buildings, <i>Tata McGraw-hill Publishing Company Limited -2000</i></li> <li>• Sun, Wind &amp; Light – <i>G.Z. Brown, Mark Dekay, John Wiley &amp; Sons, 2001.</i></li> </ul>		

**Energy Conservation II (Luminous Environment)**

<b>Subject Code : 204</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	6 hours/week	Credits	6
Teaching hours/ semester	90 hours	University examination (UE)	60 marks
Hours for Internal Assessment	18 hours	Internal Assessment (IA)	40 marks

**Aim:**

Demonstrate knowledge and understanding the effects of Luminous Environment on comfort condition in built space.

**Learning Objective :**

At the end of semester the student will understand:

- Phenomenon of Light and the Day-lighting strategies
- Less energy-intensive technologies for artificial lighting
- Artificial lighting performance and savings from day-lighting

Unit I	<b>Introduction to Luminous Environment</b>	2 hours
Unit-II	<b>Lighting Fundamentals</b>	18 hours
	Physics of light, Light and sight, Quantity of Light, Quality of Light, Fundamentals of Colour.	
Unit III	<b>Analysis Techniques, Design Strategies and Evaluation Procedures – Luminous Environment</b>	10 hours
	Analysis of the Precedent, Analysis of the site and climate, Analysis of the building Programme and use, Schematic design, Design development and System integration. Glazing Properties, Design Options of top lighting/side lighting/Core Daylighting/Atrium	
Unit IV	<b>Light Sources and Lighting Design Process</b>	16 hours
	Daylight sources, electric light sources	
Unit V	<b>Day lighting Design and Electrical Lighting Design</b>	24 hours
	Day lighting opportunities, Strategies for day lighting buildings, Aperture Sizing- side lighting and top lighting, specialized day lighting strategies, daylight factor, components of day lighting, guidelines for preliminary day lighting design, design analysis method and physical modeling. Luminaires, lighting control, Detailed Design procedures, evaluation.	
Unit VI	<b>Electrical Lighting Applications</b>	20 hours
	Residential occupancies, educational facilities, Commercial Interiors , industrial lighting and special lighting applications.	

**Sessional Work: Unit tests and assignments based on contents above**

**IA: Please refer to the guidelines given in the annexure**

**Text Books and References**

- Sun, Wind & Light – G.Z. Brown, Mark Dekay, John Wiley & Sons, 2001.
- Inside out – G. Z. Brown et al, John Wiley and Sons, 1992.
- Man climate and architecture – B. Givoni, Applied science pub. Ltd., U.K.
- Manual of tropical housing and building – Koenigsberger et al, Orient Longman, 1973.
- Mechanical and electrical equipment for building – Stein, Benjamin and Reynolds, John Wiley and Sons, 1991.
- Energy efficient buildings in India – Milli Mujumdar, TERI, MONES, 2001.
- Managing energy efficiently in hotels and commercial buildings – Pradeep Kumar, Amitkumar Tyagi, TERI, New Delhi, 2002.

## Research Design and Methods

<b>Subject Code : SA 205</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks

### Aim:

To induce research attitude in students by introducing them to research methodology with a focus on sustainable architecture.

### Learning Outcome :

At the end of semester the student will understand:

- Significance, types, approaches and areas of research in sustainable architecture
- To Conduct research and prepare report

Unit I	<b>Introduction to research methodology</b>	04 hours
	<ul style="list-style-type: none"> <li>• Meaning, need and significance of research.</li> <li>• Objectives and characteristics of research</li> <li>• Criteria for good research</li> <li>• Areas of research in sustainable architecture.</li> <li>• Ethics in research</li> </ul>	
Unit-II	<b>Introduction to research types and approaches</b>	10 hours
	<ul style="list-style-type: none"> <li>• <b>Research Types</b> <ul style="list-style-type: none"> <li>▪ Historic, Descriptive, Case study, Experimental, Applied and Causal, etc.</li> <li>▪ Advantages and disadvantages of various research types</li> </ul> </li> <li>• <b>Research Approaches</b> <ul style="list-style-type: none"> <li>▪ Qualitative</li> <li>▪ Quantitative</li> <li>▪ Mixed</li> <li>▪ Advantages and disadvantages of various approaches</li> </ul> </li> </ul>	
Unit III	<b>Research Design</b>	16 hours
	<ul style="list-style-type: none"> <li>• <b>Steps in conducting research</b> <ul style="list-style-type: none"> <li>▪ Preparing Research Proposal</li> <li>▪ Formulating research problem</li> <li>▪ Framing Hypothesis and understanding variables</li> <li>▪ Literature review and sources for literature</li> </ul> </li> <li>• <b>Sampling design</b> <ul style="list-style-type: none"> <li>▪ Need for sampling</li> <li>▪ Types of sampling design</li> <li>▪ Criteria for sample selections</li> </ul> </li> </ul>	

Unit IV	<b>Data collection</b>	08 hours
	<ul style="list-style-type: none"> <li>• Types of data</li> <li>• Tools for data collection (Survey, observation, interview, mapping, etc)</li> <li>• Measures of central tendencies (mode, mean, median)</li> <li>• Measurement and scaling techniques</li> </ul>	
Unit V	<b>Data presentation and analysis</b>	14hours
	<ul style="list-style-type: none"> <li>• Data presentation techniques</li> <li>• Introduction to analytical tools (Descriptive statistics, content analysis, visual analysis)</li> <li>• Interpreting results</li> </ul>	
Unit VI	<b>Research Report</b>	08hours
	<ul style="list-style-type: none"> <li>• Structure of report</li> <li>• Writing report and presentation</li> <li>• Referencing styles</li> </ul>	
<b>Sessional work: Unit tests and assignments based on above content</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Kothari, C. R. (2004). <i>Research Methodology Methods &amp; Techniques</i> (Second Edition ed.). New Delhi: New Age international publisher.</li> <li>• Sanoff, H. (1991). <i>Visual Research Methods in Design</i>. NewYork: VNR.</li> <li>• Bechtel, R., Marans, R., &amp; Michelson, W. (Eds.). (1990). <i>Methods in environmental and behavioral research</i> (second ed.). Florida: Robert E. Krieger</li> <li>• Groat, L., &amp; Wang, D. (Eds.). (2002). <i>Architectural Research Methods:</i> John Wiley and Son.</li> <li>• Zeisel, J. (2006). <i>Inquiry by Design</i> (Revised ed.). New York W.W.Nortan &amp; Company</li> </ul>		



**Elective II**

<b>Subject Code : SA 206</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	2 hours/week	Credits	2
Contact hours/ semester	30 hours	University examination (UE)	-
Hours for Internal Assessment	6 hours	Internal Assessment (IA)	100 marks

**Aim:**

To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to discipline-centric' subjects as well as cross-disciplinary subjects.

**Learning Outcome :**

At the end of semester the student will understand:

- Application of knowledge in solving a real life problem in an analytical and scientific way.

**Description**

The student can select any one subject in semester II from the list of subjects prepared by the department. A comprehensive list of subjects to be included under three broad areas of study namely; ; Core, Allied and Open Electives.

A selected subject expertise be arranged to provide for necessary syllabus formulation and guidance to students.

**Sessional work :**

The students are expected to study the selected topic in depth under the guidance of the expertise, undertake case-studies and necessary site visits, and collect all the relevant information and present an exhaustive study report in group.

**IA: Please refer to the guidelines given in the annexure**

**Advanced Simulation Modeling**

<b>Subject Code : SA 301</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks

**Aim:**

To introduce software simulation tools for energy efficient buildings.

**Learning Outcome :**

At the end of semester the student will understand:

- Environmental modeling and simulation of built and open spaces.

Unit I	<b>Introduction to simulation tools</b>	8 hours
	Introduction to advanced tools for thermal, air flow and lighting simulation and their application to building design and design research.	
Unit-II	<b>Performances Assessment and Inference</b>	
	Environmental software's will be introduced for assessment and representation of thermal, airflow, lighting processes and energy simulation in and around a real or virtual building and outdoor spaces. The course will allow the students to generate and analyze climate data for any site, predict micro-climate conditions, perform shading, day lighting and thermal simulation studies, calculate energy requirements and assess environmental impacts of building.	Module based distribution of teaching hours.
<b>Sessional work</b>		
	Students have to model and simulate a design project with a detailed report of inferences and solutions drawn from the simulation study.	
<b>IA: Please refer to the guidelines given in the annexure</b>		

**Clean Technologies**

<b>Subject Code : SA 302</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> To introduce students to Fundamentals and Technologies of different Clean Technologies.			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Different types of Alternate or Renewable Energy Sources.</li> <li>• Developments in the field of clean technologies in India and abroad..</li> <li>• Their application and Energy Conservation Opportunities</li> </ul>			
Unit I	<b>Concept of Clean Technologies and Renewable Energy Sector Scenario in India and World</b>		6 hours
	Concept of Clean Technologies, Introduction to New & Renewable Sources, Types and Classification of Renewable Energy Sources, Need for Promoting Rapid Growth of New and Renewable energy in India, Benefits and Limitations on Use of Renewable Energy, Overview of Renewable Energy Development in the World over last few Years, Issues and Challenges for Growth of Renewable Energy at in India and at Global level		
Unit-II	<b>Fundamentals of Renewable Energy Technologies, Status of Technological Developments and Capacity Growth in India</b>		8 hours
	Principles and Fundamentals of Different types of Renewable Energy Sources, Status of Technologies and Technological Development of different Renewable Energy Sources in India. Present Status of Sector wise Renewable Energy Capacity Development in India, Potential & Future Scope for Renewable Energy Capacity Development in the Country, Targets for RE Development in the Country, Rural Renewable Energy Renewable Energy Policies, Present Incentives & Subsidies		
Unit III	<b>Solar Thermal Energy and Solar Electrical Energy Systems</b>		20 hours
	Fundamentals of Solar Energy, Solar Heating and Solar Power, Flat Plate Collector Technology, Evacuated Tube Collectors Technology, Solar Concentrators for Steam Generation, Solar Water Heating Systems for Commercial, Residential and Industrial Sectors, Thermal Storage Systems Jawaharlal Nehru National Solar Mission, Solar Energy Systems for Buildings, Sizing ,Selection Criteria and Feasibility. Solar Air Conditioning.		
Unit IV	<b>Wind Energy</b>		12 hours
	Basics of Wind Energy and Wind Power Generation, Variability of Wind Speed and its Effect, Types of Wind Turbines, Operating Characteristics of Wind Turbines and Generators, Wind energy		

	Calculations, Capacity factor, Grid connected Wind Generators, Future of Wind power Generation in India, Issues related to Wind power Generation, Small size Wind Energy Systems for Buildings, Selection Criteria and Feasibility	
Unit V	<b>Hydro Power, Bio-Energy, Oceanographic and Geothermal Energy</b>	8 hours
	Basics of Hydro power generation, Classification of Hydro power Plants, Future of Growth of Hydro power capacity increase in India Fundamentals of Bio-energy, Bio-mass, Biogas and Bio-fuels, Direct combustion of Biomass, Biomass Gasification, Bio- methanation, Bio-fuels from biomass, Installed Biomass Power Capacity, Growth of Ethanol & Bio-fuel Production Fundamentals of Wave, Tidal Energy and Ocean Thermal Energy Conversion (OTEC), Basics of Geothermal Energy, Usages of Geothermal energy, Power Generation through Geothermal energy. Indian Scenario of Oceanographic and Geothermal Energy	
Unit VI	<b>Chemical Energy Sources and Energy from Solid and Liquid Wastes &amp; Other Sources</b>	6 hours
	Principles of Fuel Cell Technology, Operation of Fuel Cells, Present Status and Future of Fuel Cell Development Hydrogen as efficient fuel, Principle of Waste to Energy Generation, Municipal Solid Waste Power Generation (MSW), Power Generation from Municipal Sewage and Effluents. Power Generation from Landfill Gas Principle of Magneto Hydro Dynamic Power Generation (MHD) Principle of Energy storage and Distribution, Batteries	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Book 1 Published by Bureau of Energy Efficiency, New Delhi – Book -1.</li> <li>• Alternate Energy Sources – T. H. Taylor, Adam Higlir Ltd., Bristol.</li> <li>• Renewable Energy Sources for rural areas in Asia and Pacific- APO, Tokyo 2000.</li> <li>• Energy Technology – S. Rao, Dr. B. B. Parulekar – Khanna Publications.</li> <li>• Non-conventional Energy Sources – G. D. Rai – Khanna Publications.</li> <li>• Websites – <a href="http://www.ireda.org">www.ireda.org</a>, <a href="http://www.windenergy.com">www.windenergy.com</a></li> <li>• Kumar, Amitkumar Tyagi, TERI, New Delhi, 2002.</li> <li>• Technology Menu for Energy Efficiency – NPC.</li> <li>• ASHRAE Handbook.</li> </ul>		

### Sustainable Design Studio-III

<b>Subject Code : SA 303</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	10 hours/week	Credits	6
Teaching hours/ semester	150 hours	University examination (UE)	60 marks
Hours for Internal Assessment	30 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> To undertake detailed analysis of urban environmental issues related to sustainable planning and design of cities.			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Various urban environmental issues and approaches to address them.</li> </ul>			
Unit I	<b>Studio: Project I</b>		<b>60 hrs</b>
	<p>The exercise will address the urban environmental issues. The exercise shall consist of a critical issue for understanding environmental challenges faced in urban context.</p> <p>Design Methodology:</p> <ul style="list-style-type: none"> <li>• Identify environmental issues related to selected urban areas.</li> <li>• Study impact of these issues on selected area of the study.</li> <li>• Study parallel cases to understand the approaches for addressing the issues.</li> <li>• Provide guidelines and solutions for sustainable planning and designing of the study area.</li> </ul> <p>The base work for the lab will be carried out in group and issues will be addressed individually.</p>		
Unit-II	<b>Studio: Project II</b>		<b>90 hrs</b>
	<p>A design Project of area from 3000-5000 sq.m. built up that reflects clear understanding of solar passive principles, luminous and acoustic response taught during the semester.</p>		
<b>Sessional Work</b>			
<ol style="list-style-type: none"> <li>1. A well documented report for project I submitted by a group of students</li> <li>2. A2 size portfolio giving design solution along with analysis for project II.</li> </ol>			
<b>IA: Please refer to the guidelines given in the annexure</b>			
<b>Text Books and References</b>			

- Man climate and architecture – *B. Givoni, Applied science pub. Ltd., U.K.*
- Manual of tropical housing and building – *Koenigsberger et al, Orient Longman, 1973.*
- Climate Design: Energy Efficient building principles and practices by *Watson Donalt*
- Climate responsive architecture- a design handbook for energy efficient buildings, *Tata McGraw-hill Publishing Company Limited -2000*
- Sun, Wind & Light – *G.Z. Brown, Mark Dekay, John Wiley & Sons, 2001.*

**Energy Conservation III (Acoustics and Aqueous Environment)**

Subject Code : <b>SA 304</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	6 hours/week	Credits	6
Teaching hours/ semester	90 hours	University examination (UE)	60 marks
Hours for Internal Assessment	18 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> Demonstrate knowledge and understanding the effects of Acoustic and Aqueous on comfort condition in built space.			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Acoustical consideration and response of various spaces.</li> <li>• Concepts related to resource-oriented water conservancy</li> <li>• Management, recycling and reuse of waste.</li> </ul>			
Unit I	<b>Introduction to Introduction to Acoustic and Aqueous Environment</b>		8 hours
	Introduction and Analysis of the Precedents - Acoustic and Aqueous Response Climate and Site Analysis ,Analysis of Building Programme and Use, Schematic Design and Design development		
Unit-II	<b>Fundamentals of Architectural Acoustics and Sound in Enclosed Spaces</b>		12 hours
	Sound Theory and Hearing Phenomenon, Noise Sound in enclosures, Absorption, Room Acoustics, Room Design, Sound Reinforcement Systems		
Unit III	<b>Building Noise Control</b>		16 hours
	Noise Reduction, Absorption, Sound Isolation, Airborne Sound, Speech Privacy, Structure Borne Sound, Mechanical System of Noise Control, STC and IIC Recommendations and criteria, Outdoor Acoustic Considerations.		
Unit IV	<b>Water Management</b>		20 hours
	Water in Architecture, Hydrologic Cycle, Basic Planning, Collection and storage, site Planning and Components. Management of the water cycle as a single system, Management of water supply, sanitation and drainage - social imperatives, environmental considerations and economic challenges, technological, options for water management, recycling, reuse, conservation and treatment Design for water conservation – building and products Designing building services – plumbing, drainage and sewerage for effective water reuse, recycling, and recharge Rain water harvesting techniques – Basic Concepts of artificial recharge methods.		
Unit V	<b>Efficient Waste Water Treatment and Solid Waste Management</b>		24 hours

	Water less toilets and urinals, Principals of Drainage, piping, fittings and accessories, Design of residential and large building waste piping, Onsite individual and multiple Building Sewage treatment, Large scale sewage treatment systems, recycling and gray water, storm water treatment. Introduction to Waste management, Municipal Solid Waste Management, Waste as a Resource, Energy from Waste.	
Unit VI	<b>Waste Management and Recycling</b>	10 hours
	Wastes generated by Human Habitat – Solid, liquid and Gaseous Types of Wastes- Municipal, Industrial, Agricultural, Toxic, Bio-Medical, Hazardous, Electronic, Radioactive etc., Overview of laws /rules governing waste management in India , Importance of Community participation in waste management Impact on health and sanitation	
<b>Sessional Work: Unit tests and assignments based on contents above</b>		
<b>IA: Please refer to the guidelines given in the annexure</b>		
<b>Text Books and References</b>		
<ul style="list-style-type: none"> <li>• Inside out – G. Z. Brown et al – John Wiley &amp; sons Inc., New York.</li> <li>• Environmental systems – H. J. Cowan, P. R. Smith, VNR Co., New York.</li> <li>• Environmental Acoustics – Leslie L. Doelle, Canada.</li> <li>• Architectural Acoustics – Eagan, M. David, McGraw Hill Co., 1988.</li> <li>• MEEB – Stain, Benjamin et al, John Wiley &amp; sons Inc. 2000.</li> <li>• Sun, Wind &amp; Light, Second edition, G. Z. Brown &amp; Mark DeKay, John Wiley &amp; sons</li> <li>• Sustainable building technical manual: Green building design, construction and operations, Abraham L.E. et al, 1996, Washington D.C. U.S. Green building council and Public Technology, Inc.</li> <li>• Composting and Vermi-composting, Agarwal S. K. and Saxena L.M. 2001.</li> <li>• Watershed protection, Athens L and Ferguson B.K. 1996</li> <li>• Climatic zones and rural housing in India, Bansal N. K. and Minke G. 1988</li> <li>• Directory of Indian building materials, BMTPC, 2003, LHM publication</li> <li>• CPCB publication, 1989 and 2000 on air quality and root zone method</li> <li>• Beyond growth: The economics of sustainable development, Daly H. E. , 1997, Boston, Deacon press</li> <li>• Energy recovery from Municipal solid waste: Potential and possibility, Dhussa A.K. and Varshney A.K., 2000, Bio-Energy news 4(1)</li> </ul>		



**Dissertation I**

<b>Subject Code : SA 305</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Teaching	4 hours/week	Credits	4
Teaching hours/ semester	60 hours	University examination (UE)	60 marks
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> To apply the methods taught in <b>research design &amp; methods</b> to carry out research related to the field of Sustainable Architecture. This will help in developing research skills in terms of selecting appropriate method to carry out research and writing report.			
<b>Learning Outcome :</b> At the end of semester the student will be equipped : <ul style="list-style-type: none"> <li>To carry research work individually using selected approach and prepare report.</li> </ul>			
Unit I	Identify area of research related to sustainable architecture & prepare a proposal Design complete research including selecting methods for data collection, tool for Analysis etc.		8 hours
Unit-II	To carry out literature review and case studies		12 hours
Unit III	To Carry out research (Field work)		12 hours
Unit IV	To Compile and analyze collected data using tools.		8 hours
Unit V	Present analysis & draw conclusions		8 hours
Unit VI	To prepare a detailed research report and write a paper for publication		12 hours
<b>Sessional Work: A research report of not more than 50 pages or a paper of approx. 3000 words on the selected area of research.</b>			
<b>IA: Please refer to the guidelines given in the annexure</b>			
<b>Text Books and References</b> <ul style="list-style-type: none"> <li>Kothari, C. R. (2004). <i>Research Methodology Methods &amp; Techniques</i> (Second Edition ). New Delhi: New Age international publisher.</li> <li>Sanoff, H. (1991). <i>Visual Research Methods in Design</i>. NewYork: VNR.</li> <li>Bechtel, R., Marans, R., &amp; Michelson, W. (Eds.). (1990). <i>Methods in environmental and behavioral research</i> (second ed.). Florida: Robert E. Krieger</li> <li>Groat, L., &amp; Wang, D. (Eds.). (2002). <i>Architectural Research Methods</i>: John Wiley and Son.</li> <li>Yvonne N. B. (2013). <i>How to Write a Master's Thesis</i> (Second edition). Sage publications Inc.</li> </ul>			

**Elective III**

<b>Subject Code : SA 306</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	2 hours/week	Credits	2
Contact hours/ semester	30 hours	University examination (UE)	-
Hours for Internal Assessment	6 hours	Internal Assessment (IA)	100 marks
<b>Aim:</b> To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to discipline-centric' subjects as well as cross-disciplinary subjects.			
<b>Learning Outcome :</b> At the end of semester the student will understand: <ul style="list-style-type: none"> <li>• Application of knowledge in solving a real life problem in an analytical and scientific way.</li> </ul>			
<b>Description</b> The student can select any one subject in semester III from the list of subjects prepared by the department. A comprehensive list of subjects to be included under three broad areas of study namely; ; Core, Allied and Open Electives. A selected subject expertise be arranged to provide for necessary syllabus formulation and guidance to students.			
<b>Sessional work :</b> The students are expected to study the selected topic in depth under the guidance of the expertise, undertake case-studies and necessary site visits, and collect all the relevant information and present an exhaustive study report in a group.			
<b>IA: Please refer to the guidelines given in the annexure</b>			

## Dissertation II

<b>Subject Code : SA 401</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	18 hrs/week	Credits	18
Contact hours/ semester	270 hours	University examination (UE)	60 marks
Hours for Internal Assessment	18 hours	Internal Assessment (IA)	40 marks
<b>Aim:</b> To integrate the acquired knowledge in the previous semesters into design solution.			
<b>Learning Outcome :</b> At the end of semester the student will demonstrate application of knowledge in solving a real life/difficult problem in an analytical and scientific way.			
<b>Description</b> The objective of design dissertation is to provide an opportunity to each student to undertake original and independent project in Semester IV on the subject area of his / her interest and specialization, developed through theory courses and architectural design projects of the previous semesters. The quality of work should demonstrate student's ability to carry out successfully independent investigation, analysis and conclusions as well as evolve innovative design solution. The students will be guided in their work by appointed guides throughout the semesters to produce an illustrative, written dissertation.			
<b>Course Outline:</b> The subject selected may be conceptual or practical in nature related to a specific context and climate. The minimum built-up area shall not be less than 5000 sq.mtrs M. Arch. Dissertations shall include :  <ul style="list-style-type: none"> <li>• Selection of topic and preparing proposal</li> <li>• Aim, Objectives and scope of work</li> <li>• Methodology</li> <li>• Literature Survey</li> <li>• Data collection and Case Studies</li> <li>• Findings/inferences/guidelines from literature survey and case studies</li> <li>• Program formulation and analysis</li> <li>• Site selection and analysis</li> <li>• Selection of appropriate strategies and techniques</li> <li>• Formulating Approach / parameters for proposed design</li> <li>• Design solution and details</li> <li>• Verification using simulation modeling</li> </ul> A progressive evaluation of the dissertation work done by the student will be made throughout semester by the departmental evaluation committee and concerned faculty			

as per the schedule declared at the beginning of the term.  
The final evaluation of the dissertation work and report will be done by the Dissertation Viva-Voce board at the end of the forth semester.

**IA: Please refer to the guidelines given in the annexure**

**Sessional Work**

1. Technical report:  
The entire work should be submitted in a comprehensive report as per prevailing norms and specifications.
2. Design Solution:  
A1 size portfolio explaining the complete design scheme with detailing and simulation results.

**Self Study**

<b>Subject Code : SA 402</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	6 hours/week	Credits	4
Contact hours/ semester	60 hours	University examination (UE)	-
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	100 marks
<p><b>Aim:</b> To facilitate the students to learn out of a pool of specialized subjects, which provides extended scope or which enables exposure to cross-disciplinary subjects.</p>			
<p><b>Description</b> This subject is included in the syllabus to facilitate the students to learn cross-disciplinary subjects. Under this, the student can select any one subject related the parent course or other than the parent course. The choice of the subject is not restricted. If a student is interested in a subject of a particular discipline her/she has to inform accordingly to the Head and PG-Co-ordinator of that department.</p>			
<p><b>Sessional Work: A report on selected subject for study.</b></p>			
<p><b>IA: Please refer to the guidelines given in the annexure</b></p>			

**Seminar**

<b>Subject Code : SA 403</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Contact Hours	4 hours/week	Credits	4
Contact hours/ semester	60 hours	University examination (UE)	-
Hours for Internal Assessment	12 hours	Internal Assessment (IA)	100 marks
<b>Aim:</b> The aim of the seminar is to train the students to prepare state of art report by assimilation of concepts / ideas on a chosen topic in the area of Sustainable Architecture through an extensive literature study and data collection from the field.			
<b>Description</b> The topic for seminar is to be selected on the specific aspects of Sustainable Architecture and a comprehensive seminar report is prepared with the identification of areas for further research and development. The progress of the seminar work is presented and discussed by the student periodically in the classroom environment and progress monitored continuously. The seminar work develops the comprehension and presentation skills of the students. Alternatively the students can also identify new topics for the seminar work which can be supportive literature study of their dissertation.			
<b>Sessional Work: Presentations and seminar report.</b>			
<b>IA: Please refer to the guidelines given in the annexure</b>			

## Internship

<b>Subject Code : SA 404</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Duration	40 Working Days	Credits	4
		University examination (UE)	60 marks
		Internal Assessment (IA)	40 marks
<p><b>Aim:</b> To give an opportunity for learning and for development of skills related to practical aspects of the discipline of Sustainable Architecture, by working in a firm/organization working in the field of Sustainability.</p>			
<p><b>Description</b></p> <p>The students will need to undertake internship of 40 working days to get acquainted with the procedures of the professional methods of consultancy.</p> <p>The students will have to complete internship under a professional/institute/NGO registered with respective bodies working in the field of sustainable architecture/environment/energy/resource management or consultancy. Student can also work as a research associate with doctoral candidate/ institute.</p> <p>During the course of their tenure, they will maintain a log book of their activities on a daily basis, which will be duly signed by the employer.</p> <p>At the end internship the candidate will have to submit a training report along the certificate by the employer to the effect that he / she has completed training satisfactorily for the stipulated period.</p> <p>Internal Assessment shall be done on the basis log book and training report which shall comprise of hard copies of the actual work done by the student, including reports on meetings attended, site visits performed and any work of special mention etc.</p>			

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**

**PUNE**

**Proposes a Revised**

**BACHELOR OF SCIENCE (B.Sc.)**

**IN**

**BIOTECHNOLOGY**

**SYLLABUS OF SEM I – SEM VI UNDER**

**CHOICE BASED CREDIT SYSTEM**

**To Be Introduced In Academic Year**

**2015 – 2016**





# Bharati Vidyapeeth Deemed University, Pune (India)

'A' Grade University Status by MHRD, Govt. of India  
Accredited & Reaccredited with 'A' Grade by NAAC



Hon'ble Dr. Paragprasad Kadnis  
M.A., U.S., Ph.D.  
Chancellor

Prof. Dr. Shivrajrao Kadnis  
M.A., Ph.D.  
Vice-Chancellor



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## NOTIFICATION NO. 762

It is hereby notified for the information of all concerned that the Academic Council, at its 49<sup>th</sup> meeting held on 17/07/2015, has resolved to approve the course structure, syllabus and other rules including examination rules for B.Sc. Biotechnology programme based on choice based credit system to be implemented from the academic year 2015-16.

A copy of the course structure, syllabus and rules of B.Sc. Biotechnology programme based on Choice Based Credit System is enclosed.

Ref. No. BVDU/959/2015-16  
Date: 01/08/2015

*G. Jayashree*  
Registrar

1. The Dean, Faculty of Science, Y. M. College, Pune - 38.
- ✓ 2. The Principal, Rajiv Gandhi Institute of IT and BT, Pune - 43.
3. The Director, Statistics Cell, BVU, Pune
4. The Controller of Examinations.

6/16/2015 10:27



## **INTRODUCTION**

The curriculum of Bachelor of Science (B. Sc.) in Biotechnology Course is revised and the new curriculum is framed according to the choice based credit system adapted by Bharati Vidyapeeth Deemed University. It is a full time 156 Credits program to be offered in its constituent units. Bharati Vidyapeeth Deemed University has been accredited with 'A' Grade by National Assessment and Accreditation Council (NAAC) (2004, 2011). Also, Ministry of HRD, Govt. of India has awarded "A" Category to the University in 2012 based on parameters including innovative programs, research and infrastructural facilities. Further, University Grants Commission (UGC), New Delhi has bestowed u/s 12B status to the university.

The programme will be offered at Rajiv Gandhi Institute of IT and Biotechnology, Pune with effect from the academic year 2015-2016. Rajiv Gandhi Institute of IT and Biotechnology is a constituent unit of BVDU that was established in the year 2003. The institute has excellent infrastructure, state-of-the-art laboratories, and competent faculty facilitating appropriate learning environment. The Institute offers five programmes in Biotechnology - one at undergraduate (B.Sc.) level and four at post graduate (M.Sc) level.

### **OBJECTIVES of the B.Sc. Biotechnology Programme**

The programme focuses on

1. Fundamental concepts in various allied subjects
2. Building of interdisciplinary approach
3. Developing skills in relevant areas to enhance employment opportunities
4. Inculcating social values, sense of scientific responsibilities and environmental awareness

### **ELIGIBILITY FOR ADMISSION TO THE COURSE**

Candidates satisfying the following conditions are eligible to apply for admission to B.Sc. Biotechnology programme

- i. The candidate should have passed Higher Secondary School Certificate (10+2) or its equivalent examination with at least 40% (35% for SC/ST) marks in aggregate.
- ii. Subject to the above conditions, the final admission is based solely on the merit at the all India entrance test (BBT) conducted by Bharati Vidyapeeth Deemed University.

## **DURATION OF THE COURSE**

The minimum credits required to complete the programme are 156 which normally takes a three years or six semesters. The medium of instruction and examination is English.

## **RULES AND REGULATIONS**

1. The entire course is of 156 credits and will be executed in 6 semesters.
2. One credit for theory course is equivalent to 15 lectures/tutorials while one credit for practical course is equivalent to 25-35 hrs. of lab /field work / or demonstration.
3. The curriculum comprises of Core Courses, Open courses and General Courses.
4. The entire syllabus consists of a total of 24 core theory (72 credits), 20 core practical (60 credits), 12 open (24 credits), and 6 general (12 credits) courses. Of these, the core courses are mandatory while the Open and General Courses are elective.
5. The Core Courses are aimed at imparting fundamental knowledge in various allied disciplines of biotechnology. The Open Courses are value addition courses intending skill development in commercial biotechnology sector. The General Courses are designed to develop relevant soft skills of students to compete in the global market.
6. There is a provision for opting Open and General Courses offered by other

constituent units of BVDU. In such case, the courses will be evaluated as per the rules of evaluation of the course undertaken and credits earned will be transferred from the respective constituent unit.

## RULES FOR EXAMINATION

### A: Nature of Examination:

1. For all subjects, there shall be an Internal Assessments (IA) conducted by the Institute and an end-of-the term University Examination (UE) conducted by the university. The UE will be based on the entire syllabus.
2. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. **The respective weights for performance at UE and IA shall be 60% and 40%.**

## STANDARD OF PASSING

**A: Grading System:** A **10-point absolute grading system** will be adapted for grading in each head of passing. The system will have seven grade points, the highest being 10. The grading system shall be as shown in Table-1 below. The performance indicators O, A+, A, B+, B, C, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, Satisfactory, and Poor.

**Table-1: The grading system under CBCS**

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} \leq 80$	9	A+
$60 \leq \text{Marks} \leq 70$	8	A
$55 \leq \text{Marks} \leq 60$	7	B+
$50 \leq \text{Marks} \leq 55$	6	B
$40 \leq \text{Marks} \leq 50$	5	C
$\text{Marks} < 40$	0	D

1. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table) shall be the GPA for the course.**
2. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses up to and including the current semester. The CGPA of a student when he/she completes the programme is his/her final result.
3. The SGPA is calculated by the formula , 
$$\text{SGPA} = \frac{\sum C_k \times \text{GPA}_k}{\sum C_k}$$
 where  $C_k$  is the credit-value assigned to a course and  $\text{GPA}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**
4. The CGPA is calculated by the formula , 
$$\text{CGPA} = \frac{\sum C_k \times \text{GPA}_k}{\sum C_k}$$
 where  $C_k$  is the credit-value assigned to a course and  $\text{GPA}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**
5. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result.
6. Grace marks of 1, 2 or 3 may be awarded to a candidate at UE as per the university rules.

## **B: Standards of Passing and ATKT rules:**

1. For all Core Courses, both UE and IE constitute separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits

(a) the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA;

**OR**

(b) If he/she fails in IA, then also the learner passes in the course, **provided that a minimum of 25% is obtained in IA and GPA for the course is at least 6.0 (50%marks ) in aggregate.** The GPA for a course will be calculated only if the learner passes in that course.

1. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP. **A student who passes in aggregate in a course need not reappear even if he failed at IA if he/she obtains 25% at IA.**
2. The students of Semester I and II will be admitted to Semester III and IV even if they get backlog in any of the course. They can reappear in the next semester examination as a backlog candidate. The students will however not be admitted to Semester V **unless he/she clears all heads in Semesters I & II.** In case the candidate gets backlog in Sem III to Sem VI, then he will be admitted to Semester V and may improve the grade by reappearing in the next semester examination as a backlog candidate.

## **C: Award of Honours:**

1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade and CGPA only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 2.

**Table 2: Criteria for the award of honours at the end of the programme**

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq CGPA \leq 10.00$	O	Outstanding	$80 \leq Marks \leq 100$
$9.00 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks \leq 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks \leq 70$
$7.00 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks \leq 60$
$6.00 \leq CGPA \leq 6.99$	B	Average	$50 \leq Marks \leq 55$
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory	$40 \leq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks below 40

## THE FORMAT OF THE TRANSCRIPTS

The transcripts may be acquired by the students indicating his/her performance in every semester examination. The transcript shall show the performance indicators given in the following table, in addition to any other information.

Course Number	Course Description	Number of Credits	University Examination		IA/CA		Grade Point Average (GPA)	Result
			Grade	Grade Point	Grade	Grade Point		
Total Cumulative Credits Completed		SGPA	CGPA	Equivalent Marks (%)	<b>Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be GPA</b>			

## **PATTERN FOR ASSESSMENT**

### **A: Pattern of Evaluation for Internal Assessment of Theory Courses:**

The weightage for Internal Assessment is 40%. Students for IA of every theory course will be assessed for total of 40 marks which will be cumulative marks obtained in three separate assessments specified below.

1. Two internal examinations of 25 marks each. An average of the two tests will be considered.
2. One Assignment/Oral, Open book examination of 10 Marks
3. 05 Marks are assigned for the attendance of students in regular classes (lectures and tutorials). The students will acquire marks in the range of 01- 05 equating to the percent attendance of student in respective theory course

### **B. Pattern of Evaluation for Internal Assessment of Practical Courses:**

The Internal Assessment for every practical course will be of 40 Marks. The students for IA will be assessed on the basis of;

1. The average of two internal oral examinations of 25 marks each
2. One Assignment/Tour report of 10 Marks
3. 05 Marks are assigned for attendance of students in practical sessions. The students will acquire marks in the range of 01- 05 equating to the percent attendance of the student in respective practical course

### **C: Pattern of question paper at University Examination**

University Examination for every theory course will be of 60 Marks. The question paper will comprise of 8 questions of 10 marks each distributed equally in two sections. Students will appear for 3 questions out of 4 in each section. The pattern of question paper will be as given on next page.



**Pattern of question paper for university theory examination of B.Sc. Biotechnology 2015 CBCS Course**  
**(Total Marks:60, Tme:2.00 Hrs.)**

**Note:**

- I. Q.1 & Q.5 are compulsory. Answer Any Two from Questions 2,3 & 4 and from 6,7 & 8.
- II. Answers the questions of Section I and Section II in separate answer books

**SECTION I**

**Q. 1** Attempt **Any Five** of the following (10)

- a.
- b.
- c.
- d.
- e.
- f.

**Q. 2** a. (5)  
b. (5)

**Q.3** Explain the following/ Give reasons/ Differentiate between/Explain diagrammatically/ ---- (10)

- a.
- b.

**Q. 4** Write short notes on **Any Two** of the following (10)

- a.
- b.

**SECTION II**

**Q. 5** Attempt the following questions (Based on fundamental aspects of the course of Unit II & Unit III) (10)

- a.
- b.

**Q. 6** a. (5)  
b. (5)

**Q. 7** Give reasons/ write short notes/ differentiate between/----- (10)

- a.
- b.

**Q. 8** Describe the applications/ Give an account on/Any other (10)

- a.
- OR
- a.

-----

**D: Pattern for question paper of University Practical Examination of B.Sc. Biotechnology 2015 CBCS Course**

**(Total Marks:60, Tme:6.00 Hrs.)**

Q.1 Major Practical	(25)
Q.2 Minor Practical	(15)
Q.3 Viva	(10)
Q.4 Journal	(10)

**E: Pattern of continuous assessment for evaluation open courses**

The Open courses will be evaluated by continuous assessment mode. The students will be evaluated for 100 marks to be obtained in three separate assessments specified below conducted during the course of semester.

- 1) An assignment for 30 marks
- 2) Project / Seminar for 30 marks
- 3) One assessment, written test at end of the term for 30 marks
- 4) 05 Marks are assigned for attendance of students in practical sessions. The students will acquire marks in the range of 01- 05 equating to the percent attendance of the student in respective open course

**F: Pattern of continuous assessment for evaluation for General Courses**

The General courses of every semester will be evaluated by continuous assessment mode. The students will be evaluated for total of 100 marks to be obtained in three separate assessments specified below conducted during the course of semester.

- 1) An activity/project of 60 marks to be conducted during the course of the semester.
- 2) The presentation of above project/activity for 30 marks
- 3) 05 marks to be given on the basis of percent attendance of students to the respective general course

**Course structure of three- year B.Sc. Degree Course in Biotechnology  
Under Choice Based Credit System**

**SEMESTER I**

<b>Course No. &amp; Description</b>	<b>Title</b>	<b>Credits</b>	<b>IA</b>	<b>Univ. Exam</b>	<b>Total Credits</b>
<b>BBT 101</b> Core Course-Theory	Animal Science	3	40	60	28
<b>BBT 102</b> Core Course –Theory	Plant Science	3	40	60	
<b>BBT 103</b> Core Course –Theory	Foundations of Chemistry & Biochemistry	3	40	60	
<b>BBT 104</b> Core Course –Theory	Basics of Computer	3	40	60	
<b>BBT 105</b> Core Course –Practical	Animal Science Lab	3	40	60	
<b>BBT 106</b> Core Course –Practical	Plant Science Lab	3	40	60	
<b>BBT 107</b> Core Course –Practical	Foundations of Chemistry & Biochemistry Lab	3	40	60	
<b>BBT 108</b> Core Course –Practical	Computer Fundamentals & C-Programming Lab	3	40	60	
<b>BBT 109</b> Open Course I	Elective	2	Continuous Assessment		
<b>BBT 110</b> General Course I	Elective	2	Continuous Assessment		

**Elective Courses in Sem I: 1) BBT 109: Elective Open Course I; Option I:** General English. **Option II:** Basic Programming for Bioinformatics. **Option III.** Open course offered in other constituent units of BVDU.

**2) BBT 110: Elective General Course; Option I.** Yoga & Meditation, **Option II.** An appropriate General course offered in other constituent units of BVDU.

## SEMESTER II

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>BBT 201</b> Core Course –Theory	Introduction to Microbiology	3	40	60	28
<b>BBT 202</b> Core Course –Theory	Biochemistry I	3	40	60	
<b>BBT 203</b> Core Course –Theory	Cell Biology	3	40	60	
<b>BBT 204</b> Core Course –Theory	Genetics	3	40	60	
<b>BBT 205</b> Core Course -Practical	Introduction to Practical Microbiology	3	40	60	
<b>BBT 206</b> Core Course-Practical	Biochemistry I Lab	3	40	60	
<b>BBT 207</b> Core Course –Practical	Cell Biology Lab	3	40	60	
<b>BBT 208</b> Core Course –Practical	Genetics Lab	3	40	60	
<b>BBT 209</b> Open Course II	Elective	2	Continuous Assessment		
<b>BBT 210</b> General Course II	Elective	2	Continuous Assessment		

**Elective Courses in Sem II: 1) BBT 209: Elective Open Course II; Option I:** Ecology, **Option II:** Gardening & Landscaping, **Option III:** An appropriate Open course offered in other constituent units of BVDU.

**BBT 210: Elective General Course II; Option I:** Human Values, **Option II:** An appropriate General course offered in other BVDU constituent units

### SEMESTER III

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>BBT 301</b> Core Course –Theory	Concepts in Microbiology	3	40	60	25
<b>BBT 302</b> Core Course –Theory	Biochemistry II	3	40	60	
<b>BBT 303</b> Core Course –Theory	Principles & Techniques in Molecular Biology	3	40	60	
<b>BBT 304</b> Core Course –Theory	Immunology	3	40	60	
<b>BBT 305</b> Core Course-Practical	Practicals in Microbiology	3	40	60	
<b>BBT 306</b> Core Course-Practical	Practicals in Biochemistry II	3	40	60	
<b>BBT 307</b> Core Course-Practical	Practicals in Molecular Biology & Immunology	3	40	60	
<b>BBT 308</b> Open Course III	Elective	2	Continuous Assessment		
<b>BBT 309</b> General Course III	Elective	2	Continuous Assessment		

**Elective Courses in Sem III: 1) BBT 308: Elective Open Course III; Option I:** Patent & IPR, **Option II:** Nutrition, **Option III:** An appropriate Open course offered in other disciplines of BVDU.

**2) BBT 309: Elective General Course III; Option I:** Communication skills& Personality Development, **Option II:** An appropriate General course offered in other constituent units of BVDU

## SEMESTER IV

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>BBT 401</b> Core Course –Theory	Environmental Biotechnology	3	40	60	
<b>BBT 402</b> Core Course –Theory	Fundamentals in Molecular Biology	3	40	60	
<b>BBT 403</b> Core Course –Theory	Developmental Biology	3	40	60	
<b>BBT 404</b> Core Course –Theory	Analytical Techniques	3	40	60	
<b>BBT 405</b> Core Course-Practical	Environmental Biotechnology Lab	3	40	60	
<b>BBT 406</b> Core Course-Practical	Practicals in Molecular & Developmental Biology	3	40	60	
<b>BBT 407</b> Core Course-Practical	Analytical Techniques Lab	3	40	60	
<b>BBT 408</b> Open Course IV	Elective	2	Continuous Assessment		
<b>BBT 409</b> General Course IV	Elective	2	Continuous Assessment		

### Elective Courses in Sem IV: 1) BBT 408: Elective Course IV Option I:

Nanotechnology, **Option II:** Bio fertilizer Technology, **Option III:** An appropriate Open course offered in other disciplines of BVDU.

**2) BBT 409: General Course IV; Option I:** Seminar & Journal Club, **Option II.** An appropriate General course offered in other BVDU constituent units.

## SEMESTER V

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>BBT 501</b> Core Course –Theory	Biostatistics	3	40	60	
<b>BBT 502</b> Core Course –Theory	Clinical Biotechnology	3	40	60	
<b>BBT 503</b> Core Course –Theory	Recombinant DNA Technology	3	40	60	
<b>BBT 504</b> Core Course –Theory	Food Biotechnology	3	40	60	
<b>BBT 505</b> Core Course-Practical	Practicals in Clinical Biotechnology	3	40	60	
<b>BBT 506</b> Core Course-Practical	Practicals in Recombinant DNA Technology	3	40	60	
<b>BBT 507</b> Core Course-Practical	Practicals in Food Biotechnology	3	40	60	
<b>BBT 508</b> Open Course V	Elective	2	Continuous Assessment		
<b>BBT 509</b> General Course V	Elective	2	Continuous Assessment		

**Elective Courses in Sem V: 1) BBT 508: Elective Course V; Option i.** Biotechnology for forensics, **Option II:** Biodiversity, **Option III:**Information security

**2) BBT 509: Elective General Course V; Option I:** Innovative ideas in Biotechnology, **Option II:** An appropriate General course offered in other BVDUconstituent Unit

## SEMESTER VI

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>BBT 601</b> Core Course –Theory	Animal Biotechnology	3	40	60	25
<b>BBT 602</b> Core Course –Theory	Bioprocess Technology & Quality Control	3	40	60	
<b>BBT 603</b> Core Course –Theory	Plant Biotechnology	3	40	60	
<b>BBT 604</b> Core Course –Theory	Basics of Bioinformatics	3	40	60	
<b>BBT 605</b> Core Course-Practical	Practicals in Animal Tissue Culture	3	40	60	
<b>BBT 606</b> Core Course-Practical	Practicals in Plant Tissue Culture	3	40	60	
<b>BBT 607</b> Core Course-Practical	Exercises in Computer Applications & Bioinformatics	3	40	60	
<b>BBT 608</b> Open Course VI	Elective	2	Continuous Assessment		
<b>BBT 609</b> General Course VI	Elective	2	Continuous Assessment		

### Elective Courses in Sem VI: 1) BBT 608: Elective Open Course VI; Option i.

Entrepreneurship in Biotechnology, **Option II:** Business management in Biotechnology, **Option III:** Cyber Law

2) **BBT 609: Elective General Course VI; Option i:** Scientific Writing, **Option ii:** An appropriate General course offered in other BVDU constituent unit

**Total Credits: 28+28+25+25+25+25 = 156**



**B.Sc. Biotechnology Detail Curriculum  
SEMESTER I**

<b>BBT 101: Animal Science</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |  |     |
|--|-----|
| 1 <b>Introduction</b> to Kingdom Animalia, Principles of classification of non chordates and chordates with representative examples.   | 4 L |
| 2 <b>Type study: Non chordate: Earthworm (<i>Pheretima posthuma</i>)</b><br>Systematic position, habitat and habits, external morphology, digestive system, vascular system, excretory system, reproductive system, cocoon formation, nervous system.  | 5L  |
| 3 <b>Type study: Chordates: Rat</b><br>Systematic position, habitat and habits, external characters and sexual dimorphism, Digestive system (functional anatomy and dentition), Respiratory system and mechanism of respiration, Circulatory system, (Heart, Arterial, Venous and Portal system), Nervous system (brain and its functions), reproductive system (male & female), excretory system (structure of kidney and uriniferous tubules). Rat as a food pest. | 6L  |

**UNIT II**

- |   |     |
|---|-----|
| 4 <b>Endocrinology and Physiology</b><br>Basic concept of neural and endocrine regulation of physiological processes; important endocrine glands and hormones of mammals, an overview; structure of pituitary gland and its secretions, (Pars distalis- STH/GH; Prolactation, TSH, FSH, LH/ ICSH, ACTH; Pars intermedia- MSH; Pars nervosa- Oxytocin, ADH), thyroid gland, adrenal gland ,pancreas (Islets of Langerhans)- insulin, glucagon; gonadotropic hormones, feedback mechanism in hormone secretion, impact of hormones on different physiological processes | 10L |
| 5 <b>Parasitology</b><br>Study of parasites with reference to <i>Entamoeba histolytica</i> , <i>Plasmodium vivax</i> , <i>Taenia solium</i> , <i>Ascaris lumbricoides</i> : systematic position, habitat and habits, morphology, life cycle, pathogenicity, mode of infection, control measures, effects on host and host response, brief introduction to human defense mechanism.  | 5L  |

**UNIT III**

- |   |    |
|---|----|
| 6 <b>Vermi-composting</b><br>Types of earthworms in vermi-composting; ( <i>Eudriuseugeniae</i> , <i>Eisenia foetida</i> , <i>Perionyx excavates</i> ); soil processing worms; | 3L |
|---|----|

(*Heretimaposthuma*, *Pheretima elongate*); economic and ecological importance of vermi-composting for garden, agriculture and industry. Vermi-wash applications.

- |    |  |    |
|----|--|----|
| 7  | <b>Apiculture</b><br>Wild species of honey bees: <i>Apis dorsata</i> , <i>Apis florea</i> ; domesticated species of honeybees: <i>Apis indica</i> , <i>Apis mellifera</i> , castes of honeybees, bee pollination and food plants, bee products (Pollen, glue, honey wax, venom, royal jelly) and their applications. | 3L |
| 8  | <b>Sericulture</b><br>Types of silkworms: Mulberry, Eri, Tasar, Muga; mulberry plant cultivation, rearing house, silkworm rearing, economic importance of wild and new silk moth.  | 3L |
| 9  | <b>Fisheries</b><br>Fish as nutritive human food, fish oil, fish glue, fish leather, fish manure, aqua culture industry, biological control in fish farming, fish preservation methods, pearl fishery and economic value of fishes, fish as bio-control agent.   | 3L |
| 10 | <b>Overview of use of animal and animal products for industrial applications</b>   | 3L |

#### References

- 1) Biology – Life on earth, 5th Edn., Audesirk, T. and Audesirk, G., Prentice Hall, New Jersey (1999).
- 2) Parasitology, 1st Edn., Chernin, J., Taylor & Francis Publ., London (2000).
- 3) Modern Textbook of Invertebrate Zoology, 8th Edn., Kotpal, R. L., Rastogi Publication, Meerut (2002).
- 4) Modern Textbook of Vertebrate Zoology, 2nd Edn., Kotpal, R. L., Rastogi Publication, Meerut (2003).
- 5) Invertebrates (Protozoa to Echinodermata), 1st Edn. Verma, A., Narosa Publishing House, New Delhi (2005).
- 6) Nonchordata II, 1st Edn., Arora, M.P., Himalaya Publishing House, Mumbai (2006).
- 7) Biology of Understanding Life, 1st Edn., Alters, S. and Alters, B., John Wiley & Sons Inc., USA (2006).

**Core Course – Theory; 3 Credits** **45L**

**UNIT I**

- 1 **Plant diversity: Plant kingdom** 4 L  
General characteristics of plant kingdom; classification system; concept of binomial nomenclature; genus and species; diversity in habitat and habit; life span; mode of nutrition.
- 2 **Algae, Fungi and Lichens** 3 L  
General characteristics, classification with examples. Life history and uses of *Chlorella/Spirogyra*, *Aspergillus* & *lichens*. Biotechnological significance.
- 3 **Bryophytes and Pteridophytes** 4 L  
General characteristics, classification up to class with examples, alternation of generations, life history of *Riccia*, *Selaginella* and their economic importance.
- 4 **Gymnosperms and Angiosperms** 4 L  
General characteristics, classification up to orders with examples, life history of *Pinus*, difference between monocots & dicots, causes of phenomenal success of angiosperms; economic importance

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**UNIT II**

- 4 **Plant Morphology: General organization of plant body** 3 L  
Underground, axis; aerial parts; morphology and functions of roots and leaves with their biotech significance
- 5 **Inflorescences and Flowers** 3 L  
Definition; major types with examples; significance of inflorescence; parts of flower and their functions; types based on symmetry and whorls; stalk and bracts; significance in Biotechnology industry.
- 6 **Fruits** 3 L  
Definition and formation of fruit parts; major types: simple, aggregate and composite fruits with examples; preservation of fruits and commercial applications
- 7 **Embryology** 3 L  
Male and female gametophytes; fertilization; endosperm; embryogenesis (monocot, dicot); polyembryony; apomixis
- 8 **Seeds** 3 L  
Definition; structure and types; seed preservation and germination methods; Concept of seed dormancy

### UNIT III

- 6 **Anatomy: Study of plant tissues** 7 L  
Types, structures and functions of plant tissues. Significance of anatomy in ecological interpretation, pharmacognosy and wood identification.  
Structure of root, stem, bark and leaves
- 7 **Plant physiology** 8 L  
Mineral nutrition and deficiency diseases, overview of nitrogen fixation, photosynthesis and respiration, phloem transport, photoperiodism and flowering, stress physiology (heat, water, salinity and metal), phytohormones and their role in fruit and seed development.

### References

- 1) College Botany, Vol. I-II Gangulee, H.C., Das, K.S and Dutta, C., New Central Book Agency (P) Ltd., Kolkata (2002).
- 2) Botany for Degree Students Part-I-III, Alage, Fungi & Bryophyta-Vashishta, B.R., Sinha, A.K. and Singh, V.P., S Chand & Company Ltd., New Delhi (2002).
- 3) A Textbook of Botany-Fundamentals of Botany (Plant diversity), Dhumal, K.N., More, T.N., Gadekar, S.S. and More, A.D. NiraliPrakashan, Pune(2002).
- 4) A Textbook of Botany-Plant Anatomy and Plant Morphology, Dhumal, K.N., More, T.N., Gadekar, S.S. and More, A.D. NiraliPrakashan, Pune(2002).
- 5) Plant Physiology, 3rd Edn., Taiz, L., Zeiger, E., Panima Publishing Corp., New Delhi (2003).

<b>BBT 103: Foundations of Chemistry &amp; Biochemistry</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1</b>	<b>Introduction</b>	<b>3 L</b>
	Scope and contributions of biochemistry to human welfare; The cell as a unit of life, functions of plasma and cell membrane; water as a universal solvent –shape of H <sub>2</sub> O molecule, properties of water (B.P., M.P., solubility, polarity, adhesion-cohesion), diffusion, osmosis, osmotic pressure, surface tension	
<b>2</b>	<b>Carbohydrates</b>	<b>3 L</b>
	Occurrence/sources; Classification-on basis of carbon no & functional grs.; Structure with molecular formulae; Stereochemistry (structural and conformational isomers); isomers with one and more chiral centres, properties of stereoisomers; cyclization of sugars; conformations of cyclic forms (chair & boat forms).	
<b>3</b>	<b>Important monosaccharides</b>	<b>3 L</b>
	6 C sugars- glucose, fructose, mannose, galactose, 5 C sugars- ribose, deoxyribose, important modified monosaccharides (2-keto-3-deoxy-D- <i>manno</i> -octulosonic acid (KDO), 2-keto-3-deoxy-D- <i>glycero</i> -D- <i>galacto</i> -nonulosonic acid (KDN), sialic acids, aminosugars, sugar acids (their biological role/ occurrence)	
<b>4</b>	<b>Linkages in Sugars</b>	<b>3 L</b>
	Structure and functions of important di-saccharides (sucrose, lactose, maltose, cellobiose) and poly-saccharides (homo and heteropolymers, storage and structural polymers – starch, glycogen, cellulose, chitin, peptidoglycan)	
<b>5</b>	<b>Physico-chemical properties of carbohydrates</b>	<b>2 L</b>
	Reducing-non-reducing properties; Exploitation for detection and separation –Benedict’s test; Introduction to conjugate sugars (Glycoproteins and glycolipids and their importance)	
<b>6</b>	<b>Significance of carbohydrates in microbial, plant and animal system</b>	<b>1 L</b>
	ABO blood groups, heparin, lectins, carbohydrate vaccines	

**UNIT II**

<b>7</b>	<b>Lipids</b>	<b>1 L</b>
	Occurrence/sources: plant derived oils, ghee	
<b>8</b>	<b>Structure</b>	<b>2 L</b>
	Structure of fatty acids, triglycerides; Classification viz., simple and compound, structural and storage with examples; unsaturated-saturated, Oils (refined/unrefined significance); fats, waxes, rancidity/spoilage of fats (microbial, oxidative)	
<b>9</b>	<b>Functions</b>	<b>2 L</b>
	Functions in a living system: significance of hydrophobicity and water immiscibility for compartmentalisation, in vitamins, cofactors, for	

- signalling, pigments
- 10 **Lipid conjugates** 3 L  
Important conjugates and their functions: phospholipids, glycerophospholipids, sphingolipids; structure of membranes, micellar structures
- 11 **Cholesterol** 2 L  
Structure, function and significance
- 12 **Liposomes** 2 L  
Liposomes in drug delivery, soaps, biosurfactants
- 13 **Physico-chemical properties of carbohydrates and lipids** 3 L  
Compare and contrast of properties arising due to differences in C:O ratio; Comparison of carbohydrate & lipid as fuel molecule of the cell (Glycolysis and beta oxidation in brief, without detailed steps/enzymes)

### UNIT III

- 15 **Temperature profiles of carbohydrates & lipids** 4 L  
B.P., M. P.; morphology (amorphous/crystalline), solubility in polar/nonpolar solvents; Polarity and dipole moment, hydrophilic/hydrophobic interactions
- 16 **Properties of their solutions** 5 L  
True solutions, recap of colligative properties- (lowering of vapour pressure, elevation of boiling point, depression in freezing point); effects of temperature and pressure on solutions; viscosity, osmotic pressure, surface tension.  
Effect of temperature and pressure on interfacial tension; its significance on biological systems; colloids, dispersion, suspension, colloidal system; their stabilization in biological system; properties of colloids and emulsions
- 17 **Physico-chemical measurements** 6 L  
Concept of buffers, how to prepare normal/molar solutions (examples), standard buffers, measuring pH with pH-meter: Working, Calibration, maintenance of electrodes, effect of molarity on pH maintenance  
Spectroscopy – colorimetry; Beer-Lambert law  
Chromatography – adsorption – TLC, paper

#### References

- 1) Biochemistry, Berg, J.M., Tymoczko, J. L. and Stryer, L. W.H. Freeman and Co., New York, USA (2003).
- 2) Principles of Biochemistry by Lehninger, A., Nelson, D. L. and Cox, M.M. W.H. Freeman and Co., New York, USA (2008).
- 3) Biochemistry, Satyanarayan, U. Books and Allied (P) Ltd., Kolkata, India(2008).

**BBT 104: Basics of Computers** **Total**  
**Core Course – Theory; 3 Credits** **45L**

**UNIT I**

<b>1</b>	<b>Fundamentals</b> Introduction, History, Evolution, Characteristics of Computers, Block diagram of computer, Computer Generations	2 L
<b>2</b>	<b>Computer Organization</b> I/O units, Storage units (primary and Secondary), ALU, CU, CPU, Complete System	3 L
<b>3</b>	<b>Number Systems</b> Positional, Non-Positional, Binary , Octal , Hexadecimal, Conversion from one number system to another	4 L
<b>4</b>	<b>Classification of computers and features</b> Notebook, Personal, Workstations, Mini, Micro, Mainframe and Super	4 L
<b>5</b>	<b>Computer Networks: LAN, WAN and MAN</b>	2 L

**UNIT II**

<b>6</b>	<b>Types of Programming Languages</b> Machine, Assembly and High Level	2 L
<b>7</b>	<b>Computer software</b> Software and hardware relationship, System and Application software	2 L
<b>8</b>	<b>Algorithm and Flowcharts</b> Definition, characteristics, Advantages and limitations, example	3 L
<b>9</b>	<b>Operating System and Services</b> Introduction, Functions and performance Windows and Linux – Features and Windows Accessories MS Word, MS Powerpoint, MS Excel, MS Access	8 L

**UNIT III**

<b>10</b>	<b>Introduction to C Programming</b> Introduction	2 L
<b>11</b>	Character sets, Constants, variables, Keywords, Comments	3 L
<b>12</b>	Operators, Statements, I/O Operations, Preprocessor Directives	3 L
<b>13</b>	Pointers, Arrays, Strings	3 L
<b>14</b>	User defined data types: Structure and Union	2 L
<b>15</b>	Control structure, loop structures and Functions	2 L

**References**

- 1) Computer Fundamentals by Pradeep Sinha and Priti Sinha
- 2) Fundamentals of Computers by V Rajaraman
- 3) Linux : The Complete Reference 6th Edition by Richard Petersen,

Tata McGraw-Hill Education (2007)

- 4) Let Us C by YashavantKanetkar, BPB Publications.
- 5) The C programming language by Kerighan and Richie, PHI Publication.
- 6) Programming in ANSI C by Balaguruswamy, Tata McGraw-Hill Education.



<b>BBT 105: Animal Science Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	<b>Animal Classification</b> Study of general and distinguishing characteristics; classification of chordates and non-chordates up to class level with examples	6 P
2	Demonstration of earthworm for visceral organs and various systems	1 P
3	Demonstration of rat for visceral organs and various systems	2 P
4	Study of slides of <i>Paramecium</i> and <i>Hydra</i> .	2 P
5	<b>Study of parasites</b> Morphology, mode of infection, pathogenicity and control measures: <i>Entamoebahistolytica</i> , <i>Plasmodium vivax</i> , <i>Taeniasolium</i> , <i>Ascaris lumbricoides</i> .	2 P
6	<b>Study of external morphology of honey bee</b> Mouth parts, legs, sting apparatus and wings. Observation of bee products: honey, wax, bee venom and royal jelly.	1 P
7	<b>Main fresh water cultivable fishes and their economic importance</b> <i>Catlacatla</i> , <i>Labeorohita</i> , <i>Cirrhinamrigala</i> , <i>Cyprinusbatrachus</i> , <i>Clarias batrachus</i> , <i>Tilapia mosambica</i> .	1 P
8	<b>Study of human blood groups</b>	1 P
9	<b>Histology</b> Observation of permanent slides of important mammalian organs	1 P
10	<b>Excursion Tour</b> Visit to sericulture industry/ Apiculture centre/Aquaculture industry/ Sea shore/Vermiculture Center.	3 P

### References

- 1) Modern textbook of Invertebrate Zoology, 8<sup>th</sup>Edn, Kotpal R. L., Rastogi Publication, Meerut.
- 2) Modern textbook of Vertebrate Zoology, 2<sup>th</sup>Edn. Kotpal R L., Rastogi Publication, Meerut.
- 3) Invertebrates (Protozoa To Echinodermata), 2<sup>nd</sup> Edn, Verma, A., Narosa publishing house, New Delhi.
- 4) Nonchordata II, 1<sup>st</sup>Edn., Arora m.p., Himalaya Publishing House, Mumbai.
- 5) Biology of Understanding Life, 1<sup>st</sup>Edn., Alters, S and Alters B., John Wiley & Sons Inc., USA.
- 6) Parasitology, 1<sup>st</sup>Edn., Chernin, J., Taylor & Francis Publ. London.

<b>BBT 106: Plant Science Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
<b>1</b>	<b>Study of modes of nutrition in plants</b> Autotrophs (Chlorophyllous plants), photo-autotrophs (Nitrifying bacteria), chemo-autotrophs ( <i>Rhizobium</i> ); Heterotrophs: total parasite ( <i>Cuscuta</i> ) partial parasite ( <i>Loranthus</i> ), insectivorous ( <i>Drosera</i> , <i>Utricularia</i> ); saprophyte: <i>Rhizopus</i> , mushrooms; symbiotic: symbionts (Lichens, Corolloid root of <i>Cycas</i> )	1 P
<b>2</b>	<b>Study of algae and life history of a typical alga</b> Chrysophyta (Diatoms and Desmids), Chlorophyta ( <i>Oedogonium</i> , <i>Chlorella</i> ), Phaeophyta ( <i>Sargassum</i> , <i>Ectocarpus</i> ), Rhodophyta ( <i>Batrachospermum</i> ), Cyanophyta ( <i>Nostoc</i> , <i>Oscillatoria</i> )	2 P
<b>3</b>	<b>Study of fungi and life history of a typical fungus</b> Phycomycota ( <i>Mucor</i> ), Ascomycota ( <i>Penicillium</i> ), Basidiomycota ( <i>Pleurotus</i> ), Rust ( <i>Puccinia</i> ), Smut ( <i>Ustilago</i> ) and Puffballs ( <i>Lycoperdon</i> ), Deuteromycota ( <i>Alternaria</i> )	2 P
<b>4</b>	<b>Study of Lichens</b> <i>Usnea</i>	1 P
<b>5</b>	<b>Study of bryophyta and life history of a typical bryophyte</b> <i>Anthoceros</i> , <i>Funaria</i> , <i>Riccia</i>	1 P
<b>6</b>	<b>Study of pteridophyta and life history of a typical pteridophyte</b> <i>Psilotum</i> , <i>Lycopodium</i> , <i>Equisetum</i> , <i>Selaginella</i> .	2 P
<b>7</b>	<b>Study of gymnosperms and life history of a typical gymnosperm</b> <i>Cycas</i> , <i>Pinus</i>	2 P
<b>8</b>	<b>Study of general organization of plant body</b> Underground (root and rhizome) and aerial parts (stem, leaves, fruits and seeds), Types and morphology	2 P
<b>9</b>	<b>Study of inflorescence and morphology of a typical flower</b> Racemose (raceme, spike & capitulum), cymose (solitary helicoids, dichasial <i>polychasial</i> ) and special types ( <i>cyanthium</i> , <i>hypanthium</i> , <i>verticillaster</i> ). Structure and types of flowers based on sexuality and symmetry, structure of a typical stamen and carpel.	2 P
<b>10</b>	<b>Study of types of fruits and structure of seeds</b> Simple fruits: Dehiscent (Legume and capsule), Indehiscent: dry (Caryopsis and Cypsella), indehiscent fleshy (Berry & drupe). Aggregate fruits (Etario of berry & etario of follicle). Albuminous seed	2 P

(castor), ex-albuminous seed(bean), types of seed germination

- 11 **Anatomy of dicot and monocot.** 2 P  
Dicot -Root, stem and leaf (Sunflower).  
Monocot-Root,stem and leaf (Maize and Jowar)  
Study of Vascular bundles (Maize stem sunflower, Cucurbita stem,  
Fern rachis and Dracaena stem, Monocot root.  
Study of types of stele (Permanent slide)
- 12 **Visit to forest** 1 P  
To study plant diversity

### References

- 1) College Botany, Vol. I-II, Gangulee, H. C., Das, K. S. and Dutta, C., New Central Book Agency (P) Ltd., Kolkata (2002).
- 2) Botany for Degree Students Part-I-III: Algae, Fungi and Bryophyta Vashishta, B. R., Sinha, A. K. and Singh, V.P., S Chand & Co. Ltd., New Delhi (2002).
- 3) A Textbook of Botany: Plant Anatomy and Plant Morphology: Dhumal, K. N., More, T. N., Gadekar, S. S. and More, A. D., Nirali Prakashan, Pune (2002).
- 4) A Text Book of Plant Diversity and Plant Resources (Management and Utilization), Dhumal, K. N., More, T. N., Gadekar, S. S. and More, A. D., Nirali Prakashan, Pune (2002)
- 5) A Text book of Practical Botany-2, Bendre, A. M. and Ashok Kumar, Rastogi Publication, Meerut (2006).

<b>BBT 107: Foundations of Chemistry &amp; Biochemistry Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Significance of good laboratory practices (GLP) Safe handling of equipments/ Instruments. Introduction to volume and weight measurements, Personal safety, accuracy and reliability.	2 P
2	Safety in the use of acids, alkalies and organic solvents. Distillation of water, Preparation of de-mineralized water, Preparation of washing solution/ disinfectant	2 P
3	Preparation of buffers-acetate buffer & Preparation of biochemical reagents (Benedict's reagent)	2 P
4	Isolation of commercially important biomolecules 4.1 Isolation of starch from corn (separation on the basis of density) 4.2 Extraction of triglycerides from oilseeds (separation on the basis of differential solubility)	2 P
5	Color reactions (qualitative determination) for identification Sugars and starch	2 P
6	To determine $\lambda$ max and extinction coefficient of coloured compounds using spectrophotometer & validation of Beer-Lambert Law (Varying concentrations of $\text{KMnO}_4$ ).	2 P
7	Determination of glucose by DNSA method.	2 P
8	Thin layer chromatography (TLC) Separation of plant pigments	2 P
9	Preparation of soap	2 P
10	Acid value or saponification value. Determination with reference to fatty acids.	2 P

### References

- 1) Introductory Practical Biochemistry, Sawhney, S. K. and Singh, R. Narosa Publishing House, New Delhi (2000).
- 2) An Introduction to Practical Biochemistry, Plummer, D.T., Tata-McGraw-Hill Publishing Co., New Delhi (2005).
- 3) Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J., Cambridge University Press, New York (2005).
- 4) Laboratory Manual in Biochemistry, Jayraman J., New Age International (P) Ltd., New Delhi (2007).

**BBT 108: Computer Fundamentals & C-Programming Lab** **Total**  
**Core Course – Practical; 3 Credits** **20 P**

**1 Computer fundamental:** 05 P

1. MS office Packages: MS Word, MS Powerpoint, MS Excel, MS Access
2. DOS Commands
3. Number Systems: Binary , Octal , Hexadecimal, Conversion from one number system to another
4. Use of Internet in Biological sciences

**2 C-Programming:** 15 P

1. Data types, operators and expressions, Hierarchy of operators,
2. control statements including decision (if, if-else), loops (while, do-while, for), branching statements (switch, break, continue),
3. Functions,
4. Arrays (1D, 2D- all matrix operations including inverse of a matrix),
5. Strings,
6. File handling etc.
7. Utilization of C-Programming in Biological Sciences

**References**

1. Fundamental of Computers – By V. Rajaraman B.P.B. Publications
2. Fundamental of Computers – By P. K. Sinha
3. Computer Today- By Suresh Basandra
4. Unix Concepts and Application – By Sumitabha Das
5. MS- Office 2000(For Windows) – By Steve Sagman
6. Computer Networks – By Tennenbum Tata Mac Grow Hill Publication
7. Let Us C by Yashavant Kanetkar, BPB Publications.
8. The C programming language by Kerighan and Richie, PHI Publication.
9. Programming in ANSI C by Balaguruswamy, Tata McGraw-Hill Education.
10. Sams Teach Yourself C in 21 Days Peter Aitken and Bradley L. Jones, Macmillan Computer publishing.
11. Schaum's outline of programming with C by Byron Gottorfried.

**BBT: 109- Open Course I; Elective Course; Option I - General English** **Total**  
**Open Course I; 2 Credits** **30L**

**UNIT I**

- |   |   |     |
|---|---|-----|
| 1 | Listening, Speaking, Essential Grammar, Undergraduate writing, Writing PG Assignments   | 5 L |
| 2 | Writing descriptions of places, objects etc.: Describing location and direction, Writing definitions, Classifying / categorizing, Comparing and contrasting: similarities and differences, Reporting and narrating  | 5 L |
| 3 | Answering exam questions: Understanding the question, Planning the answer, The exam answer, Evaluating the answer   | 2 L |
| 4 | <b>Research and using the library:</b> Finding relevant information, Using catalogues, Using books and periodicals, Using bibliographies and indexes, Using sources, Making notes, Paraphrasing and writing up notes, Summarizing, Quoting directly, Referring to sources, Writing a references list. | 3 L |

**UNIT II**

- |   |   |     |
|---|---|-----|
| 5 | <b>Describing processes and developments:</b> Expressing purpose, means and method, Expressing degrees of certainty, Expressing reasons and explanations / cause and effect, Describing developments and changes, Describing a sequence of events / time relations, Writing instructions  | 5 L |
| 6 | <b>Developing an argument:</b> Presenting arguments, ideas and opinions, Expressing certainty and doubt, Supporting an argument: illustrating and exemplifying ideas, Refuting arguments, ideas and opinions, Offering evaluative comments on opinions and arguments, Drawing conclusions | 5 L |
| 7 | <b>Writing an essay:</b> Essay organization: presentation and layout, Spelling and punctuation, Including graphs, charts and tables, Writing paragraphs, Writing introductions and conclusions, Academic writing style, Revising the essay – proofreading                                 | 5 L |

**References:**

- 1) Essential English Grammar by Raymond Murphy, Cambridge Publication (Available in paper back)
- 2) Practical English Usage by Michael Swan, Oxford University Press.
- 3) Practical English Grammar by Thomson, A J & Martinet, A V. Oxford University Press. 1986. Paperback. Intermediate. ISBN 0194313425

<b>BBT 109: Open Course II; Option II- Basic Programming for Bioinformatics, Open Course I; 2 Credits</b>	<b>Total 30L</b>
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**UNIT I**

<b>1</b>	Introduction to Perl programming	1 L
<b>2</b>	Numbers, Strings, Arithmetic and Logical operators	2 L
<b>3</b>	Control statements and Loops, Functions (push, pop, length, log etc)	2 L
<b>4</b>	Scalar variables	2L
<b>5</b>	Working with Arrays	2 L
<b>6</b>	Input/output in Perl	3 L
<b>7</b>	<b>Subroutine:</b> Defining subroutine, Invoking subroutine, Passing, arguments to subroutine, Return values	3 L

**UNIT II**

<b>8</b>	<b>Working with files:</b> File handle, Opening file, Reading contents of file, Writing into files etc.	3 L
<b>9</b>	Regular Expression, Pattern Matching, Hashes	2L
<b>10</b>	<b>Object-Oriented Programming in Perl:</b> Objects, Methods, and Classes in Perl	4L
<b>11</b>	<b>Perl Modular Programming:</b> Use of Perl Modules, Namespaces, Packages, Defining modules, Storing modules, First Perl module, Using modules, CPAN modules, Bioperl module	6L

**References:**

- 1) Beginning Perl for Bioinformatics by James Tisdall, O-Reilly publication.
- 2) Perl: Complete Reference Perl by Martin C. Brown, McGraw-Hill publication.
- 3) Mastering Perl for Bioinformatics by James D. Tisdall, O-Reilly Publication.
- 4) Teach Yourself Perl 5 in 21 days by David Till, Sams publishing.
- 5) Mastering Algorithms with Perl by Jon Orwant, JarkkoHietaniemi and John Macdonald, O-Reilly Publication.
- 6) Professional Perl Programming by Peter Wainwrigth, Published by Wrox Press Ltd.
- 7) Beginning Web Development with Perl by Steve Suehring, Apress publication.

**BBT 110: General Course I Elective; Option I – Yoga & Meditation  
General Course I; 2 Credits,**

**Total  
20L/Act.**

As a school of philosophy, Yoga is a way of life, and incorporates its own epistemology, metaphysics, ethical practices, systematic exercises and self-development techniques for body, mind and spirit. Yoga and meditation when practiced together strengthen the mind body connection, improving overall fitness and well-being. Many styles of yoga combine meditation with the physical routines, which use controlled breathing throughout the yoga poses. Meditation is practiced by relaxing, clearing your mind and concentrating on controlled breathing. Both yoga and meditation, when used consistently, have proven health benefits. Meditation is also an effective stress reducer that is used to help reduce anxiety, panic disorders and agoraphobia, an anxiety disorder commonly seen in student life.

### **Unit I**

1. Overview of history of yoga, its origin and claimed benefits
2. Aasana alignment and the human anatomy and physiology explained in connection with yoga techniques like pranayama and meditation teaching methodology with practice

### **Unit II**

3. The science of meditation and current scientific research
4. What is meditation? Techniques of meditation
5. Different kinds of yoga
6. Overview of current styles, forms and purposes of meditation
7. Techniques for cultivation of inner calm, insight and wisdom through Yoga and meditation

### **References**

1. Jeevanved. Shri Shri Anand Murtii. Anand Marg Publ. 1955
2. Yoga psychology. Shri Prabhat Ranjan Sarkar; Anand Marg Publ., Calcutta, India, ISBN 10 817251138; 1990.
3. Yoga for health. Avd Anandmitra, 1999.



## SEMESTER II

**BBT 201: Introduction to Microbiology** **Total**  
**Core Course – Theory; 3 Credits** **45L**

### UNIT I

- |  |     |
|--|-----|
| <b>1 History of Microbiology</b><br>Important experiments and discoveries, Golden age of Microbiology, Koch's postulates. .  | 5 L |
| <b>2 Introduction to Microscopy</b><br>Principle, instrumentation and applications of bright field, dark field, phase contrast, fluorescence and electron microscope | 10L |

### UNIT II

- |  |     |
|--|-----|
| <b>4 General properties and structure of prokaryotes</b><br>Bacterial cell structure and function; cell wall, cell membrane, endospore, capsule, flagella, fimbriae & pili, nucleoid, ribosomes, plasmids, cell inclusions, chemotaxis           | 8 L |
| <b>5 Taxonomy of bacteria</b><br>Nomenclature, its objectives, rules and regulations, taxometrics, intra-subspecific ranks-biovar, serovar, pathovar, phagovar, morphovar, <b>Salient features of Bergey's Manual of Systematic Bacteriology</b> | 7 L |

### UNIT III

- |  |     |
|--|-----|
| <b>6 Microbial growth</b><br>Growth curve, introduction to kinetics of growth, generation time, reproduction in microorganisms   | 4 L |
| <b>7 Microbial nutrition</b><br>Nutritional types of microorganisms, growth factors, macro and microelements, media ingredients, Different types of culture media: complex, defined, selective, differential media, pure culture techniques  | 3 L |
| <b>8 Microbial metabolism</b><br>Aerobic & anaerobic, respiratory, fermentative  | 3 L |
| <b>9 Control of microorganisms:</b><br><b>Physical agents</b> - Heat, Radiations, Filtration<br><b>Chemical agents and their mode of action</b> - Aldehydes, halogens, quaternary ammonium compounds, phenolic compounds, ethylene oxide, heavy metals, alcohol, soaps and detergents<br>Sterility checking- chemical and biological indicators. | 5L  |

### References

- 1) Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg

- N.R., The McGraw Hill Companies Inc. NY
- 2) General Microbiology - Stanier R.Y., 5th edition, (1987)Macmillan Publication UK.
  - 3) Prescott's Microbiology, 8th edition (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, ChrisWoolverton, McGrawHil Science Engineering, USA
  - 4) Biology of Microorganisms, Madigan, M. T., Martinko, J. M. and Parker, J. B., Prentice-Hall Publ., New York (2001).
  - 5) Introduction to Microbiology, 2nd Edn. Ingraham, J. L. and Ingraham C. A., Thompson Asia Pvt. Ltd., Singapore (2002).
  - 6) Microbiology: An Introduction, 8th Edn. Tortora, G. J., Funke, B. R. and Case, C. L., Pearson Education Inc., New Jersey (2004).

**BBT 202: Biochemistry I**  
**Core Course – Theory; 3 Credits**

**Total**  
**45L**

**UNIT I**

- |          |   |     |
|----------|---|-----|
| <b>1</b> | <b>Amino acids, peptides and proteins</b><br>Occurrence/sources, Naturally occurring amino acids; structures; abbreviated names; stereoisomerism; amphoteric nature of amino acids; modified amino acids and their role in nature; Classification of amino acids (on basis of functional groups, essential/non-essential); Chemical reactivity due to functional group (amide, acid, amine); peptides & proteins (peptide bond, bond properties, N-Terminal, C-Terminal); importance of sequence of amino acids for structure and function of protein (eg. Sickle cell anaemia) | 5 L |
| <b>2</b> | <b>Protein structure</b><br>Primary, secondary ( $\alpha$ helix and $\beta$ conformation), tertiary and quaternary structure. Forces stabilizing molecular structure (covalent bond, ionic bond, hydrogen bond, salt linkage, van der Waal's forces) a brief over view of Ramchandran plot  | 4 L |
| <b>3</b> | <b>Classification of Proteins according to function</b><br>Structural proteins, transport proteins, chromoproteins, phosphoproteins, glycoproteins and their structures and significance in microbial, plant and animal systems   | 4 L |
| <b>4</b> | <b>Introduction to enzymes as biocatalysts</b>  | 2 L |

**UNIT II**

- |          |  |     |
|----------|--|-----|
| <b>6</b> | <b>Nucleic acids</b><br>Occurrence; Structures of purines and pyrimidines; nucleosides, nucleotides - as components of DNA & RNA; Spectrophotometric estimation of purines and pyrimidines-theory; Structure of DNA- Watson-Crick model; denaturation-renaturation of DNA;<br>Types of RNA- their structures and functions | 4 L |
| <b>7</b> | <b>AMP and cAMP, ADP &amp; ATP, NAD &amp; NADP, FMN &amp; FAD-</b> structure, function and biological role.  | 4 L |
| <b>8</b> | <b>Vitamins</b><br>Occurrence/sources; rich sources of different vitamins; Classification and general structural features, Role as coenzymes; Functions & Deficiency symptoms  | 4 L |
| <b>9</b> | <b>Minerals</b><br>Role of Na, K, Mg, Fe, Zn, Co, Cu, P and I in physiology; General electronic configurations and their shapes/preferred geometries and its significance in metalloenzymes  | 3L  |

### UNIT III

- |    |  |    |
|----|--|----|
| 10 | <b>Analytical tools for separation of biomolecules</b>   | 4L |
|    | Separation techniques: Filtration (gross, mini, micro and ultra-filtration), dialysis, specific gravity, sedimentation, density gradient ultracentrifugation |    |
| 11 | <b>Flame photometry:</b> Estimation of Na and K, principle and procedure, accuracy   | 1L |
| 12 | <b>Kjeldahl method of nitrogen estimation</b> Soil /fertilizer/ water/ plant analysis  | 1L |
| 13 | <b>Chromatography:</b> - gel, affinity, ion exchange, applications; purification of water, streptomycin, proteins and enzymes and DNA/RNA fractionation.     | 4L |
| 14 | <b>Electrophoresis:</b> Principle of separation, factors affecting separation, types-paper, agarose gel, PAGE, 2D- gel electrophoresis.                      | 2L |
| 15 | <b>Estimation of important minerals:</b> Calcium and Iron from industrial effluents (gravimetry); modern methods of estimation.                              | 1L |
| 16 | <b>Estimation of inorganic phosphate:</b> Analysis of soil for phosphate fertilizer (colorimetry)  | 1L |
| 17 | <b>Estimation of purity of water:</b> Fluoride, chloride, sulphate and arsenic from potable water (titrimetry)   | 1L |

### References

1. Industrial Enzymology, 2nd Edn., Godfrey, T. and Reichelt, J.R.,McMillan Publ. Co., London(1997).
2. Principles of Fermentation Technology, Stanbury, P. F., Whitaker, A. and Hall, S. J., Butterworth-Heinemann, Burlington, MA, USA (2005).
3. Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).
4. Laboratory Manual in Biochemistry, Jayraman, J., New Age International (P) Ltd., New Delhi (2007).

<b>BBT 203: Cell Biology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |   |   |     |
|---|---|-----|
| 1 | <b>Introduction to Cell</b><br>Evolution of cell from molecules to first cell, from prokaryotes to eukaryotes and from single to multicellular organisms. Cell size, shapes, morphology and cell theory, General structure of prokaryotic and eukaryotic cell (plant and animal).   | 3 L |
| 2 | <b>Organelles of eukaryotic cells</b><br>Nucleus, Mitochondria, Endoplasmic Reticulum, Golgi apparatus, Lysosomes, Chloroplast and Plant Cell Wall; Structure and function of different organelles, comparison between prokaryotic and eukaryotic cell structure. Types of cells (neurons, RBC and muscle cells) and their functions. | 6 L |
| 3 | <b>Membrane Structure</b><br>Components of membrane, Structure (Fluid Mosaic Model), properties and functions of membrane. Function of lungs as membranous bags.  | 6 L |

**UNIT II**

- |   |   |     |
|---|---|-----|
| 3 | <b>Transport across the membrane</b><br>Passive diffusion, facilitated diffusion, Active transport. Structure, function and significance of Na <sup>+</sup> / K <sup>+</sup> ATPase and Ca <sup>+</sup> ATPase;<br>Ion channels – leak channels, gated channels, voltage gated and ligand gated channels. Ionophores, phosphotransferase system, transport antibiotics. Endocytosis and exocytosis , receptor mediated endocytosis. | 8 L |
| 4 | <b>Cytoskeleton</b><br>Actin filaments, Intermediate filaments, Microtubules, their structure, organization and functions, its polar nature, assembly and disassembly, regulators and role in cellular activities, tread milling. Muscle contraction, relevance of microtubules in anticancer treatment.  | 7 L |

**UNIT III**

- |   |  |     |
|---|--|-----|
| 5 | <b>Cell cycle and cell division</b><br>Cell cycle: steps and regulation. Cell division – mechanism of cell division, mitosis and meiosis, significance and comparison between two nuclear divisions. | 6 L |
| 6 | <b>Cell- cell interaction</b><br>Tight junctions, gap junctions, desmosomes & hemidesmosomes, plasmodesmata and extracellular matrix. Significance in neural transmission.                           | 3 L |

- 7 **Cell signaling** 3 L  
Types of cell signaling Signal molecules, receptors and mechanism of signal transduction.
- 8 **Cell death** 3 L  
Mechanism of apoptosis, its failure leading to cancer development, necrosis.  
Comparison between apoptosis and necrosis

### References

- 1) Molecular Biology of the Cell, Alberts, B., Johnson, A., Lewis, J., Raff, K., Roberts, K. and Walter, P., Garland Science, Taylor and Francis Group, New York, USA (2002).
- 2) Biochemistry, Berg, J. M., Tymoczko, J. L. and Stryer, L. W. H. Freeman & Co., New York (2003).
- 3) The Cell: A Molecular Approach, Cooper, G. M. and Hausman, R. ASM Press, Wahigton, USA (2004).
- 4) Cell and Molecular Biology, Karp, G., John Wiley & Sons Inc., New Jersey 2005).

**BBT 204: Genetics** **Total**  
**Core Course – Theory; 3 Credits** **45L**

**UNIT I**

- |   |     |
|---|-----|
| <b>1 Heredity</b><br><b>Mendelian inheritance</b><br>Segregation, independent assortment, test cross, dominant and recessive traits, multiple alleles, patterns of inheritance; Autosomal, X-linked, Y Linked<br>Prenatal and parental diagnosis; pedigree analysis and norms of genetic Counseling                       | 5 L |
| <b>2 Non-Mendelian inheritance</b><br>Gene interactions; cooperative interactions, epistasis; Cytoplasmic inheritance; mitochondrial and chloroplast horizontal gene transfer   | 5 L |
| <b>3 Arrangement of genetic material</b><br>Chromosomes: Structure, types, staining, FISH, banding, nomenclature and karyotyping, polytene and lampbrush chromosomes; Prokaryotic genetic material, Plasmids; Linkage and recombination, gene mapping in diploids, tetrad analysis, other methods of gene mapping (RFLP). | 5 L |

**UNIT II**

- |  |     |
|--|-----|
| <b>6 Applied genetics</b><br>Significance of genetics in breeding for improved food; Interactions of genes and environment; Model study organisms - <i>E. coli</i> , <i>S. cereviceae</i> , <i>Arabidopsis</i> , <i>C. elegans</i> , <i>Drosophila</i> and mice. | 7 L |
| <b>7 Sex determination</b><br>Chromosomal pattern of sex determination, sex determination in human, environment-dependent sex determination, dosage compensation; Sex linked inheritance   | 8 L |

**UNIT III**

- |   |     |
|---|-----|
| <b>10 Changes in genetic material</b><br>Variation: continuous and discontinuous; Chromosomal aberrations: Numerical (aneuploidy in human and polyploidy in plants); Structural (deletion, duplication, inversion and translocation); Related human diseases; Gene mutation, types, congenital diseases; Transposones                             | 7 L |
| <b>11 Evolutionary genetics</b><br>Theories of evolution: Pre-Darwenian theories, Darwin's theory of evolution and Modern evolutionary synthesis; The Hardy-Weinberg Law; Genetic equilibrium; changes in allelic frequencies: Mutation, Migration, Genetic Drift, Natural Selection; Co-evolution; Co-operation; Speciation; Molecular evolution | 8 L |

## References:

- 1) Practical Genetic Counseling, 6th Edn., Harper, P. S. Butterworth-Heinemann, Oxford (2004).
- 2) Fundamentals of Bacterial Genetics, Trun, N. and Trempy, J., Blackwell Science Ltd, Oxford (2005).
- 3) Genetics, Singh, B.D., Kalyani Publications, New Delhi (2005).
- 4) An Introduction to Genetic Analysis, Griffiths, A. J. F., Miller, J. H., Suzuki, D. T., Lewontin, R. C. and Gilbert, W. M., W. H. Freeman and Co., New York (2005).
- 5) Principles of Genetics 8<sup>th</sup>Edn. Gardner, E. J., Snustad, D. P. and Simmons, M. J., John Wiley & Sons (Asia) Pvt. Ltd, New Delhi (2006).
- 6) Genetics, A Molecular Approach, Russell, P. J., 2nd Edn., Pearson Education Inc., San Fransisco (2006).
- 7) Genetics, Strickberger, M. W., Pearson Education, India (2007).



<b>BBT 205: Introduction to Practical Microbiology</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Safety precautions in microbiology laboratory	1 P
2	Introduction to laboratory instruments used in microbiology	1 P
3	Sterilization techniques	2 P
4	Introduction to microscopy :Demonstration of compound microscope	2 P
5	Preparation of media and its application: selective and differential media	2 P
6	Pure culture techniques Pour plate, streak plate, spread plate, observation of cultural characters	3 P
7	Staining techniques: Monochrome staining, Gram staining, Negative staining	3 P
8	Staining of cell organelles: Staining of capsule, spore, cell wall and metachromatic granule	2 P
9	Observation of bacterial motility- hanging drop, swarming growth methods	2 P
9	To study the growth curve of bacteria	2 P

### References

- 1) Source Book for Experiments for the Teaching of Microbiology, (1982) Primrose, S. B. and Wardlow, A. C. Academic Press, London.
- 2) Microbiology: A Laboratory Manual, (2004),6thEdn. Cappuccino, J.G. and Sherman, N., Pearson Education Pvt. Ltd., Singapore.
- 3) Practical Microbiology: Principles and Techniques, (2005), 1st Edn., Kale, V and Bhusari, K. Himalaya Publishing House, New Delhi.
- 4) Introductory Practical Microbiology, (2007),Mu dili, J., Narosa Publ. House P.Ltd., New Delhi
- 5) Experiments in Microbiology, Plant Pathology and Biotechnology, (2007),4<sup>th</sup>Edn., Aneja, K. R., New Age International Publishers, New Delhi.

**BBT 206: Biochemistry I Lab** **Total**  
**Core Course - Practical; 3 Credits** **20 P**

1	Isolation of casein from milk (separation on the basis of isoelectric pH)	2 P
2	To determine $\lambda$ max and extinction coefficient of bio-molecules Tyrosine, purine and pyrimidine using spectrophotometer. Identification of purines from $\lambda$ max	2P
3	Color reactions for identification. Amino acids and proteins	2 P
4	Estimation of proteins. Determination of albumin concentration by Biuret method	2 P
5	Paper chromatography/TLC for the separation of amino acids	2P
6	Determination of pKa values of solutions.	2 P
7	Titration curve of acidic, basic and neutral amino acids	2P
8	Quantitative estimation of ascorbic acid	2 P
9	Separation of dyes on the basis of ion exchange chromatography	2 P
10	Adsorption chromatography Separation of leaf pigments	2 P

**References**

- 1) Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).
- 2) Laboratory Manual in Biochemistry, Jayraman, J., New Age International (P) Ltd. New Delhi (2007).

**BBT 207: Cell Biology Lab**  
**Core Course – Practical; 3 Credits**

**Total**  
**20 P**

1	Study of compound microscope	1 P
2	Cell structure- Prokaryotes and eukaryotes	4 P
3	Study of sub cellular organelles	4 P
4	Study of mitochondria from oral mucosal cells with Janus green B	2 P
5	Study of mitosis and meiosis by onion root tip chromosomes	2 P
6	Determination of total erythrocytes (RBCs)from given blood sample	2 P
7	Determination of total leucocytes (WBCs)from given blood sample	2P
8	Temporary preparation of Polytene chromosomes from Chironomus salivary gland	2 P
9	Effect of organic solvents on cell membrane permeability of a cell	1 p

**References:**

- 1) Alberts B. and Jhonson A.4<sup>th</sup> edition (2002) Molecular Biology of the cell, Garland science.
- 2) Berg J., Tymoczko J, and Stryer L, 5<sup>th</sup>edition(2002) Biochemistry, W. H. Freeman and company, New York.
- 3) Cooper G.M., Hausman R. E. The cell: A molecular approach. 5th edition. ASM Press and Cinauer Associates Inc. 2009

<b>BBT 208: Genetics Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Staining of yeast, plant and animal chromosome	3 P
2	Survey of genetic traits in human	3 P
3	Analysis of karyotypes of various genetic disorders	3 P
4	Bacterial conjugation	3 P
5	Effect of mutagenic agents on seeds	3 P
6	Isolation and Cultivation of <i>C elegance</i>	2 P
7	Study of <i>Drosophila</i> life cycle	3P

### References

- 1) *Drosophila*, Methods and Protocols (2008) Edited by Christian Dahmann Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, Germany
- 2) S. Harisha. *Biotechnology Procedures and Experiments Handbook*(2007) Infinity Science Press.
- 3) Antoine Barrière and Marie-Anne Félix§, Institut Jacques Monod Isolation of *C. elegans* and related Nematodes CNRS - Universities of Paris, 75251 Paris cedex 05, France
- 4) Theresa Stiernagle Maintenance of *C. elegans*-, *Caenorhabditis* Genetics Center, University of Minnesota, Minneapolis, MN 55455 USA

**BBT 209: Open Course II: Elective; Option I - Ecology**  
**Open Course II; 2 Credits**

**Total**  
**30L**

**UNIT I**

<b>1</b>	Definition and scope of ecology; ecological factors	3 L
<b>2</b>	Ecosystem - concept, characteristics, kinds and structure	3 L
<b>3</b>	Ecosystem diversity	3 L
<b>4</b>	The species & Individual in the Ecosystem	3 L
<b>5</b>	An overview on different types of ecosystem. Structure and function of ecosystem, energy flow through ecosystem	3 L

**UNIT II**

<b>6</b>	Definition and concept of community, community diversity, structure, dominance, stratification and periodicity; Community interdependence, Ecotone, Edge effect and Ecological Niche	3 L
<b>7</b>	Ecological succession – characteristics, types of succession, concept of climax, significance of succession	3 L
<b>8</b>	Plant communities: definition, classification, characteristics and function	3 L
<b>9</b>	Ecosystem functioning- food chain, food web; Ecological pyramids – pyramids of numbers, pyramids of biomass, pyramids of energy, inverted pyramids; Ecological energetic - energy flow, ecological efficiency	2 L
<b>10</b>	Definition, Types and examples of ecosystem- terrestrial (grassland) and aquatic (pond)	2 L
<b>11</b>	Application of the study of ecology in wild life conservation and sustainable development	2 L

**References**

1. Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2. Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3. Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4. Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Press

**BBT 209: Open Course II: Elective; Option II - Gardening and Landscaping, Open Course II; 2 Credits** **Total  
30L**

**UNIT I**

1	Scope and objectives of gardening	1 L
2	Style of gardens: Formal, Informal	1 L
3	Types of gardens: English, Mughal and Japanese	1 L
4	Components of garden	1 L
5	Planning of Indoor /outdoor gardens:	1 L
6	Residential, Larger Home Garden, Roof Garden, Terrace Garden, Children's garden, School and Institutional Garden, Park, Industrial garden, Housing complex, Hanging garden	3 L
7	Nursery production and management	2 L
8	Propagation of ornamental plants by seeds, layering, cuttings, grafting, budding & tissue culture.	2 L
9	Annuals & Biennials: Important Genera and Species, their importance in garden designs	2 L
10	Orchids: Environment, propagation, potting & compost, nutrient supply, watering important species	1 L

**UNIT II**

1	Landscape Design: Definition, objectives and scope, Landscape elements of construction and designing of Residential, Commercial, Bungalow, Public area, Hotel, Educational Institute and religious places	3 L
2	Computer application in landscape	2 L
3	Palms and Cycas: Characteristics, propagation, culture, pest and disease, importance and uses, genera and species of palms and Cycas.	2 L
4	Bamboo and conifers: Genera, species and varieties Shrubs: Different types	2 L
5	Climbers and Bougainvillea: Different types Hedges for gardens & farms	2 L
6	Lawns & Grasses: Planting methods, maintain Herb garden, Rose garden, Bog garden, Sunken garden, Topiary garden, Kitchen garden, Paved garden, Dish garden, Rock garden, Terrace garden, Water garden & Bottle garden (Terrarium)	3 L
7	Field Visit: Visit to various gardens (public and private) and plant nurseries	1 L

**References:**

- 1) Christine Wein-Ping Yu 1987. Computer-aided Design: Application to ConceptualThinking in Landscape Architecture. amazon.com
- 2) Arora J S ( 1990). Introductory Ornamental Horticulture, Kalyani Publication.
- 3) Bailey L H 1901. The Standard cyclopedia of Horticulture, volume ,2 and 3 Macmillan Publications.
- 4) Bose T K and Mukerjee D 1987, Gardening in India, Oxford Book House
- 5) Sue Wilson (Editor) E & F. N. Spon. 2001 Guidelines for Landscape and Visual Impact Assessment.

**BBT 210: General Course II: Elective; Option I – Human Values**  
**General Course II; 2 Credits,**

Values are socially accepted norms to evaluate objects, persons, and situations that form part and parcel of sociality. A value system is a set of consistent values and measures. Knowledge of the values are inculcated through education. It contributes in forming true human being, who are able to face life and make it meaningful. There are different kinds of values like, ethical or moral values, doctrinal or ideological values, social values and aesthetic values. Values can be defined as broad preferences concerning appropriate courses of action or outcomes. As such, values reflect a person's sense of right and wrong or what "ought" to be.

The objectives of the course are:

- To lay a strong foundation in value education.
- To create awareness towards realizing self
- To inculcate in students the spirit of social responsibility
- To add value to human relations.
- To make students understand Salient values for life such as truth, commitment, honesty , integrity etc.

**Unit I: Yam – Satya, Ahinsa, Brahmacharya, Asteya, Aparigraha**

Value education-its purpose and significance in the present world –Holistic living – Balancing the outer and inner –Body, Mind and Intellectual level- Duties and responsibilities. Environment and Ecological balance –interdependence of all beings – living and non-living. The binding of man and nature – Environment conservation and enrichment.

**Unit II: Niyam – Soch, Santosh, Tapa, Swadhyaya, Ishwar Pranidhan**

- Social Evils – Corruption, Cyber crime, Terrorism – Alcoholism, Drug addiction – Dowry – Domestic violence – untouchability – female infanticide – atrocities against women-How to tackle them.
- Values for life : truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity , and inclusiveness, Self esteem and self confidence, punctuality – Time, task and resource management – Problem solving and decision making skills- Interpersonal and Intra personal relationship – Team work – Positive and creative thinking

**References:**

1. M.G.Chitakra: Education and Human Values, A.P.H.Publishing Corporation, New Delhi, 2003
2. Chakravarthy, S.K. : Values and ethics for Organizations: Theory and Practice, Oxford University Press, New Delhi , 1999.
3. Das, M.S. & Gupta, V.K. : Social Values among Young adults: A changing Scenario, M.D. Publications, New Delhi, 1995
4. Bandiste, D.D.: Humanist Values: A Source Book, B.R. Publishing Corporation, Delhi, 1999

## SEMESTER III

**BBT 301: Concepts in Microbiology** **Total**  
**Core Course – Theory; 3 Credits** **45L**

### UNIT I

- 1 **Bacterial genetics:** Genetic exchanges in bacteria-Conjugation, Transformation, Transduction, Holliday model of Recombination 7 L
- 2 **Eukaryotic unicellular microorganisms:** Yeast and fungi: Distribution, classification, structure, reproduction, economic importance. Distinguishing characteristics of Archea, Actinomycetes, Rickettsia & Mycoplasma 8 L

### UNIT II

- 6 **Bacterial viruses:** General characteristics, classification, nomenclature, morphology and structure, life cycle (lytic & lysogenic) of  $\lambda$  phage. 7 L
- 7 **Plant and animal viruses:** Structure, classification, replication of plant viruses (TMV) and animal viruses (Influenza), methods of virus cultivation, viroids 8 L

### UNIT III

- 8 **Infection and pathogenicity:** Host parasite relationship, infection, sources of infection, mode of transmission, virulence factors, types of infectious diseases, epidemiology and public health microbiology, control of epidemics 7 L
- 9 **Antimicrobial chemotherapy:** Antibiotics and their mode of action, inhibition of cell wall synthesis, damage of cytoplasmic membrane, inhibition of nucleic acid & protein synthesis, inhibition of specific enzyme system, microbial assay. 8 L

### References:

- 1) Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY
- 2) General Microbiology - Stanier R.Y., 5th edition, (1987) Macmillan Publication UK.
- 3) Prescott's Microbiology, 8th edition (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, Chris Woolverton, McGrawHil Science Engineering, USA
- 4) Biology of Microorganisms, Madigan, M. T., Martinko, J. M. and Parker, J. B., Prentice-Hall Publ., New York (2001).



- 5) Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY
- 6) General Microbiology - Stanier R.Y., 5th edition, (1987) Macmillan Publication UK.
- 7) Prescott's Microbiology, 8th edition (2010), Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, ChrisWoolverton, McGrawHil Science Engineering, USA
- 8) Biology of Microorganisms, Madigan, M. T., Martinko, J. M. and Parker, J. B., Prentice-Hall Publ., New York (2001).

**BBT 302: Biochemistry II**  
**Core Course – Theory; 3 Credits**

**Total**  
**45L**

**UNIT I**

- 1 Thermodynamics** 7 L  
(Recap second law of thermodynamics, entropy, spontaneous change, free energy, enthalpy, reactions at equilibrium, interpretation of equilibrium constants, acid and bases, solubility equilibria, biological activity), Bioenergetics: Anabolism and catabolism. Energy transformations obey laws of thermodynamics, oxidation and reduction, redox potential, high energy bonds / compounds.
- 2 Enzymes** 8 L  
Introduction, classification and nomenclature, specificity of enzymes, mechanism of enzyme actions (Induced fit theory etc), factors affecting enzyme activity; enzyme kinetics-Michaelis–Menten rate equation; regulatory enzymes; enzyme inhibition- allosteric, feedback, competitive and non-competitive inhibition (double reciprocal plots).

**UNIT II**

- 3 Catabolism of carbohydrates** 8 L
- I. Carbohydrates from diet, its digestion, concept of cellular respiration
  - II. Glycolytic pathway, entry of pyruvate in citric acid cycle: site, enzymes, regulation, energetics
  - III. Glycogenolysis: site, enzymes, regulation, energetics
  - IV. TCA: pathway, site, enzymes, regulation, energetic, amphibolic nature of citric acid cycle; Glyoxylate cycle: site, enzymes, regulation, energetics
  - V. Electron transfer chain, enzymes, pathway and oxidative phosphorylation in mitochondria, energetic, regulation
  - VI. Overview of entry of other sugars
  - VII. Alternate pathways: Pentose phosphate pathway
- 4 Anabolism of carbohydrates** 7 L
- I. Photosynthesis (C3):Photosynthetic pigments, light reaction (absorption of light, ETC and cyclic and non-cyclic photophosphorylation) and dark reactions, photorespiration, C4 and CAM metabolism
  - II. Gluconeogenesis (C6): site, enzymes, regulation, energetics
  - III. Glycogenesis (C6 polymer): site, enzymes, regulation, energetics

## UNIT III

- 5 **Lipid metabolism** 8 L
- I. Digestion, transport , absorption
  - II. Oxidation of fatty acids (saturated, unsaturated), regulation, energetics – compare with breakdown of carbohydrates
  - III. Ketone bodies
  - IV. Overview of anabolism
- 6 **Nitrogen metabolism** 7 L
- I. Overview of nitrogen metabolism
  - II. Digestion of proteins to peptides and amino acids, essential amino acids, transamination of amino acids
  - III. Nitrogen excretion and urea cycle
  - IV. Molecules Derived from Amino Acids

### References:

- 1) Biochemistry, Berg, J.M., Tymoczko, J. L. and Stryer, L. W.H. Freeman and Co., New York, USA (2003).
- 2) Principles of Biochemistry, Lehninger, A., Nelson, D.L and Cox, M. M., W.H. Freeman and Co., New York, USA (2008).
- 3) Biochemistry, Satyanarayan, U., Books and Allied (P) Ltd., Kolkata, India (2008).

**BBT 303: Principles and techniques in Molecular Biology** **Total**  
**Core Course – Theory; 3 Credits** **45L**

**UNIT I**

- |          |  |     |
|----------|--|-----|
| <b>1</b> | <b>Molecules of life</b><br>Introduction to molecular biology, structure and role of nucleotides and nucleic acids; evidence of DNA as genetic material, Watson and Crick's structure of DNA, A & Z forms of DNA; Properties of DNA                            | 4 L |
| <b>2</b> | <b>Types, structure and role of RNA</b><br>Types of RNAs, mRNA of prokaryotes and eukaryotes, tRNA structure and role as an adapter molecule, rRNA of prokaryotic and eukaryotic cells, structural and catalytic role of RNA                                   | 3 L |
| <b>3</b> | <b>Mutations</b><br>Types of mutations, effect of mutations, mutation related inherited human disorders, Physical and chemical mutagenic agents, frequency of mutations, measuring mutation rate, somatic & germline mutations, role of mutations in evolution | 4 L |
| <b>4</b> | <b>Genetic code</b><br>Salient features of genetic code, codon – anticodon recognition, Wobble hypothesis, exceptions to the universal genetic code  | 4 L |

**UNIT II**

- |          |  |     |
|----------|--|-----|
| <b>4</b> | <b>Features of whole genome</b><br>Genome size of different organisms; C value, C value paradox, repetitive and nonrepetitive  | 4 L |
| <b>5</b> | <b>Organization of genome</b><br>Organization of bacterial nucleoid; structure of eukaryotic chromosome; structure and role of centromere and telomere; chromatin; structure of nucleosome and higher level organization | 5 L |
| <b>6</b> | <b>Genome sequences and gene number</b><br>Concept of gene, number and distribution of genes and other sequences in the genome, pseudogenes, clusters, repeats and satellite DNA sequences, polymorphism in genomes      | 4 L |
| <b>7</b> | <b>Extra chromosomal genomes</b><br>Organization of mitochondrial and chloroplast genomes; their significance, evolution of mitochondrial genome   | 2 L |

### UNIT III

- |           |   |     |
|-----------|---|-----|
| <b>8</b>  | <b>Basic Techniques in Molecular Biology</b><br>Nucleic acids isolation and separation techniques; nucleic acid detection: Quantification of DNA and RNA with absorption and fluorescence Spectroscopy techniques, blotting methods | 5L  |
| <b>9</b>  | <b>Polymerase chain reaction</b><br>Principle and applications of nested, multiplex, random amplified polymorphic DNA, Long PCR and Real time PCR   | 5 L |
| <b>10</b> | <b>Advance techniques</b><br>Creating mutation; random or specific, DNA sequencing, DNA microarrays; chromatin immunoprecipitation  | 5 L |

### References

- 1) Lewin's GENES XI. Krebs J.E., Kilpatrick S.T., Goldstein E. S., International Student Ed. Jones and Bartlett Publ. MA, USA, 01776, 2013.
- 2) Watson J.D., Baker T.A., Bell S.P., Gann A., Levine M., Losick R., Molecular Biology of the Gene 7<sup>th</sup> Ed. Benjamin Cummings Publ. USA 2013.
- 3) Cooper G.M., Hausman R. E., The Cell: A molecular approach, Sixth Ed. Sinauer Associates, Inc., ASM Press., Washington DC. 2013
- 4) Prescott's Microbiology, 8th edition, Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, ChrisWoolverton, McGrawHil Science Engineering, USA. 2010
- 5) Pal J.K., Ghaskadbi S.S., Fundamentals of Molecular Biology. Oxford University Press Incorporated 2009.

<b>BBT 304: Immunology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

1	<b>Introduction to basic immunology</b>	2
2	<b>Types of immune response</b> Innate immunity; adaptive immunity; humoral and cell mediated immune response	4
3	<b>Cells of adaptive immune system</b> Lymphocytes and antigen presenting cells	2
4	<b>Organs of the immune system</b> Bone marrow, thymus, lymphoid organs and spleen	2
5	<b>Antigens and antibodies</b> Antigens, nature and types; antibodies , molecular structure, classes and subclasses	5

**UNIT II**

5	<b>Molecular Immunology</b> Antigen presenting cells; antigen processing and presentation	3
6	<b>Major Histocompatibility complex</b> Class I, class II MHC molecules; Diversity of MHC molecules; role in thymic selection of T cells and in antigen presentation	4
7	<b>B cell differentiation</b> B cell maturation, activation and differentiation	4
8	<b>T cell differentiation</b> T cell maturation, activation and differentiation, T cell receptor, primary and secondary immune response	4

**UNIT III**

9	<b>Complement system</b> Classical pathway, alternative pathway	3
10	<b>Immunological diseases</b> Hypersensitivity; autoimmunity; immunodeficiency diseases	5
11	<b>Immuno – chemical techniques</b> Antigen – antibody reactions; immunoprecipitation; agglutination; ELISA; RIA; Western blotting; immune fluorescence; preparation of polyclonal antibodies; production of monoclonal antibodies	7

**References**

1. Gangal S, Sontakke S. Textbook of basic and clinical immunology. University Press 2013
2. Golddy A, Thomas JK, Barbara AO and Kuby J, Immunology, 6<sup>th</sup> Ed, 2006
3. Peter Patham, The immune system, 3<sup>rd</sup> Ed., Garland SC, 2009
4. Janeway C, Traverse, Walport and Shlomchic Immunology, 6<sup>th</sup> Ed, Garland SC.

<b>BBT 305: Practicals in Microbiology</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Micrometry	2P
2.	Cell/ spore counting	2P
3	Biochemical Characterization of Bacteria	6 P
	I. Sugar fermentation Test	
	II. Catalase, Oxidase and Urease Tests	
	III. IMViC test	
	IV. Hydrogen Sulfide Test and Nitrate Reduction Test	
	Casein and Starch Hydrolysis	
4	Maintenance and revival of cultures through traditional and modern methods	3 P
5	Isolation of bacteriophages	3 P
6	Isolation of fungi and yeast from natural environment	2 P
7	Antibiotic susceptibility by disc diffusion assay	2 P

### References

- 1) Source Book for Experiments for the Teaching of Microbiology, (1982) Primrose, S. B. and Wardlow, A. C. Academic Press, London.
- 2) Microbiology: A Laboratory Manual, (2004),6thEdn. Cappuccino, J.G. and Sherman, N., Pearson Education Pvt. Ltd., Singapore.
- 3) Practical Microbiology: Principles and Techniques, (2005), 1st Edn., Kale, V and Bhusari, K. Himalaya Publishing House, New Delhi.
- 4) Introductory Practical Microbiology, (2007),Mu dili, J., Narosa Publ. House P.Ltd., New Delhi
- 5) Experiments in Microbiology, Plant Pathology and Biotechnology, (2007),4<sup>th</sup>Edn., Aneja, K. R., New Age International Publishers, New Delhi.

<b>BBT 306: Practicals in Biochemistry II</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Detection of industrially significant enzymes: $\alpha$ - Amylase, protease, Lipase, invertase, phosphatase, cellulase.	2P
2	Enzymatic preparation of bio-molecules: 2.1 Dextrin: Production of malto-dextrin by using $\beta$ -amylase 2.2 Glucose: Production of glucose by bacterial $\alpha$ -amylase and amyloglucosidase 2.3 Production of invert sugar by invertase 2.4 Peptide preparation by proteolysis by using papain 2.5 Softening of chhole, rajma, idli using papain	5 P
3	Estimation of $\alpha$ - amylase enzyme activity	1 P
4	Study of parameters affecting enzyme activity 4.1 Effect of temperature (optimum temp). 4.2 Effect of pH (optimum pH). 4.3 Effect of incubation period. 4.4 Effect of substrate concentration ( $K_m$ & $V_{max}$ ). 4.5 Effect of enzyme concentration. 4.6 Effect of activators and inhibitors.	8 P
5	Laboratory Experiments on the Actions of Digestive Enzymes	2 P
6	Study of a metabolic pathway: the GPO–PAP triacylglycerol test	2 P

### References

- 1) Introductory Practical Biochemistry, Sawhney, S. K. and Singh, R. Narosa Publishing House, New Delhi (2000).
- 2) An Introduction to Practical Biochemistry, Plummer, D.T., Tata-McGraw-Hill Publishing Co., New Delhi (2005).
- 3) Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J., Cambridge University Press, New York (2005).
- 4) Laboratory Manual in Biochemistry, Jayraman J., New Age International (P) Ltd., New Delhi (2007).



<b>BBT 307: Practicals in Molecular Biology and Immunology</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Introduction to important equipments used for molecular biology laboratory; clean handling practice; precision and reliability in liquid and weight measurements	1P
2	Preparation of buffers and stock solutions; learning of safety measures for hazardous chemicals	2 P
3	Isolation of genomic DNA from bacterial cells	3 P
	Isolation of DNA from plant cells	2 P
4	Determination of melting temperature of DNA	1 P
5	Quantitation of DNA and RNA preparations and determination of purity by UV spectrophotometry	1 P
6	Analysis of DNA and RNA preparations by agarose gel electrophoresis	2 P
7	Demonstration of blood groups	1 P
8	Differential count of WBC	1 P
9	Widal test, VDRL test	2 P
10	Dot ELISA	1 P
11	Ouchterlony double diffusion	2 P
12	Separation of serum from blood and precipitation of immunoglobulin	1 P

### References

1. Green M.R., Sambrook J., Molecular cloning: A laboratory manual (Fourth Ed.): Three volume set. Cold Spring Harbor Laboratory Press. New York. 2012
2. Pal J.K., Ghaskadbi S.S., Fundamentals of Molecular Biology. Oxford University Press Incorporated 2009.
3. Wilson K. and Walker J. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, New York. 2005
4. Gangal S, Sontakke S Textbook of basic and clinical immunology. University Press 2013
5. Golddy A, Thomas JK, Barbara AO and Kuby J, Immunology

**BBT 308: Patent & IPR, Open Course III; Option I**  
**Open Course III; 2 Credits**

**Total**  
**30L**

**UNIT I**

- |   |   |     |
|---|---|-----|
| 1 | Introduction – Invention and Creativity – Intellectual Property (IP) – Importance Protection of IPR – Basic types of property (i). Movable Property - Immovable Property and - Intellectual Property. | 3 L |
| 2 | Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of New GMOs  | 3 L |
| 3 | International framework for the protection of IP; IP as a factor in R&D; Introduction to History of GATT, WTO, WIPO and TRIPS.  | 3 L |
| 4 | Patent databases; Searching International Databases; Country-wise patent searches   | 3 L |
| 5 | Case Studies on – Patents (Basmati rice, turmeric, Neem, etc.) Protection against unfair competition.   | 3 L |

**UNIT II**

- |    |  |     |
|----|--|-----|
| 6  | Patent application- forms and guidelines, fee structure, time frames; Types of patent applications: provisional and complete specifications; | 3 L |
| 7  | PCT and convention patent applications; International patenting- requirement, procedures and costs;  | 3 L |
| 8  | financial assistance for patenting-introduction to existing schemes;   | 3 L |
| 9  | Role of a Country Patent Office ,Patent office in India, Role of patent Attorney .   | 3 L |
| 10 | Patent infringement- meaning, scope, litigation, case studies and examples   | 3 L |

**References: Important Links**

- 1) Intellectual property rights in agricultural biotechnology By Frederic H. Erbisch, Karim M. Maredia, Biotechnology in Agriculture Series No 28,
- 2) The role of intellectual property rights in biotechnology innovation By David Castle, Edward Elgar Publishing
- 3) <http://www.wipo.int/portal/index.html.en>
- 4) [http://www.ipr.co.uk/IP\\_conventions/patent\\_cooperation\\_treaty.html](http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html)
- 5) [www.patentoffice.nic.in](http://www.patentoffice.nic.in)
- 6) [www.iprlawindia.org](http://www.iprlawindia.org)

**BBT 308: Nutrition, Open Course III; Option II** **Total**  
**Open Course III, 2 Credits** **30 L**

- |  |     |
|--|-----|
| <b>1 Nutritional Biochemistry</b><br>Nutrition classification of food; Five-food group plan (ICMR),<br>Basic food groups; Fuel value of carbohydrates, fats and protein<br>(Unit of energy)  | 6 L |
| <b>2 Nutrition and its physiological role</b><br>Definition for nutrition, nutrients, body weight body composition,<br>measurement of energy expenditure – calorimeter, BMR, SDA and RQ.<br>Physico chemical properties and physiological actions of dietary fibre,<br>protein energy malnutrition | 9 L |

**UNIT II**

- |  |     |
|--|-----|
| <b>6 Significance of water in metabolism</b><br>Dehydration and oedema, Significance, preservation of physiological pH<br>and, anion and cation balance, Acid – base balance in body fluids.   | 5 L |
| <b>7 Vitamins and Minerals</b><br>Outlines of vitamins and minerals. Classification of vitamins – Fat soluble<br>and water soluble. Dietary source, structures, RDA, functions and<br>deficiency states. Dietary sources, structures, RDA, functions and<br>deficiency of Iron, Calcium, phosphorus and magnesium, Iodine, zinc<br>and copper. | 7 L |
| <b>8 Analytical techniques in food biochemistry; recent<br/>advances in food biotechnology research</b>  | 3 L |

**References:**

- 1) Food biochemistry and Food processing, Y. H. Hui, Blackwell publishing (2006),
- 2) Food: The chemistry and its components; Tom Coultate, RSC publishing (2008),

**BBT 309: General Course III, Elective; Option I - Communication Skills and Personality Development** **Total**  
**General Course III; 2 Credits** **30 L**

1	Preparation of presentation –principles and presentation technique (what, how, for whom etc).	3 L
2	Nonverbal communication during presentation – how to manage stress, what to do with hands, legs ..., activating the audience with nonverbal communication	3 L
3	Verbal communication –argumentation, usable and unsuitable phrases	2 L
4	Communication skills – listening, empathic reaction, how to question, stealing the show, opening door question	3 L
5	Conflict situation solving, attack from the audience – communication skills as a work experience, vicious circle of attack and defence	2 L
6	Work with audience – ice-breaking, get them in the mood, work with emotions, visualization tools, nonstandard situations	3 L
7	Improvisation and unprepared presentations	2 L
8	Paradigm of human cooperation – why there could be problems to start the communication and what to do with it	3 L
9	Defense against manipulation, how to say NO, stress management	3 L
10	Image and etiquette	2 L
11	Basics of Personality (Definationetc), Theories of Personality Development	3 L
12	Analysing Strengths & weaknesses, Body Language & Preparation of Self Introduction	3 L

## SEMESTER IV

### BBT 401: Environmental Biotechnology Core Course – Theory; 3 Credits

Total  
45L

#### UNIT I

- |   |  |     |
|---|--|-----|
| 1 | Environmental Components: Constituents of environment, biotic and abiotic factors.   | 2 L |
| 2 | Ecosystems: Aquatic, forest, marine life, mountain life and underground life.  | 3 L |
| 3 | Atmosphere: composition and structure. Green house effect, ozone depletion and problems of climate change, related international conventions | 3 L |
| 4 | Characteristics of hydrosphere, water resources, hydrological cycle  | 2 L |
| 5 | Composition of lithosphere/soil; Biogeochemical cycles, their Implications on living systems   | 3 L |
| 6 | Characteristics of the biosphere.  | 2 L |

#### UNIT II

- |    |  |     |
|----|--|-----|
| 7  | <b>Natural resources and environment</b><br>Types of resources, current status and conservation. Sustainable development   | 4 L |
| 8  | <b>Concept of biodiversity</b> and its conservation, present status and types of biodiversity; extinct and endangered species; red data book, steps to preserve biodiversity; concept of in-situ and ex-situ conservation of species; concept of gene and germplasm banks in conservation of endangered species. | 4 L |
| 9  | <b>History of Environmental Biotechnology:</b> Role of Environmental Biotechnology in Environment protection, Microbial interactions in the environment  | 4 L |
| 10 | <b>Biotechnological processes:</b> Bioconversion, Bioaccumulation  | 3 L |

#### UNIT III

- |    |   |     |
|----|---|-----|
| 11 | <b>Environmental pollution &amp; Control</b><br>Introduction: Definition and sources of pollution; Different types of pollution                                   | 2 L |
| 12 | <b>Air pollutants</b> , monitoring techniques, pollution control devices, effects on human health, plants & atmosphere, acid rain, and aerobiology                | 2 L |
| 13 | <b>Water pollution</b> , effects on human health, monitoring techniques (BOD, COD, TVC), eutrophication, waste water treatment, ground water and marine pollution | 2 L |
| 14 | <b>Soil erosion and remedial measures</b> to recover alkaline, acidic and   | 2 L |

	saline soils, bio-pesticides	
15	<b>Solid waste and management:</b> Types of wastes (municipal, agricultural, industrial and mining), Hazardous wastes (electronic, nuclear and biomedical); Waste reduction for energy management - biomass, biogas, composting.	2 L 1 L
16	<b>Bioremediation,</b> biodegradation, biosorption	1 L
17	<b>Noise pollution:Sources,</b> measurement, effects on human health and control.	
18	<b>Radiation hazards:</b> Introduction, atomic radiation, effects of radiation, radioactive waste, radiation protection	2 L
19	<b>Sustainable sources of energy</b>	1 L

### References

1. Waste water Engineering: Treatment, Disposal and Reuse. Metcalf and Eddy Revised by G. Tchobanoglous, Franklin L. Burton & H. David Stensel Tata Mcgraw Hill Publishing Company Limited, New Delhi (2003).
2. De, A K (2008) Environmental Chemistry, New Age International (P) Ltd., New Delhi.
3. Rittmann, BE and McCarty, P L(2001) Environmental Biotechnology: Principles and Applications ,International Edition, Mcgraw-Hill, New York.
4. Mohan Primalani (2005) WasteWater Treatment, Oxford and IBH Publishing Co.Pvt.Ltd. New Delhi
5. P. K. Goel (2006) Water Pollution: Causes, Effects and Control, 2<sup>nd</sup> Revised Ed., New Age International Publishers, New Delhi

**BBT 402: Fundamentals in Molecular Biology** **Total**  
**Core Course – Theory; 3 Credits** **45L**

**UNIT I**

- |   |     |
|---|-----|
| <b>1 DNA replication</b><br>DNA polymerases: types, structure and catalytic role, priming reactions, semi-conservative replication of DNA, synthesis of leading, lagging strands, okazaki fragments, termination of replication | 9 L |
| <b>2 DNA Repair</b><br>Damage to DNA, repair mechanisms (excision in prokaryotes and eukaryotes, mismatch, recombination, error prone), SOS response  | 6 L |

**UNIT II**

- |  |     |
|--|-----|
| <b>3 Prokaryotic transcription</b><br>Overview; RNA polymerase structure and role; typical bacterial promoter and its interaction with sigma factor, initiation, elongation and termination of transcription                                       | 6 L |
| <b>4 Eukaryotic transcription</b><br>Eukaryotic RNA polymerases, structure and types; initiation of rRNA, tRNA and mRNA synthesis; promoter elements; role of TBP; transcription factors and enhancers; post – transcriptional modification of RNA | 9 L |

**UNIT III**

- |  |     |
|--|-----|
| <b>5 Translation</b><br>Structure and role of ribosomes; initiation, peptide bond formation, translocation, elongation and termination of protein synthesis in prokaryotes and eukaryotes, post translational modification of proteins | 9 L |
| <b>6 Regulation of gene expression</b><br>Overview; regulation of lac, tryptophan and arabinose operon   | 6L  |

**References**

- 1) Lewin's GENES XI. Krebs J.E., Kilpatrick S.T., Goldstein E. S., International Student Ed. Jones and Bartlett Publ. MA, USA, 01776, 2013.
- 2) Watson J.D., Baker T.A., Bell S.P., Gann A., Levine M., Losick R., Molecular Biology of the Gene 7<sup>th</sup> Ed. Benjamin Cummings Publ. USA 2013.

- 3) Cooper G.M., Hausman R. E., The Cell: A molecular approach, Sixth Ed. Sinauer Associates, Inc., ASM Press., Washington DC. 2013
- 4) Prescott's Microbiology, 8th edition, Joanne M Willey, Joanne Willey, Linda Sherwood, Linda M Sherwood, Christopher J Woolverton, ChrisWoolverton, McGrawHil Science Engineering, USA. 2010
- 5) Pal J.K., Ghaskadbi S.S., Fundamentals of Molecular Biology. Oxford University Press Incorporated 2009.



**BBT 403: Developmental Biology**  
**Core Course – Theory; 3 Credits**

**Total 45L**

**UNIT I**

1	Embryology: History & Concepts	4 L
2	Gametogenesis (Spermatogenesis, Oogenesis)	5L
3	Meiosis	2L
4	Types and patterns of cleavage, blastulation	4L

**UNIT II**

	Gastrulation in frog and chick up to formation of three germinal layers	6L
	Germ Layer Formation	3L
	Implantation	3L
	Fetal Membranes, Placenta	3L

**UNIT III**

6	Concepts of competence, determination, commitment and differentiation, dedifferentiation, redifferentiation, transdifferentiation, developmental plasticity in animal development	4L
7	Role of gene/s in patterning and development. Concept of Stem cells, Progenitor cells, cell lineages in plants and animals	4L
8	Ageing and apoptosis, abnormal development and teratogenesis in animals: cancer	4L
9	Cloning in mammals, transgenic technology in plants and animals	3L

**References**

- 1) Development Biology, 9<sup>th</sup> edition, (2010), Gilbert S.F.(Sinauer Associates, (USA)
- 2) Principles of Development, 4<sup>th</sup> edition (2010), Wilbert L and Tickle C, Publisher: Oxford University Press, USA.
- 3) Human Embryology and Developmental Biology, Author: [Carlson, Bruce M.](#) Edition: 3, Publisher: Elsevier - Health Sciences Division ISBN-13: 9780323014878
- 4) Developmental Biology, 6th ed., Gilbert, Scott F; Sunderland (MA): Sinauer Associates
- 5) An Introduction to Embryology, 9<sup>th</sup> edition, B. I. Balinsky. Publisher-Thomas Asia Pvt. Ltd
- 6) Balinsky : introduction to Embryology (CBS College Publishers)
- 7) Berril, NJ : Developmental biology (Tata-McGraw-Hill)

- 8) Davenport : An outline of animal development (Addison - Werley)
- 9) Subramanyan, T : Developmental Biology (Narosa Publishing House)
- 10) Rao, K.V. : Developmental Biology : A modern synthesis (Oxford - IBH Publishers)
- 11) Arumugam N.A. text book of embryology (Saras publication)

<b>BBT 404: ANALYTICAL TECHNIQUES</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |   |   |     |
|---|---|-----|
| 1 | <b>Filtration techniques:</b> Gross filtration, steri-pad filtration, membrane filtration, milli-filtration, micro-filtration, ultra-filtration, reverse osmosis, dialysis, their applications in industry. Merits and limitations                    | 4 L |
| 2 | <b>Centrifugation-</b> Table top, high speed, microfuge, refrigerated, ultra, density gradient centrifugation. Basket centrifuges, cream separators, sharples centrifuge, continuous and batch-wise processing, applications in biochemical industry. | 4 L |
| 3 | <b>Lyophilization</b> Principle and practice, applications in R&D (cells and proteins) and nutraceuticals   | 4 L |
| 4 | <b>MALDI-TOF</b> - Introduction to mass spectrometry, applications in determining mass of peptides and proteins   | 3 L |

**UNIT II**

- |   |   |     |
|---|---|-----|
| 5 | <b>Chromatography-</b> Principle, types- (paper, thin layer, gel, affinity, ion exchange), applications; purification of proteins and enzymes and DNA/RNA fractionation | 4 L |
| 6 | <b>HPLC-</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control   | 4 L |
| 7 | <b>GC:</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control     | 4 L |
| 8 | <b>Introduction to NMR;</b> principle, <sup>1</sup> H and <sup>13</sup> C NMR, applications in determining structures of biomolecules, Magnetic resonance imaging (MRI) | 3 L |

**UNIT III**

- |    |  |     |
|----|--|-----|
| 9  | <b>Radioimmunoassays/MRI:</b> Definition of isotopes and radioisotopes, measurement (counters), half-life, useful isotopes for applications in health and research, carbon dating. Electromagnetic radiations (UV, IR, X-ray, α, β, γ rays, visible spectrum), their measurement. Applications for health and agriculture. | 4 L |
| 10 | <b>Electrophoresis</b> Principle of separation, factors affecting separation, types -paper, agarose gel, PAGE, 2D- gel electrophoresis   | 4 L |
| 11 | <b>AFM:</b> principle, method, applications  | 3 L |
| 12 | <b>X-ray diffraction</b> – principle, method, application for determining 3D structure of proteins - over view of Ramchandran plot.  | 4 L |

**References:**

- 1) Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).
- 2) Laboratory Manual in Biochemistry, Jayraman, J., New Age International (P) Ltd., New Delhi (2007).

<b>BBT 405: Environmental Biotechnology Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Preparation of vermin-compost	1 P
2	Study of ecosystems Aquatic, forest, river, hill slopes, etc.	1 P
3	Experiments based on Spectrometer and Flame Photometer Na/K	2 P
4	Determination of equivalent noise level (Leq) of the surrounding air	1 P
5	Determination of Dissolved Oxygen (DO) in given water sample	1 P
6	Determination of Biochemical Oxygen Demand (B.O.D) in given water sample	2 P
7	Determination of Chemical Oxygen Demand (C.O.D) in given waste water sample	1 P
8	Enumeration of coilform in water by Most Probable Number (MPN) test	1 P
9	Determination of Nitrate In Waste Water	1 P
10	Determination of organic matter from given soil sample	2 P
11	Estimation of biomass from Planktonic organisms	2 P
12	Study of production of biogas from municipal sewage & food waste	2 P
13	Determination PM <sub>10</sub> Concentration using High Volume Sampler (HVS)	1 P
14	Biodegradation of Environ friendly material	1 P
15	Visit to waste water treatment plant(Industrial visit)	1P

### **References**

- 1) Waste water Engineering: Treatment, Disposal and Reuse. Metcalf and Eddy Revised by G. Tchobanoglous, Franklin L. Burton & H. David Stensel Tata Mcgraw Hill Publishing Company Limited, New Delhi (2003).
- 2) Sharma, B K (2006) Environmental Chemistry, Krishna Prakashan Media (P) Ltd., Delhi.
- 3) Mohan Pramlani (2005) WasteWater Treatment, Oxford and IBH Publishing Co.Pvt.Ltd. New Delhi
- 4) Environmental Microbiology(Second Edition)Edited by:Ian L. Pepper, Charles P. Gerba, Terry Gentry and Raina M. Maier ISBN: 978-0-12-370519-8

**BBT 406 : Practicals in Molecular & Developmental Biology** **Total**  
**Core Course- Practical; 3 Credits** **20 P**

1	Isolation of DNA from mammalian cells	1 P
2	Isolation of RNA from mammalian cells	1 P
3	Quantitation of DNA and RNA preparations and determination of purity by UV spectrophotometry	1 P
4	Analysis of DNA and RNA preparations by agarose gel electrophoresis	1 P
5	Amplification of DNA segment by Polymerase Chain Reaction (PCR)	1 P
7	Temporary preparation of Polytene chromosome from chironomous larvae	1 P
8	Study of staging & staining of Chick embryos	1P
9	Study of frog development, observation of frog embryo different development stages	2 P
10	Study of different types of sperms by smear preparation.	1 P
11	Types of eggs (insect, amphioxus, frog & hen)	1 P
12	Types of blastulae and gastrulae (insect, amphioxus and hen)	1 P
13	Study of permanent histological slides of chick embryo: Primitive streak (T. S), 24h (T. S. through neural tube) and 33H (T. S. through heart).	2P
14	Study of chick embryo whole mounts with reference to staging method in chick development (By Hamburger & Hamilton, given the book by Balanskey): 18 h (primitive streak), 21h, 24h, 33h, 48h, 72h & 96h of incubation.	3 P
	Study of temporary preparation of whole mount of chick embryo	3 P

**References**

1. Green M.R., Sambrook J., Molecular cloning: A laboratory manual (Fourth Ed.): Three volume set. Cold Spring Harbor Laboratory Press. New York. 2012
2. Pal J.K., Ghaskadbi S.S., Fundamentals of Molecular Biology. Oxford University Press Incorporated 2009.
3. Wilson K. and Walker J. Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, New York. 2005
4. Development Biology, 9<sup>th</sup> edition, (2010), Gilbert S.F.(Sinauer Associates, (USA)
5. Principles of Development, 4<sup>th</sup> edition (2010), Wilbert L and Tickle C, Publisher: Oxford University Press, USA.

<b>BBT 407: Analytical Techniques Lab</b>		<b>Total</b>
<b>Core Course – Practical; 3 Credits</b>		<b>20 P</b>
1	Preparation of de-mineralized water	1 P
2	Separation and estimation of purine & pyrimidine bases, FAD & FMN and NAD & NADP by HPLC	3 P
3	Estimation of chlorophyll a and b on $\lambda_{max}$ basis	1 P
4	Validation of status of laminar air flow bench by direct count	2 P
5	Sterilization of vitamins by membrane filtration	2 P
6	Separation of proteins by polyacrylamide gel electrophoresis	2 P
7	Up-gradation of calcium gluconate by steri-pad filtration method	2 P
8	Sodium and potassium estimation by flame photometry	1 P
9	Reverse osmosis technique for desalination of water	1 P
10	Separation of biomolecules using dialysis technique	2 P
11	Preparation of food product using spray dryer	2 P
12	Visit to research institute or Biotechnology Industry	1P

### **References**

1. Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).
2. Laboratory Manual in Biochemistry, Jayraman, J., New Age International (P) Ltd. New Delhi (2007).

**BBT 408: Open Course IV, Elective; Option I – Nanotechnology**  
**Open Course IV; 2 Credits**

**Total**  
**30L**

**UNIT I**

1	Introduction to nanotechnology	2 L
2	Types of nanoparticles	4 L
3	Characterization of nanoparticles UV/ VIS spectrophotometer, Scanning probe microscopy, XRD, FTIR	5 L
4	Nano-bio-assemblies	4 L

**UNIT II**

5	Application of nanotechnology in medicine: For imaging and drug delivery	4 L
6	Application of nanotechnology in Biological detection	4 L
7	Application of nanotechnology in Agriculture	3 L
8	Application of nanotechnology for environmental desalination, monitoring water quality, detection of pollutants	4 L

**References**

- 1) T. Pradeep, Nano, The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, 2007
- 2) Victor E. Borisenko and Stefano Ossicini What is What in the Nanoworld A Handbook on Nanoscience and Nanotechnology 2008 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim
- 3) Nan Yao, Zhong Lin Wang EDS. Handbook of Microscopy For Nanotechnology, KLUWER Academic Publishers Boston / Dordrecht / New York / London
- 4) Nanotechnologies for the Life Sciences Vol. 1, Biofunctionalization of Nanomaterials. Edited by Challa S. S. R. Kumar, 2005 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 3-527-31381-8 XIII
- 5) J. W. M. Bulte, M.M.J. Modo, Nanoparticles in Biomedical Imaging: Emerging Technologies and Applications, Springer Science Business Media, LLC, 2008
- 6) C.A. Mirkin and C.M. Niemeyer, Nanobiotechnology- II, More Concepts and Applications, WILEY-VCH, VerlagGmbH&Co, 2007
- 7) V. Renugopalakrishnan and R. V. Lewis Eds. Bionanotechnology- Proteins to Nanodevices, Springer.
- 8) D. S. Goodsell, Bionanotechnology- Lessons from Nature John Wiley & Sons, Inc 6. Bhushan Ed., Handbook of nanotechnology, Springer.



<b>BBT 408: Open Course IV, Elective; Option II – Biofertilizer Technology</b>	<b>Total</b>
<b>Open Course IV; 2 Credits</b>	<b>30L</b>

**UNIT I**

1	Soil microorganisms, composition and types of soil.	3 L
2	Rhizospheremicroflora and its role in the rhizosphere	3 L
3	Role of microorganisms in composting and humus formation; Bioinoculants and their agricultural importance	3 L
4	Biochemistry of symbiotic and non- symbiotic nitrogen fixation	3 L
5	Phosphate solubilization and Potassium mobilization	3 L

**UNIT II**

6	Methods of application ( liquid and carrier based)	3 L
7	Comparison of bioinoculants with chemical fertilizers	3 L
8	Methods of preparation – liquid and carrier based	3 L
9	Endomycorrhizae and Ectomycorrhizae – Non symbiotic microbes – Azotobacter – Associative Symbiosis - Azospirillum – Cyanobacteria (Nostoc. Gloeocapsa)	3 L
10	AzolaAnabena System. Microbial inoculants.	3 L

**References:**

1. Food Microbiology by Adams, M.R. and Moss, M.O.1995. The Royal Society of Chemistry, Cambridge.
2. Food Microbiology by Frazier, W.C. and Westhoff,D.C.1988. TATA McGraw Hill Publishing company ltd., New Delhi. 8
3. Modern Food Microbiology by Jay, J.M.1987. CBS Publishers and distributors, New Delhi.
6. Basic Food Microbiology by Banwart, G.J.1989. Chapman & Hall New York.
7. A Modern Introduction to Food Microbiology by Board, R.C.1983. Blackwell Scientific Publications, Oxford.
8. Dairy Microbiology by Robinson, R.K.1990. Elsevier Applied Science, London.
9. Food Poisoning and Food Hygiene, Hobbs, B.C. andRoberts, D.1993. Edward Arnold. London

## **BBT 409: General Course IV, Elective; Option I – Seminar & Journal Club**

### **General Course IV; 2 Credits**

Journal Club is a student-run institutional course that gives graduate students the opportunity to read, interpret and present literature critically to fellow peers, docs and faculty. This course helps students stay abreast of current knowledge in the field, develop presentation skills .

#### **Course Objectives:**

1. Strengthens student's familiarity with and critical analysis of scientific publications and scientific writing. Seminars will emphasize student participation in discussion and evaluation of all journal articles presented.
2. Practices sound scientific thinking hypothesis construction and evaluation in terms of scientific method and merit.
3. Develops skills in critical evaluation through readings and discussions.
4. Improve written and oral communications skills.
5. Improve breadth of knowledge and of scientific topics, methods, and experimental approaches.
6. Introduces students to scientific writing techniques and manuscript reviewing

#### **PRESENTATION GUIDELINES**

Papers need to be submitted one week before the JC presentation date.

In each class session, three students will individually give a 20 minute presentation, followed by a question and answer session from the audience.

While there is no strict format, presentations should:

- focus on a critical review of a published paper, from any biotechnology topic,
- review a paper, highlight its strengths and weaknesses, and discuss its scientific implications,
- include an introduction to the topic/field, as topics will inherently be from a wide range of disciplines within biotechnology, not necessarily familiar to all students.

**Evaluation and Grading Policy:** Students are expected to attend the class, do the required reading, participate and present one lecture. Each student will lead a discussion for at least one journal article or give a research talk. The class will be graded Pass/Fail. A passing grade requires an overall percentage of 80% or greater. % of total grade Grades will be based on the following

Attendance 10%

Participation: 40%

Discuss and provide feedback to other participants, Ask questions, :50%

## SEMESTER V

### BBT 501 : Biostatistics

#### Core Course – Theory; 3 Credits

	<b>Total</b>
<b>UNIT I</b>	<b>45 L</b>
1 <b>Central Tendency:</b> Mean (Simple, Geometric and Harmonic), Median (Grouped: Discrete and Continuous, Ungrouped data), Mode (Grouped: Discrete and Continuous, Ungrouped data)	3 L
2 <b>Graphical Representation of data:</b> Line Diagram , Pie Chart, Bar diagram, Histogram, Frequency polygon, Ogives	2 L
3 <b>Set Theory</b>	2 L
4 <b>Frequency distribution:</b> Simple, Grouped, cumulative	2 L
5 <b>Probability:</b> Space and Events, Axioms of Probability, Conditional Probability, Independent Events, Bayes' Theory	3 L
6 <b>Measures of Variation:</b> Dispersion, range, Mean Deviation (Grouped: Discrete and Continuous, Ungrouped data), Standard Deviation (Simple and Discrete series), Variance, Covariance, Coefficient of Variation	3 L
<b>UNIT II</b>	
7 <b>Theoretical Distribution:</b> Normal Distribution, Permutation & Combination, Binomial Distribution, Poisson Distribution, Skewness, Kurtosis and Moments	3 L
8 <b>Discrete and Continuous Distributions:</b> Chi-Square Test: Goodness of fit, Contingency Chi-square and Homogeneity , Chi square ,Student's T Distribution: Unpaired t test and Paired t test, Z Distributions or Z test, F-Test	3 L
9 <b>Correlation:</b> Co-efficient of correlation, Types, Karl Pearson's Co-efficient of correlation, Rank correlation, scatter diagram, partial correlation, Multiple correlation	2 L
10 <b>Regression:</b> Simple, multiple, Linear and Non-linear ,Least Squares Method	2 L
11 <b>Analysis of Variance (ANOVA):</b> One-way Anova and Two-way Anova	2 L
12 <b>Statistical Inference/ Estimation Theory:</b> Estimating With Confidence,	3 L

Confidence Intervals for Population Mean, Population Variance, Testing Hypotheses , Tests for a Mean

### UNIT III

- 13 **Spread sheet as Statistical Package I:** (Problems) Data Naming, Cross tabulation using pivot table for Numerical as well as Nominal data, Computing All Elementary statistics (Measures of Central tendency , Measures of dispersion, Histograms , Frequency tables ). Preparation of simple Quality Control Charts. 3 L
- 14 **Spread sheet as Statistical Package II:** (Problems) Curve fitting (and trends), Exponential, Power, Polynomial, Growth curve analysis, Moving averages and trends 3 L
- 15 **Spread sheet as Statistical Package III:** (Problems) Chisq-test, TTests ( Paired, Unpaired,) , Ztest, ANOVA( one way and two way : Ftest ) 3 L  
Note: Use Data Analysis Tool Pack of Spread Shhets.
- 16 **SPSS or PSPP I:** (Problems) Handling large data, Data Preparation, Elementary statistics, Testing of Hypothesis, Report generation with simple graphics 3 L  
Note: PSPP is Open source equivalent of SPSS and is adequate for beginners.
- 17 **SPSS or PSPP II :** Applications (Problems on) to Linear regression, Multiple regression , ANOVA (one way, two way) 3 L

### References

1. Biostatistics: A guide to design, Analysis and Discovery, Peter Fritz, Elsevier India.
2. Goon, A.M., Gupta, M.K. and Dasgupta, B., Fundamental of Statistics – Vol. I & II, The World Press Pvt. Ltd
3. Biostatistics: A foundation for analysis 7<sup>th</sup> Edition, Ferric Darvas
4. Applied statistical designs for the researcher, Neil Ed Taylor and Francis Groop.
5. Medhi, J., Stochastic Process, Wiley Eastern Ltd.
6. 11. Anderson, T.W., An Introduction to Multivariate Statistical Analysis, John Wiley & Sons.
7. Devore, J.L., 2002 Probability and Statistics, 5<sup>th</sup> edition, Thomson Asia.
8. Hoel, Port and Stone, Introduction to Statistics.
9. Miller & Freund: Probability and Statistics for Engineers, 7<sup>th</sup> Edition.
10. Chung, Kai Lai, Elementry Probability Theory with Statistical Processes (Student Edition) Springer International

**BBT 502: Clinical Biotechnology**  
**Core Course – Theory; 3 Credits**

**Total**  
**45L**

**UNIT I**

- 1 **Clinical significance of biochemical tests-** concept of health and disease, factors causing diseases, clinical significance of biochemical tests and their role in diagnosis, monitoring and therapy of disease 3 L
- 2 **Specimen collection and processing-** collection of blood vein puncture, collection with syringe, collection with evacuated tube, skin puncture, arterial puncture and anticoagulants, plasma and serum. Collection of urine:-Timed urine specimens, urine preservatives. 3 L
- 3 **Blood analysis-** Significance of hemogram, total and differential count, clinical significance of packed RBCs, platelets and erythrocyte sedimentation rate (ESR), blood groups: matching and cross matching 3 L
- 4 **Blood coagulation-** Clotting factors, coagulation: tests- clotting time and prothrombin time, diseases associated with blood clotting/ blood lysis 3 L
- 5 **Urine analysis-** Structure and functions of kidney, abnormal constituents of urine and their significance: glucose, acetone bodies, urea, creatinine, uric acid, billirubin, protein, Na<sup>+</sup>, K<sup>+</sup> and calcium oxalate. 3 L

**UNIT II**

- 6 **Lipid profile-** Determination of triglycerides, cholesterol, VLDL, LDL, HDL, significance of deviation from normal range. 4 L
- 7 **Status of liver:** Structure and functions of liver, liver function tests, metabolism of RBC, free and conjugated billirubin, types of Jaundice - hemolytic, hepatic, post-hepatic, neonatal and jaundice of genetic origin. 4 L
- 8 **Significance of enzymes in diagnosis:** assay and significance of enzyme levels in heart, liver, kidney and pancreatic disorders. SGPT, SGOT, alkaline phosphatase, lactate dehydrogenase, creatine phosphokinase,  $\alpha$  – amylase. 4 L
- 9 **Radioisotopes in medicine-**Concept of radioactivity, use of radioisotopes in medicine, radiation hazards, radiation health safety and protection 3 L

**UNIT III**

- 10 **Acid-Base Balance:** Acids, bases and buffers, normal pH of the body fluids, regulation of blood pH, acidosis and alkalosis, anion gap 3 L

- 11 **Electrolyte balance and water metabolism-** Regulation of fluids and electrolytes, Water excess and depletion, Sodium balance, Potassium balance 3 L
- 12 **Carbohydrates pathophysiology: Regulation of Blood Sugar, Insulin and Diabetes Mellitus:**Regulation of blood glucose, insulin, glucagon, prediabetes, types of diabetes mellitus, glucose tolerance test, clinical presentation, diabetic keto acidosis, chronic complications 3 L
- 13 **Lipids pathophysiology:**Metabolism of adipose tissue, Hormone sensitive lipase, Obesity, Fatty liver, Lipotropic factors, Ketone bodies, Plasma cholesterol, Atherosclerosis, Coronary artery disease 3 L
- 14 **Protein pathophysiology-** determination of Hb, glycosylated Hb, definition of anemia, types of anemia – iron deficiency anemia, Pernicious anemia, hemolytic anemia, aplastic anemia, sickle cell anemia. Thalaessaemia. 3 L

## References

1. Human biochemistry, Frisell, W.R., Macmillan Publ. New York, (1982).
2. Basic Neurochemistry, Molecular, Cellular And Medical Aspects, Siegel, G. J., Albers, R. W., and Price, D. L., Lippincott Williams & Wilkins (2005).
3. Essentials of Clinical Immunology, Chapel, H., Ed., Blackwell Publ. (2006).
4. Kuby's Immunology, 6th Edn., Kindt, T. J., Goldsby, R. A. and Osborne, B. A., W. H. Freeman & Co. New York (2007).
5. Text book of Biochemistry: Clinical Correlations, Delvin, T. M., John Wiley & Sons Inc (2007).
6. Industrial Biochemistry, Dass, B. K., Oscar Publ. (2007).
7. Human biochemistry and diseases, Litkwack, G., Academic Press/ Elsevier, Amsterdam(2008)
8. Essentials of Clinical Immunology, Zobiriskie, J. U., Ed. Cambridge Univ. Press Publ., New York (2009).
9. Clinical Chemistry: Theory, Analysis and Correlations.Kaplan, L .A and Pesce, A. J., Mosby and co., St. Louis (2009).

**BBT 503 : Recombinant DNA technology**  
**Core Course – Theory; 3 Credits**

**Total**  
**45L**

**UNIT I**

- |   |   |      |
|---|---|------|
| 1 | Scope and milestones in genetic engineering,  | 2 L  |
| 2 | Basic techniques in recombinant DNA technology: Agarose gel electrophoresis, Southern & Northern blot, PCR amplification. Principles of DNA Sequencing: analysis of sequence data, analysis of genetic variations | 13 L |

**UNIT II**

- |   |   |     |
|---|---|-----|
| 3 | Cutting and joining DNA:DNA manipulative enzymes, Purification and Separation of Nucleic Acids.   | 6 L |
| 4 | Cloning vectors: Plasmid vectors, phage (M13 and lambda phage), cosmids, phasmids, BAC and YAC vectors, cosmids, YAC and expression vectors | 9 L |

**UNIT III**

- |   |   |     |
|---|---|-----|
| 5 | Cloning strategies: Introduction of plasmid DNA into bacterial cells, Transformation, identification of recombinant cells,introduction of phage DNA into bacterial cells, identification of recombinant phages. | 5 L |
| 6 | Genomic libraries: Isolation, insertion and selection of gene Genomic and cDNA libraries cDNA libraries, screening libraries.   | 5 L |
| 7 | Applications of genetic engineering in agriculture, environment and medicine  | 5 L |

**References**

- 1) Principles of Gene Manipulation and genomics, (2006),7thEdn., Primrose, S. B., Twyman, R.M. and Old, R. W., Blackwell Publishing,USA.
- 2) Gene Cloning and DNA analysis, 5th Edn., Brown, T. A., Blackwell Publishing, USA (2006)
- 3) An introduction to Genetic Engineering –Desmond S T Nicholl ,Cambridge university press, 2<sup>nd</sup> Ed
- 4) Recombinant DNA: A short Course, Watson J.D, CSHL press
- 5) Molecular Biotechnology Principles & Applications of Recombinant DNA, Bernard R Glick & Jack J Pasternak, ASM press.

**BBT 504: Food Biotechnology** **Total**  
**Core Course; 3 Credits** **45L**

### **UNIT I**

- |   |      |
|---|------|
| <b>1 Introduction</b><br>Importance of food and dairy Micro biology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic)   | 5 L  |
| <b>2 Food fermentations:</b> Cheese, bread, wine, fermented vegetables – methods and organisms used. Significance of fermented foods, Starter cultures for curd preparation and fermentation of idli batter, production of mushroom, single cell protein, assessment of microbiological quality of various foods. | 10 L |

### **Unit II**

- |  |      |
|--|------|
| <b>3 Food spoilage and General principles of food preservation</b><br>Preservation by Heat -Blanching, Pasteurization, Sterilization, Boiling and Canning. Refrigeration & Freezing of foods– Differences between -refrigeration and freezing, Preservation by Drying: Air convection dryers, Fluidized bed drier, roller drier, vacuum drier, spray drier, Freeze – Drying.Preservation by Concentration- Methods of concentration, Types of Evaporators. Preservation by Radiations - Types of Radiations, Effects of Radiations, Dose – Determining Factors, Status of Irradiated foods in India, Microwave, Ohmic heating. Preservation by Chemicals -GRAS, Food preservation by preservatives, Food Additives | 15 L |
|--|------|

### **Unit III**

- |  |     |
|--|-----|
| <b>4 Introduction to Tetrapack technology</b>  | 1 L |
| <b>5 Genetically modified foods –</b><br>Organic foods, Types of organic foods, identifying organic foods, organic food & preservatives.<br>Genetic modification in Food industry – Background, history, controversies over risks, application, future applications. | 7 L |
| <b>6 Industrial awareness:</b> Quality control and quality assurance in food industry, concept of current good manufacturing practices (Hazard Analysis and Critical Control Points)   | 7 L |

### **References**

1. Food Microbiology, Frazier & Westhoff, 4th edition, (2008) Tata



McGraw Hill Publications

2. James Monroe Jay, Martin J. Loessner, David Allen Golden, (2005) Modern Food Microbiology, 7<sup>th</sup> edition, Springer Science + Business Media Inc. USA.
3. Food Microbiology by Adams & Moss, 3rd edition,(2008) The Royal Society of Chemistry
4. A textbook on Biotechnology, R. C. Dubey, Illustrative edition,(2006) S. Chand Publications.
5. Advances in Biotechnology, S. N. Jogdand (2007), Himalaya Publishing House
6. Biotechnology: Food Fermentation Microbiology, Biochemistry and Technology (2009), Volume II V.K. Joshi, Ashok Pandey

**BBT 505: Practicals in Clinical Biotechnology**  
**Core Course – Practical; 3 Credits**

**Total**  
**20 P**

1	Peripheral blood smear for total and differential count	1P
2	Haemoglobin estimation using hematocrit	1 P
3	Estimation of glucose and ketone bodies in blood and urine	2 P
4	Glucose tolerance test	2 P
5	Determination of lipid profile	2 P
6	Kidney function test by estimation of urea, creatinine and protein from urine	3 P
7	Liver function test by SGPT and SGOT analysis	3 P
8	Urine Analysis	2 P
9	CSF Analysis	2 P
10	Separation of Serum proteins by electrophoresis	2 P

**References**

1. Industrial Enzymology, 2nd Edn., Godfrey, T. and Reichelt, J.R., McMillan Publ. Co., London (1997).
2. Clinical Biochemistry, 2nd Edn., Godkar, P. B. and Godkar D. P., Bhalani Publishing House, Mumbai (2003).
3. Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).
4. Laboratory Manual in Biochemistry, Jayraman, J., New Age International (P) Ltd., New Delhi (2007).

**BBT 506: Practicals in Recombinant DNA Technology  
Core Course – Practical; 3 Credits**

**Total  
20 P**

1	Preparation of competent <i>E. coli</i> cells	2P
2	Transformation of plasmid DNA for antibiotic resistance	3 P
3	Plasmid isolation from <i>E. coli</i>	3P
4	Restriction digestion	2 P
5	Ligation of DNA fragment with cloning vector	2 P
6	Southern Hybridization	3 P
7	PCR	2 P
8	Isolation of Plant DNA	3P

**References**

1. Molecular cloning: A laboratory Manual, Sambrook and Russell, Wiley New York, Volume I – III.

**BBT 507: Practicals in Food Biotechnology**  
**Core Course- Practical; 3 Credits**

**Total**  
**20 P**

1	Standard plate count of dairy products	2P
2.	Determination quality of milk sample by MBRT	2P
3	Microbiological examination of foods; detection of enteric pathogens.	4P
4	Microbiological examination of water; MPN	2P
5	Detection of food adulteration	2P
6	Oligodynamic action of metals	2P
7	Role of UV radiation in food preservation	3P
8	Cheese production	3P

**References**

- 1) Experiments in Microbiology, Plant Pathology and Biotechnology, (2007),4<sup>th</sup>Edn., Aneja, K. R., New Age International Publishers, New Delhi.
- 2) Source Book for Experiments for the Teaching of Microbiology, (1982) Primrose, S. B. and Wardlow, A. C. Academic Press, London.
- 3) Microbiology: A Laboratory Manual, (2004),6<sup>th</sup>Edn. Cappuccino, J.G. and Sherman, N., Pearson Education Pvt. Ltd., Singapore.

**BBT 508: Open Course V, Elective, Option I - Biotechnology for forensics** **Total**  
**Open Course V; 2 Credits** **30 L**

**Unit I**

1	Collection and storage of biological evidence	2L
2	Chemical and microscopic analysis of biological stains	3 L
3	Screening evidence for biological stains in forensic casework	3L
4	Species of origin and serology separation techniques	5L
5	ABO Grouping and secretor status	2 L

**Unit II**

6	Biological markers of forensic significance	3L
7	Introduction to blood spatter	3 L
8	Introduction to DNA analysis	6 L
9	Court room testimony	3 L

**References**

- 1) **Forensic Science: An Introduction to Scientific and Investigative Techniques, Third Edition**  
Author: Stuart H. James, Jon J. Nordby Ph.D.  
Publisher: CRC; 3 edition (February 20, 2009) CRC Press, Taylor & Francis Group LLC, Routledge , 6000 Broken Sound Pkwy, NW, Suite 300, Boca Raton FL 33487  
United States of America
- 2) **Criminalistics: An Introduction to Scientific and Investigative Techniques,**  
Author: Richard Saferstein  
Publisher: Prentice Hall College Div;  
10th Edition (1/13/2010)

<b>BBT 508 : Open Course V, Elective; Option II - Biodiversity</b>	<b>Total</b>
<b>Open Course V; 2 Credits</b>	<b>30L</b>

**UNIT I**

1	<b>Introduction:</b> Plant Diversity: Introduction- definition, species diversity, ecosystem diversity, genetic diversity,	2 L
2	The species & Individual in the Ecosystem	2 L
3	Biodiversity and major Biomes of World	1 L
4	Species extinction, population, individuals and genetic diversity	2 L
5	Loss of biodiversity and its ecological significance	2 L
6	Extinct and Threatened species	1 L
7	Threats to biodiversity	1 L
8	Agrobiodiversity	2 L
9	The Global biodiversity strategy and its significance for sustainable Agriculture	2 L

**UNIT II**

10	<b>Conservation of Biodiversity:</b> Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values	2 L
11	Biodiversity at global, national and local levels	1 L
12	Hot-spots of biodiversity	1 L
13	Endangered, and endemic Species; threatened species; Categories of IUCN,threatened species of plants and animals in Northeast India, Red data books	3 L
14	Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	2 L
15	Future strategy for the conservation of biological diversity	2 L
16	Biodiversity conservation: Indian Scenario	1 L
17	Biodiversity conservation:value addition through Biotechnology	2 L

## References

- 1 Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
- 2 U Kumar and Mahendra J A, Biodiversity Principles and conservations, (2007), Agrobios India Pvt. Ltd., Jodhpur
- 3 Kevin J Gaston and John I Spicer, Biodiversity an introduction (2004), Blackwell Publications, USA
- 4 G. K. Singh, Biodiversity, Taxonomy and Ecology, (2009), ALP Books, New Delhi
- 5 Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

**BBT 509: General Course V - Innovative ideas in Biotechnology  
General Course V; 2 Credits**

**Total  
30 Hrs.**

The knowledge of biotechnology is constantly advancing which has tremendous potential for applications in agriculture and medicine. From finding ways to fasten the essential processes eg. fermentation, diagnosis and slow down the unwanted process such as food spoilage, diseases; new applications and biotechnological inventions are continuously being developed to improve the society and world. The linkage between basic and applied research with new discoveries and innovations can find direct applications in agriculture, human health, environment etc.

**Objectives:**

- To understand how ideas/discoveries and inventions are commercialized,
- Apply the understanding and knowledge of the basics of biotechnology to find solution for the current issues/problems to their own field of study,
- Use the new skills and continue to independently learn more about the area of innovations,
- Express this knowledge of the innovation system in the form of oral/poster presentation.

**Teaching methods:**

- Orientation lecture, seminars / workshops as well as project assignments on group and individual level.

**References:**

1. Christensen, Clayton. The Innovator's Dilemma. Harper Business; (January 7, 2003), ISBN: 0060521996
2. Innovation and Entrepreneurship in Biotechnology, an International Perspective: Concepts, Theories and Cases. Damian Hine, John Kapeleris. Edward Elgar Publishing (2006).



## SEMESTER VI

**BBT 601 : Animal Biotechnology** **Total**  
**Core Course - Theory; 3 Credits** **45L**

### UNIT I

- |   |  |     |
|---|--|-----|
| 1 | <b>Introduction</b><br>Animal biotechnology to advance animal health; to develop more nutritive food; to advance human health; to introduce specific characters in strains for experimental research   | 2 L |
| 2 | <b>Biotechnology for improving animal health and welfare</b><br>Biotechnology for developing improved varieties of animals for increasing livestock productivity and nutrition content; Biotechnology for improving quality of milk, eggs and meat | 5 L |
| 3 | <b>Animal cloning, genetic engineering</b><br>Development of genetically engineered/ cloned animals; production of meat, milk from cloned animals  | 4 L |
| 4 | <b>Transgenic animals</b><br>Techniques and use of transgenic animals  | 4 L |

### UNIT II

- |   |   |     |
|---|---|-----|
| 3 | <b>Use of animals in life science research</b>  | 1 L |
| 4 | <b>Animal tissue culture</b><br>Introduction; systems of animal tissue culture, advantages and limitations; applications  | 3 L |
| 4 | <b>Simulating conditions for growth of cells</b><br>Temperature, pH, nutrition, sterility   | 3 L |
| 5 | <b>Culture media</b><br>Balanced salt solution, metabolic role of constituents of culture medium, serum and supplements, commercially available important media formulations              | 3L  |
| 6 | <b>Technique of cell culture</b><br>Disaggregation of tissue, preparation of primary culture, subculture and maintenance of cell lines, quantitation of cells and estimation of viability | 5 L |

### UNIT III

- |   |  |     |
|---|--|-----|
| 7 | <b>Biotechnology for improving detection, treatment and prevention of diseases</b>   | 1 L |
|   | <b>Monoclonal antibodies</b><br>Hybridoma technique for production of monoclonal antibodies; applications of monoclonal antibodies | 4 L |
| 6 | <b>Vaccines</b><br>Commonly used vaccines for humans; Recommended childhood  | 4 L |

	immunization schedule in India; Types of vaccines; method of production	
7	<b>Production of growth factors and therapeutic proteins</b> Important growth factors and therapeutic proteins approved for pharmaceutical use; method of production	3 L
8	<b>Stem cells</b> Introduction, types, use in regeneration of tissues	3 L

### References

1. Animal biotechnology science based concern, Vandenberg JG, Alwynelle SA, Cuffin JM, National Academies Press Washington DC., 2002
2. Ian Freshney, Culture of Animal cells (5<sup>th</sup> edition)2006, Wiley-Liss publication
3. Principles and practices of Animal Tissue Culture, Gangal S., University Press (India) Pvt. Ltd., Hyderabad (2009)
4. Kuby's Immunology, 6<sup>th</sup>Edn., T. J., Goldsby, R. A. and Osborne B. A., W. H. Freeman & Co. New York (2007)

<b>BBT 602: Bioprocess Technology and Quality Control</b>	<b>Total</b>
<b>Core Course - Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |   |   |     |
|---|---|-----|
| 1 | Isolation & preservation of industrially important micro-organisms  | 5 L |
| 2 | Selection of the desired characteristics, Screening methods, different methods of culture preservation, improvement of industrial micro-organisms | 5 L |
| 3 | Media formulation: media ingredients, objectives and cost effectiveness   | 5 L |

**UNIT II**

- |   |  |     |
|---|--|-----|
| 4 | Types of fermentation, design of typical bioreactor and its various parts  | 5 L |
| 5 | Types of bioreactors: continuous stirred tank reactors (CSTR), packed bed reactors, fluidized bed reactors, air lift fermenter | 5 L |
| 6 | Online monitoring and computer control of fermentation process   | 3 L |

**UNIT III**

- |   |   |     |
|---|---|-----|
| 7 | Downstream processing: General steps, recovery of products, extraction and purification   | 08L |
| 8 | Quality control in pharmaceutical industry: Evolution of quality concepts: Quality, Quality control, Quality Assurance, GMP<br>Quality Assurance concepts & tools: Process approach, System approach, Statistical Quality control , Documentation<br>Input control: Contamination, Cross contamination, Raw Material/ Packaging material, Building, premises and Location, Utilities, Human resource,<br>Process control: Validation- Equipment/Instruments, process, Operators, Utilities, Materials,<br>IPQC and Final quality testing and release of product<br>Good Documentation Practices | 09L |

**References**

- 1) Principles of Fermentation Technology, Stanbury, P. F., Whitaker, A. and Hall, S. J., Butterworth-Heinemann, Burlington, MA, USA (2005)
- 2) Biotechnology – A textbook of industrial microbiology by WulfCrueger, AnnelieseCrueger ,Panima Publishing

- Corporation. (2003)
- 3) Bioprocess Engineering Principle, Pauline Doran Elsevier Science & Technology Books (1995)
  - 4) Good Manufacturing Practices , Mindy J. Allport-Settle, PharmaLogica (2009)

**BBT 603: Plant Biotechnology**  
**Core Course - Theory; 3 Credits**

**Total**  
**45L**

**UNIT I**

- 1 **Introduction:** Historical review, methodology, scope and limitations. 2 L
- 2 **Types of cultures and their applications:** Organ, callus, cell, meristem, embryo, protoplast, endosperm, nucellus, microspore cultures and micro-techniques 8 L
- 3 **Micropropagation and strategies:** Axillary shoot proliferation, organogenesis and somatic embryogenesis. 5 L

**UNIT II**

- 4 **Molecular marker technology:** Various types and their applications in genome analysis, marker-assisted selection, germplasm analysis, taxonomic and evolutionary studies in plantbreeding. DNA finger printing. 5 L
- 5 **Conservation of plant genetic resources:** Germplasm preservation and cryopreservation 5 L
- 6 **Secondary metabolite production:** Various culture types (organized tissue, disorganized tissue, immobilized cultures and hairy root cultures), Strategies used to optimize secondary metabolite yield (Plant cell reactors, precursors, elicitors, metabolic engineering). 5 L

**UNIT III**

- 7 **Genetic engineering and applications:** Indirect methods (*Agrobacterium* and viral mediated transformation), direct methods (Chemical transformation, electroporation, microinjection, particle bombardment, sonication, whisker). *In planta* and chloroplast transformation. Selection of transformed cells (selectable markers, reporter genes and PCR). Recovery of transformed plants. Gene expression and validation. Genetic stability and field performance. Production of transgenic plants tolerant to herbicide, resistant to virus and pathogens. Concerns regarding the GM plants. 10 L
- 8 **Commercial applications:** In floriculture, horticulture, forestry and medicine 5 L

**References**

1. Plant Cell & Tissue Culture, Vasil, I.K. and Thorpe, T.A. (Eds.), Kluwer Academic Publishers, Amsterdam (1994).
2. Principles of Gene Manipulation: An Introduction to Genetic Engineering,

- Old, R.W. and Primerose, S.B., Blackwell Science, U.K. (1994)
3. Plant Tissue Culture, Applications and Limitations, Bhojwani, S. S., Elsevier Publishers, Amsterdam (1999).
  4. Plant Tissue Culture: Concepts and Laboratory Exercises, Ttrigiano, R.N. and Gray, D. J. (Eds.), CRC Press LLC, Florida (2000).
  5. Plant Biotechnology, Hammond, J., McGarvey, P. and Yusibov, V. (Eds), Springer Verlag, Berlin (2000).

<b>BBT 604:Basics of Bioinformatics</b>	<b>Total</b>
<b>Core Course - Theory; 3 Credits</b>	<b>45L</b>
	<b>15 L</b>

### UNIT I

1	<b>Introduction to Bioinformatics:</b> Introduction to Bioinformatics: Definition, History, Goal, Scope, Applications, Limitations	3 L
2	Introduction to Biological Databases: Nature of biological data, Introduction to database and types, Biological Databases, Biological Databases Pitfalls	3 L
3	Primary Resource Institutes: NCBI/EMBL/DDBJ	2 L
4	Database search engines: Entrez (GQuery), SRS	3 L
5	Bibliographic databases: Medline, PubMed, PubMed Central, PubMed Health, MESH and Google Scholar etc.	2 L
6	Nucleotide Sequence Databases: Primary Nucleotide Sequence Databases: GenBank, /EMBL Nucleotide/DDBJ Nucleotide, Secondary Nucleotide Sequence Databases: UniGene, SGD, EMI Genomes, Genome, SNP, EST, UniSTS, GSS etc., Specialized Genome databases: UCSC, SGD, TIGR, and ACeDB, Genomic Disorder Databases: OMIM, OMIA	2 L

### UNIT II

7	<b>Protein Databases</b> <b>Primary Databases:</b> Protein database on NCBI/ Protein database on EMBL, PIR-PSD, SwissProt, Uni Prot KB, TrEMBL	3 L
8	<b>Secondary Databases:</b> PROSITE, Profile, PRINTS, BLOCKS, PRODOM	3 L
9	Structure Databases: PDB, NDB, CSD, SCOP, CATH	5 L
10	3D structure visualization tools: Cn3D, Rasmol, Jmol, SPDBV	2 L
11	Pathway Databases: KEGG, Biosystem, BioCyc, PANTHER	2 L

### UNIT III

12	<b>Sequence Alignment &amp; Analysis</b> Overview/concepts in sequence analysis, DNA Sequence Analysis, Protein Sequence Analysis	5 L
13	Pairwise sequence alignment algorithms: Needleman & Wunsch, Smith & Waterman	3 L
14	Scoring matrices for Nucleic acids and proteins: PAM, BLOSUM	3 L
15	Database Similarity Searches: Dot Plot, BLAST, FASTA	2 L

## References

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J., Delhi, Pearson Education (Singapore) Pte.Ltd., 2001.
2. Bioinformatics: Sequence and Genome Analysis by Mount, David, New York, Cold Spring Harbor Laboratory Press, 2004.
3. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., New York, John Wiley & Sons Inc., 2004
4. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers
5. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press
6. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
7. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.
8. Rastogi, S.C., Mendiratta, N. and Rastogi, P. 2004 Bioinformatics: Concepts, Skills & Applications. CBS Publishers & Distributors, New Delhi.
9. Vyas, S.P. and Kohli, D.V., Methods in Biotechnology and Bioengineering.
10. Genetic Library Construction and Screening: Advanced Techniques and Applications: Lab Manual
11. Mont, D.W., Bioinformatics: Sequence and Genome Analysis.
12. Pierre Baldi and Soren Brunak, Bioinformatics: The Machine Learning Approach



<b>BBT 605: Practicals in Animal Tissue Culture</b>		<b>Total</b>
<b>Core Course- Practical; 3 Credits</b>		<b>20 P</b>
1	Study of requirements, important equipments and maintenance of aseptic conditions in tissue culture laboratory	2P
2	Preparation of reagents, formulation of tissue culture medium and sterility testing	4 P
3	Subculturing and routine maintenance of cell lines	4 P
4	Cell counting and estimate of viability	2 P
5	Seeding of cells in different culture vessels, preparation of replicate cultures	2 P
6	Testing effect of drug using MTT assay	3 P
6	Observation of cells and maintenance of records	2 P
7	Fixation and staining of cells	1 P

### **References**

1. Ian Freshney, Culture of Animal cells (5<sup>th</sup> edition)2006, Wiley-Liss publication
2. Principles and practices of Animal Tissue Culture, Gangal S., University Press (India) Pvt. Ltd., Hyderabad (2009)
3. Animal Cell Culture Methods, Methods in Cell Biology, Vol 57, Mather, J. P. and Bernes, D. Eds., Academic Press, New York (1998)
4. Animal Cell Culture – Practical Approach, Masters, J. R. W. Ed., Oxford Press, London (2003)

**BBT 606: Practicals in Plant Tissue Culture** **Total**  
**Core Course- Practical; 3 Credits** **20 P**

1	Facilities for the establishment of laboratory	1P
2	Preparation of nutrient media.	4 P
3	Selection of explants for initiating organ cultures	1 D
4	Micro-propagation of monocot and dicot plants via axillary shoot proliferation, organogenesis and somatic embryogenesis	4 P
5	Callus cultures for plant cell suspension	3 P
6	Cytological studies of callus cells	2 P
7	Anther/microspore cultures for plant regeneration.	2 P
8	<i>Agrobacterium</i> -mediated leaf disc transformation	2 P
9	Visit to organization or commercial tissue culture industry	1 P

**References**

1. Plant Biotechnology: Practical Manual, Giri, C. C. and Giri, A., I. K. International Publ.Pvt. Ltd., New Delhi (2007).
2. Plant Biotechnology: Laboratory Manual of PlantBiotechnology, Chawla, H.S., International Book Distr. Co.,New Delhi
3. Plant Tissue Culture: Theory and Practice, Bhojwani, S. S. and Razdan, M.K., Elsevier Publishers, Amsterdam (2004)

<b>BBT 607: Exercises in Computer Applications &amp; Bioinformatics</b>		<b>Total</b>
<b>Core Course- Practical; 3Credits</b>		<b>20 P</b>
1	<b>Primary Resource Institutes:</b> NCBI/EBI/DDBJ	2 P
2	<b>Database Search Engines:</b> Entrez, SRS	2 P
3	<b>Bibliographic databases:</b> Medline, PubMed, PubMed Central, PubMedHealth, Mesh, Google Scholar etc.	3 P
4	<b>Nucleotide Sequence Databases:</b> Primary Nucleotide Sequence Databases: GenBank, /EMBL Nucleotide/DDBJ Nucleotide, Secondary Nucleotide Sequence Databases: UniGene, SGD, EMI Genomes, Genome, SNP, EST, UniSTS, GSS etc., Specialized Genome databases: UCSC, SGD, TIGR, and ACeDB, Genomic Disorder Databases: OMIM, OMIA, PubM	4 P
5	<b>Protein Databases:</b> Primary Databases: Protein database on NCBI/ Protein database on EMBL, PIR-PSD, SwissProt, UniProtKB, TrEMBL, ExPASy; Secondary Databases: Probe, <u>Protein Clusters</u> , <u>Conserved Domain Database</u> ; Composite Databases: NRDB, OWL, MIPX, Swiss-Prot/TrEMBL; Motif / Pattern Databases: PROSITE, Profile, PRINTS, BLOCKS, PRODOM; Structure Databases: PDB, PDBsum, SCOP, CATH; 3D structure visualization tools: Cn3D, Rasmol, Jmol, SPDBV; Pathway Databases: KEGG, Biosystem, BioCyc, PANTHER, MetaCyc	5 P
6	<b>Sequence Alignment &amp; Analysis;</b> Database Similarity Searches: Dot Plot, BLAST, FASTA; Multiple sequence alignment: PRAS, CLUSTALW, T-Coffee, COBALT;Sequence Analysis Tools: DNA Sequence Analysis tools, Protein Sequence Analysis tools	4 P

## References

1. Bioinformatics: A Practical Guide to the analysis of Genes and Proteins (2<sup>nd</sup> Ed.) by Baxevanis, A.D. &Ouellette, B., F. F., New York, John Wiley & Sons, Inc. Publications, 2002.
2. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J., Delhi, Pearson Education (Singapore) Pte.Ltd., 2001.
3. Bioinformatics: Sequence and Genome Analysis by Mount, David, New York, Cold Spring Harbor Laboratory Press, 2004.
4. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. &Petsko, G.A., New York, John Wiley & Sons Inc., 2004.
5. Introduction to Bioinformatics; Attwood
6. Bioinformatics; C,V. Murthy
7. Bioinformatics, Baxvanis
8. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
9. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
10. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press.
11. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular

- Biology. PWS Publishing Co., Boston.
12. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.
  13. Rastogi, S.C., Mendiratta, N. and Rastogi, P. 2004 Bioinformatics: Concepts, Skills & Applications. CBS Publishers & Distributors, New Delhi.
  14. Vyas, S.P. and Kohli, D.V., Methods in Biotechnology and Bioengineering.
  15. Singer, M. and Barg, P. Exploring Genetic Mechanism.
  16. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
  17. Genetic Library Construction and Screening: Advanced Techniques and Applications: Lab Manual
  18. Mount, D.W., Bioinformatics: Sequence and Genome Analysis.

**BBT608: Open Course VI, Elective; Option I - Entrepreneurship in Biotechnology** **Total 30L**

**Open Course VI; 2 Credits**

**UNIT I Opportunities in different Biotechnology Sectors**

1	Overview of Biotechnology industry and research sector	2 L
2	Agriculture based industries and opportunities	2 L
3	Herbal extracts and its applications	2 L
4	Major Industries in Health sector and opportunities	2 L
5	Bioprocess and core biotechnology industry and opportunities	2 L
6	Opportunities in Biotechnology research	2 L
7	Opportunities in other allied areas	3 L

**UNIT II Entrepreneurship Development in Biotechnology**

8	Meaning and importance, concepts of entrepreneurship, characteristics of successful entrepreneurs,	1 L
9	classification of entrepreneurs, myths of entrepreneurship, evolution of entrepreneurship, development of entrepreneurship,	1 L
10	stages in entrepreneurial process, role of entrepreneurs in the economic development	1 L
11	role of small scale industries in the national economy	1 L
12	Identification of business opportunities in Biotechnology	1 L
13	Criteria for the principles of product selection and development, Elements of marketing	2 L
14	Project identification - assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report	3 L
15	Market and technical, feasibility studies	2 L
16	Financial and social feasibility studies	1 L
17	Raising of capital	2 L

**References**

1. Forbat, John, "Entrepreneurship" New Age International. 2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.
2. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill,
3. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House
3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).
4. Management Fundamentals – Concepts, Application, Skill Development – RobersLusier – Thomson –
5. Entrepreneurship Development – S.S.Khanka – S.Chand& Co.
6. Management – Stephen Robbins – Pearson Education/PHI – 17 th Edition, 2003.

**BBT 608: Open Course VI, Elective; Option II - Business management in Biotechnology** **Total**  
**Open Course VI; 2 Credits** **30L**

**UNIT I**

1	Nature and characteristics of Management, Scope and Functional areas of management.	1 L
2	Roles of Management, Levels of Management in Biotechnology	1 L
3	Evolution of management thought: early, contemporary and modern	1 L
4	Nature, purpose and importance of planning process	2 L
5	Types of plans and Decision making.	2 L
6	Importance of planning – steps in planning & planning premises.	2 L
7	Hierarchy of plans. Components of planning	2 L
8	Principles of organization, Types of organization. Departmentation Committees.	1 L
9	Nature and importance of staffing–Process of Recruitment and Selection.	3 L

**UNIT II**

10	Performance appraisals	2 L
11	Motivation and leadership	1 L
12	Business Communication – Meaning and importance	1 L
13	Sales Management Nature of product and market strategy	1 L
14	Packaging and advertising	2 L
15	After Sales Service	1 L
16	Pricing techniques	2 L
17	Financial functions and cost analysis in project planning and control	2 L
18	Structure of a Biotechnology Company	2 L
19	Start-up of Biotechnology Company	1 L

**References**

1. Entrepreneurship and Small Business Management: C.B. Gupta, S.S. Khanka, Sultan Chand & Sons.
2. Marketing Management, 14/E Philip Kotler Kevin Keller
3. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill  
 Management Fundamentals – Concepts, Application, Skill Development – RobersLusier – Thomson

**BBT 609: General Course VI; Elective; Option I- Scientific Writing  
General Course VI; 2 Credits**

**Total  
30 Hrs.**

**Technical and scientific writing skills**

The course will involve developing technical and scientific writing skills of students in clear and concise English. Students will select a relevant topic for which they will perform a literature search and write a review under the guidance of his tutor.

**Objectives:**

- To understand the technical ways of literature search
- To experience the mining of information relevant to the selected topic
- Learn to analyze and concise the information gathered on the selected topic in the form of review
- Building reading and writing skills

**Teaching methods:**

- Selection of a suitable topic of interest. Search the relevant literature on the topic and write a review article with assistance from the tutor/guide

**References:**

1. The Mayfield handbook of technical and scientific writing. Perelman LC, Paradis J., Barrett E. The McGraw Hill Publ.
2. Scientific writing: A reader & writer's guide. Jean Luc Lebrun. World Scientific Publ. 2014

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BVDU-RGITBT-M.Sc. Biotech.





# Bharati Vidyapeeth (Deemed to be University) Pune, India.



Hon'ble Dr. Patangrao Kadam  
M.A., LL.B., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Accredited with 'A+' Grade (2017) by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



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## NOTIFICATION NO. 894

It is hereby notified for the information of all concerned that the Academic Council, at its 55<sup>th</sup> meeting held on 26-3-2018, has resolved to approve the revised course structures, syllabi and rules of examinations of M.Sc. Biotechnology and M.Sc. Medical Biotechnology under Choice Based Credit System to be implemented from the academic year 2018-19.

Copies of revised course structures, syllabi and rules of examinations of M.Sc. Biotechnology and M.Sc. Medical Biotechnology under Choice Based Credit System are enclosed.

All the concerned may please note.

Ref. No. BVDU/2017-18/ 5333

Date: April 10, 2018

*G. Rajkumar*  
Registrar

To

1. The Dean, Faculty of Science, BVDU, Y. M. College, Pune 38
2. The Dean, Faculty of Interdisciplinary Studies, BVDU, College of Engineering, Pune 43
- ✓ 3. The Principal, BVDU Rajiv Gandhi Institute of IT and BT, Pune 43
4. The Controller of Examinations, BVDU.
5. The IT Cell for uploading in the Website.

Notification AC26-3-2018(55-5.7)



**BHARATI VIDYAPEETH DEEMED TO BE  
UNIVERSITY**

**PUNE**

**REVISED SYLLABUS FOR  
MASTER OF SCIENCE  
M.Sc. IN BIOTECHNOLOGY**

**UNDER  
FACULTY OF SCIENCE**

**SYLLABUS OF SEM I – SEM IV UNDER  
CHOICE BASED CREDIT SYSTEM**

**To be effective from Academic Year**

**2018-19**

Bharati Vidyapeeth Deemed to Be University is a multidisciplinary, multicampus university having 32 Institutions imparting quality education in various disciplines. All programmes of the University are approved by UGC and respective statutory councils. BVDU has been re accredited for the third time with 'A+' grade by NAAC in 2017. UGC has accorded 12B Status [UGC ACT1956] to the university. Ministry of Human Resource and Development, Government of India has awarded "A" category to the University in 2012 based on parameters including innovative programs, research and infrastructure facilities. The University is a member of Association of Indian Universities [AIU] which has ranked BVDU among top 10 universities of India for International students' enrollment. BVDU is also a member of International Association of Universities.

Rajiv Gandhi Institute of IT and Biotechnology is a constituent unit of BVDU established in 2003. The Institute is approved by UGC to conduct graduate and post graduate courses in Biotechnology. The Institute has excellent infrastructure, state-of-the-art laboratories and competent faculty facilitating appropriate learning environment. The Institute offers one undergraduate and four postgraduate programmes in Biotechnology.

## **INTRODUCTION**

The Master of Science (M.Sc.) in Biotechnology is a full time post graduate programme offered by Bharati Vidyapeeth Deemed to be University (BVDU) in its constituent unit Rajiv Gandhi Institute of IT and Biotechnology. The course was initiated in the year 2005 and was designed to facilitate empowerment of students to face cutting edge technological applications in biotechnology sector. The main advantage of proposing this course was availability of the expertise in biotechnology, health and environment disciplines on the same campus. The course received very encouraging response from all its stakeholders. On its implementation for 13 years, the curriculum is being revised to embrace newer emerging disciplines and value added courses. The revised M.Sc. Biotechnology is a full time 102 credits Programme to be implemented in Rajiv Gandhi Institute of IT and Biotechnology from the academic year 2017-18. The feedback of students, alumni, faculty, employers and parents has a substantial contribution in designing of this curriculum.

## **OBJECTIVES**

1. To impart deep knowledge of the discipline
2. Develop skills in relevant areas to enhance employment opportunities
3. Introduce emerging areas of pharma and biotech sector
4. Build interdisciplinary approach
5. Foster global competence among students
6. Inculcate social and moral values and sense of scientific responsibilities in students

## **ELIGIBILITY FOR ADMISSION TO THE COURSE**

Candidates satisfying following criteria are eligible to apply for M.Sc. Biotechnology Course

1. The candidate should have passed the Bachelors degree course in Biotechnology/ any branch of life science from the recognized university with minimum of 50% or 45% aggregate marks for open and SC / ST category respectively at graduate level university examination.
2. Subject to above conditions, the admission will be based on the merit at Entrance Examination conducted by Bharati Vidyapeeth Deemed to be University.

## **DURATION OF THE COURSE**

The course will be executed in four semesters. The medium of instruction and examination will be only English.

**RULES FOR THE COURSE**

1. The entire course is of 102 credits.
2. One credit for theory course is equivalent to 15 lectures/tutorials; while one credit for practical course is equivalent to 25 – 30 hrs. of lab /field work or demonstration.
3. The curriculum comprises of Core and Value Added courses. The Core Courses are compulsory where as Value Added are elective.
4. The Core Courses are aimed at providing fundamental knowledge of the discipline. The Value Added Courses intend to develop skills in relevant Biotechnology Industry sector.
5. The teaching schedule for the 3 credits and 2 credits theory courses will be 3 and 2 lectures per week respectively. All courses will have one tutorial fortnightly.
6. The respective elective course will be implemented only if more than 10 students enroll for that course.
7. Some of the core courses in Semester I and Semester II are common in two master's programmes; M.Sc. Biotechnology and M.Sc. Medical Biotechnology.
8. The teaching and evaluation for these courses will be combined for both disciplines.
9. The shared courses are coded as MBT&MedBT whereas the courses which are exclusive for M.Sc. Biotechnology are coded as MBT
10. All core courses will be evaluated by University Examination. The elective courses will be evaluated by Continuous Assessment.
11. Two extra credits will be awarded to students if there is any significant outcome of their dissertation study. The research outcome in terms of publication in indexed national/International journal; filing of patent; or commercialization of technology will be considered for the award of credits.

**RULES FOR EXAMINATION****A: Nature of Examination:**

1. Each course will have 40% marks for internal assessment and 60% marks for semester-end examination.
2. The assessment for 1, 2, 3 and 4 Credits courses will be as given in following table

Table 1: Evaluation pattern for one to four Credit Courses

Course Credits	Marks for UE (60% Weightage)	Marks for IE (40% weightage)	Total Marks for evaluation
1	15	10	25
2	30	20	50
3	45	30	75
4	60	40	100

- The duration of 60 Marks UE theory paper will be 3.00 Hrs; for 45 Marks 2.00 Hrs and for 30 Marks 1.30 Hrs. respectively.
- The Internal Assessments (IA) will be conducted by the Institute and an end-of-the term University Examination (UE) conducted by the university. The UE will be based on the entire syllabus.
- The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course.

#### STANDARD OF PASSING

**A: Grading System:** A 10-point absolute grading system will be adapted for grading in each head of passing. The system will have seven grade points, the highest being 10. The grading system shall be as shown in Table-2 below. The performance indicators O, A+, A, B+, B, C, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, Satisfactory, and Poor.

Table-2: The grading system under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} \leq 80$	9	A+
$60 \leq \text{Marks} \leq 70$	8	A
$55 \leq \text{Marks} \leq 60$	7	B+
$50 \leq \text{Marks} \leq 55$	6	B
$40 \leq \text{Marks} \leq 50$	5	C
$\text{Marks} < 40$	0	D

1. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table-2) shall be the GPA for the course.**
2. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses up to and including the current semester. The CGPA of a student when he/she completes the programme is his/her final result.
3. The SGPA is calculated by the formula ,  $SGPA = \frac{\sum Ck \times GPAk}{\sum Ck}$  where  $Ck$  is the credit-value assigned to a course and  $GPAk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**
4. The CGPA is calculated by the formula ,  $CGPA = \frac{\sum Ck \times GPAk}{\sum Ck}$  where  $Ck$  is the credit-value assigned to a course and  $GPAk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**
5. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result grace marks of 1, 2 or 3 may be awarded to a candidate at UE as per the university rules. **B: Standards of Passing and ATKT rules:**

**1.** For all Core Courses, both UE and IE constitute separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits

- (a) the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA;

**OR**

(b) If he/she fails in IA, then also the learner passes in the course, **provided that a minimum of 25% is obtained in IA and GPA for the course is at least 6.0 (50%marks ) in aggregate.** The GPA for a course will be calculated only if the learner passes in that course.

1. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP. **A student who passes in aggregate in a course need not reappear even if he failed at IA if he/she obtains 25% at IA.**
2. The students of Semester I and II & III will be admitted to next Semester even if he/she gets backlog in any of the course. They can reappear in the next semester examination as a backlog candidate.

#### C: AWARD OF HONOURS:

1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade and CGPA only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 3.

**Table 3: Criteria for the award of honours at the end of the programme**

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq CGPA \leq 10.00$	O	Outstanding	$80 \leq Marks \leq 100$
$9.00 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks \leq 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks \leq 70$
$7.00 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks \leq 60$
$6.00 \leq CGPA \leq 6.99$	B	Average	$50 \leq Marks \leq 55$
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory	$40 \leq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks below 40



**THE FORMAT OF THE TRANSCRIPTS**

The transcripts may be acquired by the students indicating his/her performance in every semester examination. The transcript shall show the performance indicators given in the following table, in addition to any other information.

Course Number	Course Description	Number of Credits	University Examination		IA/CA		Grade Point Average (GPA)	Result
			Grade	Grade Point	Grade	Grade Point		
Total Cumulative Credits Completed		SGPA	CGPA	Equivalent Marks (%)	<b>Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be GPA</b>			

**PATTERN FOR ASSESSMENT****A: Pattern of Evaluation for Internal Assessment of Theory Courses:**

The weightage for Internal Assessment is 40%. Students for IA of every theory course will be assessed for total of 30 marks for 3 credit course and for 20 marks for 2 credit course which will be cumulative marks obtained in two separate assessments specified below.

1. Two internal written examinations of 15 marks each for 3 credit course and 10 marks each for 2 credit course. A total of the two tests will be considered.
2. An optional assignment/ oral/ open book examination may be undertaken if desired.

**B. Pattern of Evaluation for Internal Assessment of Practical Courses:**

The Internal Assessment for every practical course will be of 20 Marks for 2 credits and 40 marks for 4 credits practical courses. The students for IA will be assessed on the basis of;

1. Performance for every practical: 10 Marks/20 Marks for 2/4 Credits practical courses respectively. (Marks to be distributed depending on total number of practicals)
2. Assignment/ Oral examination/Tour Report: 10/20 Marks for 2/4 Credits courses

**C: Pattern of question paper at University Examination**

University Examination for 3 credit and 2 credit theory course will be of 45 marks and 30 marks respectively. **For 3 credit course**, the question paper will comprise of 6 questions, 3 questions each in section I and section II. Q1 of section I will be of 6 marks while Q2 and Q3 will be of 8 marks each. Q 4 of section II will be of 7 marks while Q 5 and Q6 will be of 8 marks each. All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 3 Credit Course of university theory examination of M.Sc. Biotechnology 2018 CBCS Course** (Total Marks:45, Tme:2.00 Hrs.)

**Instructions to Paper Setter:**

- I. Question paper of each course will comprise of total 6 questions,
- II. Section I will have 3 questions and Section II 3 questions.
- III. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
- IV. Q. no 1 will be objective, comprising of 7 questions of 1 mark each. They will be based on entire portion of Section I. Students will have to attempt any 6 out of these.
- V. Q no 4 will be objective, comprising of 8 questions of 1 mark each. They will be based on entire portion of Section II. Students will have to attempt any 7 out of these.
- VI. Questions 2 & 3 of **Section I** and 5 & 6 of **Section II** will be descriptive and contain 3 sub-questions of 4 marks each out of which students will attempt any two.

- VII. Q 2 and 3 will be based solely on Unit I and II whereas Q 5 and 6 will be based on Unit III and IV of the syllabus respectively.
- VIII. Students will attempt answers to Section I and Section II in separate answer books

**SECTION I**

**Q. 1** Attempt **Any Six** of the following (06)

- a
- b
- c
- d
- e
- f
- g

**Q. 2** Attempt **Any Two** of the following (08)

- a
- b
- c

**Q. 3** Write short notes on **Any Two** of the following (08)

- a
- b
- c

**SECTION II**

**Q. 4** Attempt **Any Seven** of the following (07)

- a
- b
- c
- d
- e
- f
- g
- h

**Q. 5** Attempt **Any Two** of the following (08)

- a
- b
- c

**Q. 6** Write short notes on **Any Two** of the following (08)

- a
- b
- c

Question Paper Pattern for 2 Credits Theory Course at University Examination

For 2 credit course, the question paper will comprise of 4 questions, 2 questions each in section I and section II. Q1 of section I and Q3 of section II will be of 7 marks each while Q2 and Q4 will be of 8 marks each. All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 2 credit course of university theory examination of M.Sc. Biotechnology 2018 CBCS Course**  
(Total Marks:30, Tme:1.50 Hrs.)

**Instructions to Paper Setter:**

- IX. Question paper of each course will comprise of total 4 questions,
- X. Section I will have 2 questions and Section II 2 questions.
- XI. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
- XII. Questions 1 of section I and 3 of section II will be objective, and contain 8 questions of 1 mark each out of which students will attempt any 7. They will be based on entire portion of Section I and section II respectively.
- XIII. Questions 2 of **Section I** and 4 of **Section II** will be descriptive and contain 3 sub-questions of 4 marks each out of which students will attempt any two.
- XIV. Q 2 and 4 will be based solely on Unit I and II of the syllabus respectively..
- XV. Students will attempt answers to Section I and Section II in separate answer books

**SECTION I**

**Q. 1** Attempt **Any Seven** of the following (07)

- a
- b
- c
- d
- e
- f
- g
- h

**Q. 2** Attempt **Any Two** of the following (08)

- a
- b
- c

**SECTION II**

**Q. 3** Attempt **Any Seven** of the following (07)

- a
- b
- c
- d

- e
- f
- g
- h

Q. 4 Attempt **Any Two** of the following (08)

- a
- b
- c

D: Pattern for question paper of University Practical Examination of M.Sc. Biotechnology 2018  
CBCS Course

(Total Marks:30/60 for 2/4 credit courses, Time: 3 .00/6.00 Hrs.)

Q. 1	Major Practical	(10/20)
Q. 2	Spotting/Minor Experiment	(10/20)
Q. 3	Viva	(05/10)
Q. 4	Journal	(05/10)

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Course structure of M.Sc. Degree Course in Biotechnology  
Under Choice Based Credit System

## SEMESTER I

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT&amp;MedBT 101</b> Core Course-Theory	Microbiology	<b>3</b>	40	60	
<b>MBT&amp;MedBT 102</b> Core Course –Theory	Biochemistry	<b>3</b>	40	60	
<b>MBT&amp;MedBT 103</b> Core Course –Theory	Cell & Developmental Biology	<b>3</b>	40	60	
<b>MBT&amp;MedBT 104</b> Core Course –Theory	Genetics	<b>3</b>	40	60	
<b>MBT&amp;MedBT 105</b> Core Course –Theory	Molecular Biology	<b>3</b>	40	60	
<b>MBT&amp;MedBT 106</b> Core Course –Practical	Biochemistry & Molecular Biology Lab	<b>4</b>	40	60	
<b>MBT&amp;MedBT 107</b> Core Course –Practical	Cell Biology & Genetics Lab	<b>4</b>	40	60	
<b>MBT&amp;MedBT 108</b> Core Course –Practical	Microbiology Lab	<b>2</b>	40	60	
					<b>25</b>

**SEMESTER II**

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT&amp;MedBT 201</b> Core Course –Theory	Genetic Engineering	<b>3</b>	40	60	
<b>MBT&amp;MedBT 202</b> Core Course –Theory	Analytical Biotechnology	<b>3</b>	40	60	
<b>MBT&amp;MedBT 203</b> Core Course –Theory	Immunology	<b>3</b>	40	60	
<b>MBT&amp;MedBT 204</b> Core Course –Theory	Genomics & Proteomics	<b>3</b>	40	60	
<b>MBT&amp;MedBT 205</b> Core Course - Theory	Nanobiotechnology	<b>2</b>	40	60	
<b>MBT 206</b> Core Course -Theory	Animal Tissue Culture	<b>2</b>	40	60	
<b>MBT&amp;MedBT 207</b> Core Course –Practical	Genetic Engineering and Genomics Lab	<b>4</b>	40	60	
<b>MBT&amp;MedBT 208</b> Core Course –Practical	Analytical Techniques and Proteomics Lab	<b>4</b>	40	60	
<b>MBT&amp;MedBT 209</b> Core Course - Practical	Immunology & Nanotechnology Lab	<b>4</b>	40	60	
<b>MBT&amp;MedBT 210</b> Elective Course I	Bioentrepreneurship/ IPR I	<b>2</b>	Continuous Assessment		
					<b>30</b>

**Elective Courses in Sem II:**

- 1) MBT 210: Elective Course I; Option I: Bioentrepreneurship, Option II: IPR I**

## SEMESTER III

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT 301</b> Core Course –Theory	Environmental Biotechnology	3	40	60	27
<b>MBT 302</b> Core Course –Theory	Plant Biotechnology	3	40	60	
<b>MBT 303</b> Core Course –Theory	Microbial Technology	3	40	60	
<b>MBT 304</b> Core Course –Theory	Food Biotechnology	2	40	60	
<b>MBT&amp;MedBT 305</b> Core Course-Theory	Biostatistics	2	40	60	
<b>MBT&amp;MedBT 306</b> Core Course-Theory	Research Methodology	2	40	60	
<b>MBT 307</b> Core Course-Practical	Environment & Plant Biotech Lab	4	40	60	
<b>MBT 308</b> Core Course-Practical	Microbial & Food Biotech Lab	4	40	60	
<b>MBT 309</b> Core Course-Practical	Biostatistics Lab	2	40	60	
<b>MBT&amp;MedBT 310</b> Elective Course II	Biomedical Waste Management/ Drug designing/ IPR II	2	Continuous Assessment		

Elective Courses in Sem III:

1) MBT 310: Elective Course I; Option I: Biomedical Waste Management, Option II: Drug designing, Option III: IPR II

## SEMESTER IV

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT 401</b> Core Course	Research Project	20	40	60	20

Total Credits Offered: 25 C, Sem I+ 30 C, Sem II +27 C, Sem III+ 20C, Sem IV = 102 C



SEMESTER I

<b>MBT&amp;MedBT 101: Microbiology</b>		<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>		<b>45L</b>
<b>UNIT I</b>		
<b>1</b>	Microbial diversity: Bacteria Archaea	<b>3</b>
<b>2</b>	Cell structure and functions of bacteria.	<b>3</b>
<b>3</b>	Cell structure and functions of archaea and fungi.	<b>4</b>
<b>UNIT II</b>		
<b>4</b>	Microbial growth: Growth kinetics, cytokinesis, factors affecting growth of microorganisms.	<b>4</b>
<b>5</b>	Growth on different environment Extremophiles and their adaptations	<b>3</b>
<b>6</b>	Anaerobic microorganisms, cultivation and applications.	<b>3</b>
<b>UNIT III</b>		
<b>7</b>	Microbial interactions: Symbiotic interactions, parasitism, ammensalism and competition;	<b>5</b>
<b>8</b>	Microbial flora of healthy human host: Distribution and occurrence of normal flora in humans	<b>5</b>
<b>9</b>	Microbial pathogenesis: Host-microbe interactions; Bacterial, fungal and protozoalpathogenesis in humans.	<b>4</b>
<b>UNIT IV</b>		
<b>10</b>	Effect of Antimicrobial drugs: on bacterial, fungal and viral pathogens	<b>4</b>
<b>11</b>	Virology: Diversity, Classification of virus, Cytopathic effect of virus	<b>3</b>
<b>12</b>	Taxonomy, Molecular methods, Bergey's manual of systematic bacteriology.	<b>4</b>

**References**

1. Brock Biology of Microorganisms 13<sup>th</sup>eds, , Michael T. Madigan
2. Prescott's Microbiology, 9<sup>th</sup>eds, Joanne M. Willey
3. Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY
4. General Microbiology - Stanier R.Y., 5th edition, (1987) Macmillan Publication UK.
5. Introduction to Microbiology, 2nd Edn. Ingraham, J. L. and Ingraham C. A., Thompson Asia Pvt. Ltd., Singapore (2002).

<b>MBT&amp;MedBT 102: Biochemistry</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I: Biomolecules structure, functions</b>	
<b>1 Introduction:</b> Scope and importance of biochemistry in biotechnology.	<b>1</b>
<b>2 Carbohydrates, lipids and proteins -</b> Structure, properties and biological role (functions) of carbohydrates, Proteins and lipids. Protein structure and Lectins- overview. Lipids and cell membranes – types of membrane lipids, phospholipids and glycolipids from bimolecular sheets. Monoglycerides and diglycerides- structure, properties and applications.	<b>7</b>
<b>3 Hydrolytic products of polysaccharides &amp; their applications.</b> Bulk production of Malt, peptides, malto-dextrin, glue.	<b>3</b>
<b>UNIT II: Metabolism</b>	
<b>4 Metabolism of carbohydrates and protein-</b> Glycolysis, Glucogenesis, Citric acid cycle and Glycogen metabolism. Protein turnover and Amino acid catabolism, Biosynthesis of amino acids, urea cycle. Biosynthesis of carbohydrate and proteins-overview	<b>5</b>
<b>5 Fatty acid metabolism and nucleic acid metabolism-</b> Overview of Fatty Acid Metabolism, synthesis and degradation of fatty acids, De novo synthesis of Nucleotides	<b>4</b>
<b>6 Oxidative phosphorylation and photophosphorylation</b> Oxidative Phosphorylation – regulation – light reactions of Photosynthesis	<b>3</b>
<b>UNIT III: Enzymology</b>	
<b>7 Introduction to enzymes-</b> Classification of enzymes, specificity of enzyme action – monomeric and oligomeric enzymes. Allosteric enzymes. Structural Components of Enzymes – apoenzymes, prosthetic group, cofactors,	<b>4</b>
<b>8 Mechanisms of reactions catalysed by enzymes –</b> Metal activated enzymes – metalloenzymes –involvement of co enzymes, Enzyme Inhibition	<b>4</b>
<b>9 Biotechnological applications of enzymes</b> in various industries like fruit juice extraction, leather processing, Meat tenderization, Baking and dairy industry.	<b>3</b>
<b>UNIT IV: Techniques</b>	
<b>10 Free and immobilised enzyme kinetics-</b> Rationale and Methods of immobilization of enzymes: covalent coupling, cross-linking and entrapment methods. Properties of immobilized enzymes, Whole cell immobilization, Advantages of immobilization, Types of Carriers,. Applications of Immobilized enzymes: Production of High fructose corn syrup, invert sugar, synthetic penicillin.	<b>4</b>
<b>11 Chromatography-</b> Principle, types- gel, affinity, ion exchange, applications	<b>3</b>
<b>12 Electrophoresis</b> Principle of separation, factors affecting separation, types - paper, agarose gel, PAGE, 2D- gel electrophoresis, western blotting	<b>4</b>
<b>References</b>	
1. Biochemistry by Jeremy M.Berg, John L.Tymozko, Lubert Stryer, 5th Eds,	
2. Lehninger Principles of Biochemistry Edition 4, Nelson, David L. Cox, Michael M. Lehninger, Albert L. W, H Freeman & Co	
3. Student Companion to Accompany Biochemistry, Richard I. Gumpport, Jeremy M. Berg, Nancy Counts Gerber, Frank H. Deis, Jeremy Berg, W H Freeman & Co	
<b>MBT&amp;Med BT 103: Cell &amp; Developmental Biology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Structure of cell</b><br>Structure of cell organelles: Endoplasmic reticulum, mitochondria, golgi apparatus, lysosomes, chloroplast, nucleus, cell wall. Comparison of prokaryotic and eukaryotic cells | <b>6</b> |
| <b>2</b> | <b>Cytoskeleton:</b> Organization and functions cytoskeleton, Actin filaments, actin binding proteins, Intermediate filaments, Microtubules, Structure and functions of cilia and flagella.                | <b>5</b> |

**UNIT II**

- |          |  |          |
|----------|--|----------|
| <b>4</b> | <b>Plasma Membrane:</b><br>Plasma membrane structure and functions, membrane models, Transport across membrane- passive diffusion, osmosis, active transport, Ion Channels, Na <sup>+</sup> and K <sup>+</sup> pump, Ca <sup>2+</sup> ATPase pump, co-transport, symport, antiport, endocytosis and exocytosis. Membrane vesicle trafficking | <b>7</b> |
| <b>5</b> | <b>Specialized Cells (Muscle &amp; Nerve cells):</b><br>Structure & functions of muscles (Straited, nonstraited and cardiac). Structure of neuron, Neurotransmitters and their receptors   | <b>4</b> |

**UNIT III**

- |          |   |          |
|----------|---|----------|
| <b>6</b> | <b>Cell – Cell Interactions</b><br>Cell adhesion molecules, cadherins, Integrins, transmembrane proteoglycanc, Claudins and occludens, gap junctions, tight junctions, adherens, desmosomes and hemidesmosomes, plasmodesmata | <b>3</b> |
| <b>7</b> | <b>Cell Cycle</b><br>Molecular events of cell division and cell cycle, regulation of cell cycle events- Cyclins, Cyclin dependent kinases, inhibitors. Apoptosis and necrosis.  | <b>2</b> |
| <b>8</b> | <b>Cell Signaling</b><br>General principles of cell signaling, signaling via G-protein coupled receptors, kinase receptors, role of secondary messengers.   | <b>6</b> |

**UNIT IV**

- |           |   |          |
|-----------|---|----------|
| <b>9</b>  | <b>Developmental Biology</b><br>Gametogenesis (Spermatogenesis, Oogenesis), Meiosis and its significance, types of eggs, fertilization and implantation, types and patterns of cleavage, Blastulation | <b>5</b> |
| <b>10</b> | <b>Stages of fetal development</b><br>Gastrulation in Frog, Germ layer formation, fetal membranes, placenta formation in mammals  | <b>4</b> |
| <b>11</b> | <b>Concept of dedifferentiation, redifferentiation, transdifferentiation and regeneration</b>   | <b>3</b> |

**References**

1. Alberts, B., Bray, D., Lewis, J., Raf, M., Roberts, K., Watson, J.D. (1994). Molecular Biology of the Cell
2. Cooper, G.M. (1997). The Cell: A molecular approach, ASM Press, USA.
3. Hallwell, B., Gutteridge, J.M.C. (2002). Free Radicals Biology and Medicine. Oxford Press.UK.

4. Karp, G. (1996). Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.
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8. Human Embryology and Developmental Biology, Author: Carlson, Bruce M.Edition: 3, Publisher: Elsevier - Health Sciences Division ISBN-13: 9780323014878.
9. Balinsky : introduction to Embryology (CBS College Publishers)
10. Subramanyan, T : Developmental Biology (Narosa Publishing House) Arumugam N.A. text book of embryology (Saras publication)

<b>MBT&amp;Med BT 104: Genetics</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Overview of genetics:</b>	<b>5</b>
Genes and Expression, Allele, multiple alleles, pseudoallele, complementation tests, Genetic variation, Molecular basis of allelic variation. Methodologies used in genetic studies, Model organisms. Genes-Environment interaction.	
<b>2 Modes of inheritance:</b> Mendelian and Non Mendelian Inheritance: Lethal alleles, Epistasis, Penetrance and expressivity, Pleiotropy, Phenocopies, mitochondrial inheritance	<b>6</b>
<b>UNIT II</b>	
<b>3 Structure and function of human chromosome:</b>	<b>3</b>
Ultra structure of human chromosome, Classification of chromosomes, Sex chromosome, Origin of Y chromosome, SRY genes and its effects. Dosage compensation	
<b>4 Human chromosomal Abnormalities:</b> Aneuploidy and Structural, associated syndromes	<b>4</b>
<b>5 Pedigree analysis of human:</b>	<b>2</b>
X linked and autosomal disorders. Linkage maps, Lod scores to assess linkage in human pedigrees	
<b>6 Diagnostics:</b> Prenatal diagnosis, Karyotype analysis, FISH, Genetic counseling	<b>3</b>
<b>UNIT III</b>	
<b>7 Population genetics:</b> Population genetics – Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.	<b>5L</b>
<b>8 Brain, Behavior and Evolution:</b>	<b>6L</b>
Approaches and methods in study of behavior; Proximate and ultimate causation; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism; Neural basis of learning, memory, cognition, sleep and arousal; Biological clocks; Development of behavior; Social communication; Social dominance; Use of space and territoriality; Mating systems, Parental investment and Reproductive success; Parental care; Aggressive behavior; Habitat selection and optimality in foraging; Migration, orientation and navigation; Domestication and behavioral changes.	
<b>Unit IV</b>	
<b>9 Cancer genetics;</b> genetic control of cell cycle, mutations that prevent normal checkpoints, inherited cancer syndromes, cancers acquired due to chromosomal abnormalities	<b>6L</b>
<b>10 Reproductive Technologies</b>	<b>5L</b>
<b>References:</b>	
1. Human genetics: Concepts and applications. Ricky Lewis. 11 <sup>th</sup> Ed. Mc Graw – Hill Higher Education Inc Publ 2015	
2. Essential genetics, A genomics perspective. Daniel L. Hartl. 6 <sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014	

3. Human molecular genetics, 4<sup>th</sup> Ed. T Strachan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010
4. Human Genetics. A Gardner, T. Davies. 2<sup>nd</sup> Ed. Springer Verlag Publ 2010.

<b>MBT&amp;Med BT 105: Molecular Biology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Genomes and its content</b>	<b>8</b>
Basic concepts, flow of information transfer, genetic code, types of mutations	
Genome sizes of different organisms, C Value	
Gene families, clusters, pseudogenes, super-families, organelle genomes	
Organization of prokaryotic genome, Structure of nucleosome and organization of chromatin, structure of chromosome, centromere and telomere	
<b>UNIT II</b>	
<b>2 DNA replication &amp; repair</b>	<b>6</b>
DNA polymerases, mechanism of replication in prokaryotes and eukaryotes, DNA damage, Mechanisms of DNA repair in prokaryotes and eukaryotes,	
<b>3 Homologous and site specific recombination</b>	<b>4</b>
Insertion elements	<b>3</b>
<b>UNIT III</b>	
<b>4 Transcription and posttranscriptional mechanisms</b>	<b>12</b>
RNA polymerase and mechanism of prokaryotic transcription	
Eukaryotic RNA polymerases and their promoters, activating transcription, role of enhancers, gene silencers, CpG Islands, post transcriptional modifications, RNA splicing reactions, catalytic RNA, Regulatory RNA, MicroRNAs & RNA interference	
<b>Unit IV</b>	
<b>5 Translation</b>	<b>7</b>
Mechanism of translation in prokaryotes and eukaryotes, post translational modifications, transport of proteins, role of chaperons	
<b>6 Gene regulation</b>	<b>5</b>
Operon, Induction and repression, positive and negative regulation, attenuation, lactose, arabinose and tryptophan operon, Eukaryotic transcription regulation	
<b>7 Epigenetic effects</b>	<b>2</b>
Heterochromatin nucleation, Chromatin remodeling, epigenetic inheritance, genomic imprinting.	
<b>References:</b>	
1. Human genetics: Concepts and applications. Ricky Lewis. 11 <sup>th</sup> Ed. Mc Graw – Hill Higher Education IncPubl 2015	
2. Essential genetics, A genomics perspective. Daniel L. Hartl. 6 <sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014	
3. Human molecular genetics, 4 <sup>th</sup> Ed. T Stranahan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010	
4. Human Genetics. A Gardner, T. Davies. 2 <sup>nd</sup> Ed. Springer Verlag Publ 2010.	

**MBT&Med BT 106: Biochemistry & Molecular Biology Lab****Core Course –Practical; 4 Credits****Biochemistry Lab**

- |   |  |   |
|---|--|---|
| 1 | To prepare an Acetic - Na Acetate Buffer system and validate the Henderson-Hasselbach equation.  | 2 |
| 2 | To determine an unknown protein concentration by plotting a standard graph of BSA using UV-Vis Spectrophotometer and validating the Beer- Lambert's Law.   | 2 |
| 3 | Titration of Amino Acids and separation of aliphatic, aromatic and polar amino acids by TLC.   | 2 |
| 4 | AN ENZYME PURIFICATION THEME (such as E.coli Alkaline phosphatase or any enzyme of choice).<br>(a) Preparation of cell-free lysates<br>(b) Ammonium Sulfate precipitation<br>(c) Ion-exchange Chromatography<br>(d) Gel Filtration<br>(e) Affinity Chromatography<br>(f) Generating a Purification Table | 6 |
| 5 | Enzyme Kinetic Parameters: Km, Vmax and Kcat   | 3 |
| 6 | Assessing purity by SDS-PAGE Gel Electrophoresis   | 2 |
| 7 | Estimation of diagnostic markers- glucose, urea  | 3 |

**Molecular Biology Lab**

- |    |   |   |
|----|---|---|
| 1  | Understanding of basic principles, equipments and molecular biology grade reagents, Preparation of buffers and reagents | 1 |
| 2. | Isolation of DNA from bacteria and eukaryotic cells, blood & plant  | 5 |
| 3. | Analysis of DNA preparations by UV spectrometry and agarose gel electrophoresis   | 2 |
| 4. | Isolation and estimation of RNA from bacteria/yeast/eukaryotic cells  | 2 |
| 5. | Amplification of DNA by PCR   |   |
| 6. | Evaluation of gene expression using Real Time PCR (Demonstration)   | 2 |
| 7. | DNA sequencing (Demonstration)  | 1 |

**References:**

1. Sambrook J and Russell D. (2011) Molecular cloning A Laboratory Manual 3rd Ed, Cold spring harbor laboratory press, New York.
2. Wilson K. and Walker J. (2005) Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, New York.



**MBT&Med BT 107: Cell Biology & Genetics Lab****Core Course –Practical; 4 Credits****Cell Biology Lab**

1	Study of mitosis with onion root tip chromosomes	1
2	Observation of permanent slides of meiosis	1
3	Temporary preparation of Polytene chromosomes from Chironomus salivary gland	2
4	Isolation of nuclei from rat liver	2
5	To determine Erythrocyte ( <i>RBC</i> ) & Leucocytes ( <i>WBC</i> ) count of a blood sample	2
6	Chlorophyll estimation: Spectrum and light scatter	1
7	Study of frog development, observation of frog embryo of different development stages	2
8	Study of eggs and sperms from animal samples	2

**Genetics Lab**

1	Planting of blood culture	1
2	Preparation of chromosome spreads from lymphocyte culture	2
3	Banding of metaphase slides	1
4	Karyotyping and analysis	1
5	Isolation and staining of lampbrush chromosomes	2
6	Cultivation of drosophila and study of Mendelian inheritance	5
7	Demonstration of cytogenetic analysis using FISH	1

**References:**

1. Development Biology, 9th edition, (2010), Gilbert S.F.(Sinauer Associates, (USA)
2. Principles of Development, 4th edition (2010), Wilbert L and Tickle C, Publisher: Oxford University Press, USA.
3. Developmental Biology Laboratory Manual. S.R. Scadding and S. Frombach. 5<sup>th</sup> Ed.
4. Essential genetics, A genomics perspective. Daniel L. Hartl. 6<sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014
5. Human molecular genetics, 4<sup>th</sup> Ed. T Strachan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010
6. Human Genetics. A. Gardner, T. Davies. 2<sup>nd</sup> Ed., Springer VerlagPubl, 2010

**MBT&MedBT 108: Microbiology Lab****Core Course – Practical; 2 Credits**

1	Microscopy	2
2	Isolation of thermophile / halophile from soil, (media preparation, serial dilution, spread plating, streaking, staining and microscopy)	3
3	Checking the purity of pharmaceutical samples.	3
4	Use of differential media for isolation of various bacteria	2
5	Isolation of fungi from soil / clinical samples	2
6	Isolation of actinomycetes from soil/ water samples.	2
7	Cultivation of lactiobacillus under anaerobic condition	2
8	Antibiotic susceptibility testing	2
9	Ames test	2

**References:**

1. Brock Biology of Microorganisms 13<sup>th</sup>eds, , Michael T.Madigan
2. Prescott's Microbiology, 9<sup>th</sup>eds, Joanne M. Willey
3. Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY
4. General Microbiology - Stanier R.Y., 5th edition, (1987)Macmillan Publication UK.
5. Introduction to Microbiology, 2nd Edn. Ingraham, J. L. and Ingraham C. A., Thompson Asia Pvt. Ltd., Singapore (2002).

SEMESTER II

<b>MBT&amp;Med BT 201: Genetic Engineering</b>		<b>Total</b>
<b>Core course- Theory; 3 credits</b>		<b>45L</b>
<b>UNIT I : Fundamental techniques and Vectors</b>		
1	Restriction-modification systems, Various enzymes in gene manipulation: nucleases, polymerases, kinases, phosphatases, ligases.	1
2	Cohesive and blunt end ligation	1
3	Plasmid based vectors (pBR and pUC)	1
4	λ based vectors	1
5	Cloning vectors for eukaryotes	2
6	Special purpose vectors e.g. expression vectors, tag vector	3
7	DNA labelling methods	1
8	Different methods to introduce recombinant DNA into host cell	1
<b>UNIT II : Gene cloning and Sequencing</b>		
9	Construction of genomic and cDNA library	1
10	Library screening methods (hybridization and immunochemical methods)	1
11	Polymerase chain reaction and its types e.g. real time PCR, multiplex PCR Reverse transcriptase PCR, Inverse PCR, Nested PCR	3
12	DNA sequencing- Maxam-Gilbert method, Sanger's Dideoxy chain termination method, Automated DNA sequencing method.	3
13	Pyrosequencing- microarrays technology	2
14	Human genome sequencing	1
15	Genetic and Physical mapping techniques	1
<b>UNIT III: Gene Expression and Mutagenesis</b>		
16	Tools for analyzing gene expression: Reporter genes, Analysis of gene regulation, Techniques for transcript analysis	3
17	Techniques for analysis of translation product	1
18	Introduction to si RNA technology: principle and applications	2
19	Micro RNA and detection methods	1
20	Differential gene expression, Protein-protein interactions: phage-display, yeast two-hybrid system	2
21	Mutagenesis techniques	1
22	Nucleic acid hybridization assays and micro-assays	2
<b>Unit IV : Applications</b>		
23	Production of recombinant proteins from pro and eukaryotic hosts	2
24	Expression of industrially important products	1
25	Electrophoretic methods for mutation detection: SSCP, hetero-duplex analysis, DGGE MCC (Mismatch Chemical Cleavage), ASA (Allele Specific Amplification), PTT (Protein Truncation Test)	3
26	Gene therapy – ex vivo, in vivo, gene delivery systems, viral and non viral	3
27	Bio-pharming	1

**References:**

1. Brown T. A., 7<sup>th</sup> edition (2016), Gene cloning and DNA analysis, Blackwell publishing, UK
2. Primrose S., Twyman R. M. , 8<sup>th</sup> edition (2016), Principles of Gene Manipulation and Genomics, Blackwell Publishing, UK
3. Nicholl D. S. T., 2<sup>nd</sup> edition (2002), Introduction to Genetic Engineering, Cambridge University Press, UK

4. Channarayappa (2006), Molecular Biotechnology: Principles and Practices, University Press, New Delhi, India
5. Watson J. and Stephen, 7<sup>th</sup> edition (2014), Molecular biology of the gene, Pearson, US
6. From Genes to Genomes, 2nd edition, (2008), J.Dale and M.Schantz, John Wiley & Son Ltd.USA
7. From Gene to Clones ; Introduction to gene technology, 4th edition, (2003), E. Winnacker, Panima Publisher, India
8. Molecular Biology Problem solver: A laboratory guide (2004), A. Gerstein, A John Wiley & Sons, Inc., Publication, USA

<b>MBT&amp;Med BT 202: Analytical Biotechnology</b>		<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>		<b>45L</b>
<b>UNIT I</b>		
1	<b>Introduction:</b> Scope and importance of various techniques in biotechnology. The goal of structural biology.	2
2	<b>Cell disruption methods:</b> physical and chemical	2
3	<b>Filtration techniques:</b> Gross filtration, steri-pad filtration, membrane filtration (macro-filtration, micro-filtration, ultra-filtration), reverse osmosis, dialysis, their applications in industry. Merits and limitations	5
<b>UNIT II</b>		
4	<b>Centrifugation-</b> Table top, high speed, microfuge, refrigerated, ultra, density gradient centrifugation, applications in biotech industry.	3
5	<b>Microscopy:</b> Structure and working of bright field and dark field microscopes. Principle, working and applications of phase contrast microscope,	4
6	<b>Advance microscopy:</b> confocal microscopy, fluorescence microscope, electron microscope, atomic force microscopy,	4
<b>UNIT III</b>		
7	<b>Biophysical methods:</b> Analysis of biomolecules using UV/visible spectrophotometer, fluorescence, circular dichroism	4
8	NMR and ESR spectroscopy, structure determination using X-ray diffraction	3
9	Different types of mass spectrometry, MALDI-TOF and surface plasma resonance methods.	4
<b>Unit IV</b>		
10	<b>Radio labeling techniques:</b> Properties of different types of radioisotopes normally used in biology, their detection and measurement; safety guidelines. Incorporation of radioisotopes in biological tissues and cells. Molecular imaging of radioactive material	3
11	<b>HPLC-</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control	4
12	<b>GC:</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control	4
<b>References:</b>		
1.	Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).	
2.	Analytical Biotechnology, C. van Dijk, Elsevier Science, The Netherlands,	
3.	Analytical Biotechnology, Thomas G.M. Schalkhammer, Springer Basel AG, 2002	
4.	Analytical Biochemistry & Separation Techniques, Dr. P. Palanivelu, IV Edition - Lab manual (IV Edition, 2009), Twenty first Century Publications	
5.	Techniques and Methods in Biology, Ghatak K.L. Prentice Hall India Learning Private Limited (2011)	

<b>MBT&amp;Med BT 203: Immunology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I : Introduction</b>	
<b>1 Immunity</b> – Types of Immunity, components of Innate and Acquired Immunity Cells and organs of immune system, Antigen presenting cells, endogenous and exogenous pathways of antigen presentation, presentation of non-peptide antigens	<b>4</b>
<b>2 Antigens</b> - Immunogenicity versus Antigenicity, Factors that influence immunogenicity, Epitopes - Properties of B-cell epitopes and T-cell epitopes, haptens and adjuvants, Antigen engineering-Increasing Immunogenicity	<b>3</b>
<b>3 Antibodies</b> - Basic structure of Immunoglobulins - The role of multiple myeloma in understanding Ig structure, domains-variable and constant region, Immunoglobulin classes and functions, application and engineering of monoclonal antibodies	<b>3</b>
<b>UNIT II : Lymphocyte ontology</b>	
<b>4 B- cell maturation, activation and differentiation</b> Antigen dependant and antigen independent stages of B- cell maturation, B-cell activation and proliferation by Thymus independent and Thymus dependant antigens, B-cell differentiation, class-switching and generation of plasma cells and memory cells, primary and secondary response kinetics, significance in vaccination programs.	<b>3</b>
<b>5 T cell maturation, activation and differentiation</b> Stages of T cell maturation, Positive and negative selection in thymus, role of TH1 and TH2 cells, mechanism of CTL mediated cytotoxicity, co-stimulatory molecules and signals, super antigen induced T cell activation, NK cell mediated lysis, ADCC	<b>3</b>
<b>6 Complement system and Cytokines</b> Classical, alternate and lectin pathways of complement activation and function of complement system, Types and general properties Cytokines, receptors, cytokine network, Immunoregulatory role of IL-4, IFN- $\gamma$ and TNB- $\beta$ .	<b>3</b>
<b>UNIT III : Immunogenetics</b>	
<b>7 Immunoglobulin genes and proteins</b> Multigene organization of Ig genes, Generation of antibody diversity.	<b>3</b>
<b>8 TCR genes, gene products and co-repressors:</b> Structure and types ( $\alpha\beta$ and $\gamma\delta$ ), gene organization and rearrangement, T cell accessory membrane molecules, Role of TCR-CD3 complex in immune activation and signal transduction pathways.	<b>3</b>
<b>9 Major Histo-compatibility complex</b> General organization and inheritance of MHC; MHC Haplotypes, the structure of MHC class-I and class-II molecules; organization of MHC class I and class II genes, peptide binding of MHC molecules, Polymorphism of MHC class I and class II molecules; the role of HLA typing in organ transplantation and disease susceptibility/resistance.	<b>3</b>
<b>Unit IV : Clinical Immunology</b>	
<b>10 Clinical Immunology</b> <b>Hypersensitivity</b> – Type I, II, III and IV- outline of mechanism with examples.	<b>2</b>

- 11 **Immune tolerance and autoimmunity** - establishment and failure of tolerance; 3  
Autoimmunity; Types of autoimmune diseases with one example; Mechanism and role of CD4+ T cells.
- 12 **Transplantation immunology** - basis and manifestation of graft rejection, 3  
General immune-suppressive therapy. Specific immune suppressive therapy. Immune tolerance to allograft.
- 13 **Tumor immunology**- Malignant transformation of cells and immune responses. 3  
Tumor antigens, Tumor evasion of the immune system, immuno-surveillance, Cancer immune-therapy.
- 14 **Immunotechniques:** Immuniprecipitation, agglutination, RIA, ELISA, ELISPOT, Western blotting, fluorescence based imaging technique, HLA typing, Flow cytometry, and animal systems

**References:**

1. Immunology and Serology in Laboratory Medicine Turgeon Mary Louise 4<sup>th</sup> Ed. 2009
2. A Textbook of Microbiology & Immunology, Parija Subhash Chandra 2009
3. Immunology , Kuby, 7<sup>th</sup> edition, Richard A. Goldsby, T. J. Kindt and B. A. Osborna, WHfreeman and Co., New-York
4. Riott's essential Immunolgy, I. M. Riott, Evan M. riot and Peter J. Delves, 10<sup>th</sup> edition

<b>MBT&amp;Med BT 204: Genomics and Proteomics</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Introduction to Bioinformatics:</b>	<b>1</b>
Introduction to Bioinformatics: Definition, History, Goal, Scope, Applications, Limitations	
<b>2 Introduction to Biological Databases:</b>	<b>5</b>
Hierarchy of Biological databases: Primary, Secondary, Derived and knowledgebase	
<b>3 Sequence Alignment &amp; Analysis</b>	<b>6</b>
<ul style="list-style-type: none"> <li>• Sequence alignment methods: Local and global, Pairwise sequence alignment, Multiple sequence alignment</li> <li>• Sequence alignment algorithm: Needleman &amp; Wunsch, Smith &amp; Waterman</li> <li>• Sequence Similarity Search Tools: Dot Plot, BLAST, FASTA, ClustalW, ClustalX</li> <li>• Sequence analysis methods: AMAS, CINEMA, MaxAlign</li> </ul>	
<b>UNIT II</b>	
<b>4 Genomics:</b>	<b>3</b>
Genome sequencing: strategies & approaches, conventional DNA sequencing methodologies, NGS(Next generation sequencing), Third generation sequencing, Microarray Technology	
<b>5 Genomics Tools:</b>	<b>6</b>
<ul style="list-style-type: none"> <li>• Tools for Genomic Data Mining: Basic Aspects of Genome Annotation</li> <li>• Database Search Engines: Special tools for searching genomic data</li> <li>• Prediction of genes: ORFs, Prediction of Signal sequences (Promoters, Primers, splice sites, UTRs etc.), Operons</li> <li>• Identification of Disease Genes: Identification of Drug Targets, Metabolic diseases and Pathogenic diseases, Gene Expression Analysis</li> <li>• Structural Genomics and Functional Genomics</li> <li>• Genetic Disorders Databases: OMIM, OMIA, Genetic Association Database, Genetic Disorder Guide, IGDD, DisGenet, Genetic Disorder UK</li> </ul>	
<b>6 Genome mapping:</b> Genetic maps and physical maps	<b>2</b>
<b>UNIT III</b>	
<b>7 Comparative genomics and it's applications Methods:</b>	<b>4</b>
<ul style="list-style-type: none"> <li>• Genome Alignments: BLAST2, MUMmer, PipMaker, VISTA</li> <li>• Comparison of Gene Order: GeneOrder, Gene synteny</li> <li>• Comparative Genomics of organisms: Viruses, Microbes, Pathogens, Eukaryotes</li> <li>• Comparative Genomics Databases: COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb</li> </ul>	
<b>8 Proteomics:</b>	<b>1</b>
Introduction to proteomics, scope	
<b>9 Classification of proteins:</b> Primary, secondary, tertiary, quaternary.	<b>6</b>
<b>Protein Primary Databases:</b> Protein database on NCBI/ Protein database on EMBL, PIR-PSD, UniProt KB/SwissProt, ExPASy, InterPro	



**Unit IV**

<b>10 Proteomics Applications:</b>	<b>4</b>
Strategies for protein identification, Protein sequencing, Protein engineering: Protein chips and functional proteomics; Clinical and biomedical application of proteomics.	
<b>11 Proteomics tools:</b>	<b>5</b>
Structural databases: PDB, MMDB, SCOP, CATH.	
3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D	
Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.	
3D structure validation databases: PROSA, Ramchandran Plot, Procheck	
<b>12 Protein-protein interaction :</b>	<b>2</b>
Protein-Protein Interaction Networks, databases and software:	
BIND - Biomolecular Interaction Network Database, STRING	

**References:**

1. Guide to Human Genome Computing by Martin J. Bishop, Academic Press. ISBN 0-12-102051-7.
2. From Genome to Therapy: Integrating new technologies with drug development by Novartis Foundation, John Wiley. ISBN 0-471-62744-5.
3. Genome mapping and sequencing By Ian Dunham, Horizon, ISBN1-898486-50-6.
4. The Genome by Ram S. Verma, VCH, ISBN 1-56081-043-2.
5. Bioinformatics - from genomes to drugs (vol. 1), basic technologies (vol.1) by Lengauer, T., Germany, Wiley-VCH, 2002.
6. Principles of Genome Analysis And Genomics (3<sup>rd</sup> Ed.) by Primrose, S.B. & Twyman, R.M., UK. Blackwell Publishing Company, 2003.
7. Bioinformatics approach Guide to the analysis of genes and proteins by Andceas Baxevanis and B.F. Francis Ouellettee. John Wiley 2004.
8. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
9. Patterson, B.K., Techniques in Quantification and Localization of Gene Expression.
10. Singer, M. and Barg, P. Exploring Genetic Mechanism.
11. Bowtell, D. and Sambrook, J. DNA Microarrays.
12. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Bussiness Media, LLC.

MBT&MedBT 205: Nanobiotechnology	Total
Core Course – Theory; 2 Credits	30L

#### UNIT I

- |   |  |   |
|---|--|---|
| 1 | <b>Introduction to nanoscience</b> , properties of nanoparticles, Types of nanomaterial<br>Carbon nanomaterials (fullerene, nanotube, nanofibres, nanowires) Quantum dots,<br>magnetic nanoparticles | 5 |
| 2 | <b>Nanostructures:</b> Organic and Inorganic nanoparticles, Bionanostructures-protein,<br>carbohydrate and lipid, DNA based  | 4 |
| 3 | <b>Synthesis of nanoparticles</b> , Top down and Bottom up approach, Physical, Chemical<br>and Biological methods of synthesis   | 5 |

#### UNIT II

- |   |   |   |
|---|---|---|
| 4 | <b>Characterization of nanoparticles:</b> Optical (UV-Vis, FTIR, Photoluminescence<br>spectroscopy) X-ray diffraction, Microscopy (SEM,TEM,AFM,STM) Surface and<br>composition (ECSA, EDAX), Particle size analysis and charge distribution analysis,<br>Toxicity Evaluation of nanomaterials; Cyto-toxicity, Geno-toxicity In vivo tests/assays<br>etc containment | 7 |
| 5 | <b>Applications of Nano-Materials in Biosystems;</b> Nanomedicines, Targeted Drug<br>Delivery, Disease diagnosis at proteomic level, Biosensors (Nucleic acid based, protein<br>based), Lab on Chip, Applications in Gene therapy, cancer Biology. Bionanomachines  | 5 |
| 6 | <b>Application of nanobiotechnology in agriculture and environment:</b> desalination,<br>monitoring water quality, detection of pollutants  | 4 |

#### References:

1. T. Pradeep, Nano, The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Limited, 2007
2. Tuan Vo, Dinh. Ed. Nanotechnology in Biology and Medicine: methods, device and applications. CRC Press, 2007
3. NANOBIO TECHNOLOGY BioInspired Devices and Materials of the Future, Shoseyov, Oded, Levy, Ilan, Springer, 2008
4. Nanoscience: Nanobiotechnology and Nanobiology, Boisseau, Patrick, Lahmani, Marcel, Springer, 2009.
5. Nanobiotechnology Inorganic Nanoparticles vs Organic Nanoparticles, Jesus M. de la Fuente and V. Grazu, Elsevier, 2012

MBT 206: Animal Tissue Culture	Total
Core Course – Theory; 2 Credits	30L

## UNIT I

- |   |  |   |
|---|--|---|
| 1 | Introduction to animal tissue culture: Overview of its applications in research, industry & therapeutics                     | 1 |
| 2 | Systems of tissue culture with distinguishing features, advantages and limitations   | 3 |
| 3 | Growth characteristics of normal diploid and transformed cells growing in culture, anchorage dependent and independent cells | 3 |
| 4 | Aseptic techniques and its significance in ATC   | 2 |
| 5 | Tissue culture media: role of balanced salt solution, individual constituents and serum; Serum free media                    | 5 |

## UNIT II

- |    |  |   |
|----|--|---|
| 6  | Primary culture and routine maintenance: Disaggregation of tissue, techniques for primary culture, subculture and routine maintenance of cell lines, suspension culture, | 3 |
| 7  | Cryopreservation: Cryopreservation and revival of cell lines   | 6 |
| 8  | Quantitation of cells: Estimation of viability,  | 2 |
| 9  | Scale up: Scale up of anchorage independent and dependent cells, bioreactors, microcarriers, hollow fibers, perfused cultures  | 3 |
| 10 | Applications of animal cell culture for <i>in vitro</i> testing of drugs, in production of monoclonal antibodies, viral vaccines and therapeutic proteins                | 2 |

## References:

1. Ian Freshney, Culture of Animal cells (5<sup>th</sup> edition)2006, Wiley-Liss publication
2. Ed. John, Masters RW, Animal Cell Culture-Practical Approach, 2000, Oxford Press
3. Ed. Jenni, P Mather, David Barnes, Methods in Cell Biology, Vol 57, Animal cell culture methods. Academic Press 1998
4. R.Lanza, J. Geachart et. Al. (Eds.) Essentials of stem cell biology (2009), Elsevier Academic Press
5. R. Lanza, I Klimanskaya. Essential stem cell methods. (2009), Academic Press

**MBT&Med BT 207: Genetic Engineering and Genomics Lab****Core Course – Practical; 4 Credits****Genetic Engineering Lab**

1	Competent cells preparation and GFP cloning in <i>E.Coli</i>	4
2	Southern Hybridization	3
3	DNA fingerprinting	2
4	Phage titration	3
5	Restriction mapping	2

**Genomics Lab**

1	<b>Explore primary resource institutes NCBI, EBI, DDBJ</b>	5
	Explore Genomic databases	
	Explore Sequence Alignment & Analysis	
	<ul style="list-style-type: none"> <li>Sequence Similarity Search Tools: Dot Plot, BLAST, FASTA, ClustalW, ClustalX</li> <li>Explore Sequence analysis methods: AMAS, CINEMA, MaxAlign</li> </ul>	
2.	<b>Explore comparative genomics databases:</b>	5
	<ul style="list-style-type: none"> <li>COG</li> <li>VirGen,</li> <li>CORG,</li> <li>HOBACGEN,</li> <li>Homophila,</li> <li>XREFdb,</li> <li>o Gramene etc</li> </ul>	
3.	<b>Explore Comparative genomics and it's applications Methods:</b>	5
	<ul style="list-style-type: none"> <li>Genome Alignments: BLAST2, MUMmer , PipMaker , VISTA</li> <li>Comparison of Gene Order: GeneOrder , Gene synteny</li> <li>Comparative Genomics Databases : COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb</li> <li>o</li> <li>Explore NGS data analysis methods: Bowtie, TopHat</li> </ul>	

**References:**

- Green and Sambrook, 4<sup>th</sup> edition (2012), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press
- Molecular cloning: a laboratory manual, Volume 1, Joseph Sambrook, E. F. Fritsch, Tom Maniatis, Edition 2, Cold Spring Harbor Laboratory, ISBN 0879693096, 9780879693091.
- Guide to Human Genome Computing by Martin J. Bishop, Academic Press. ISBN 0-12-102051-7.
- From Genome to Therapy: Integrating new technologies with drug development by Novartis Foundation, John Wiley. ISBN 0-471-62744-5.
- Genome mapping and sequencing By Ian Dunham, Horizon, ISBN 1-898486-50-6.
- The Genome by Ram S. Verma, VCH, ISBN 1-56081-043-2.
- Bioinformatics - from genomes to drugs (vol. 1), basic technologies (vol.1) by Lengauer, T., Germany, Wiley-VCH, 2002.
- Principles of Genome Analysis And Genomics (3<sup>rd</sup> Ed.) by Primrose, S.B. & Twyman, R.M., UK. Blackwell Publishing Company, 2003.

9. Bioinformatics approach Guide to the analysis of genes and proteins by Andreas Baxevanis and B.F. Francis Ouellette. John Wiley 2004.
10. Bioinformatics in the Post-Genomic Era: Genome, Transcriptome, Proteome, and Information-Based Medicine, Jeff Augen Addison-Wesley Professional , 2004 ISBN:0321173864.
11. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Business Media, LLC

**MBT&Med BT 208: Analytical Techniques and Proteomics Lab****Core Course – Lab; 4 Credits****Analytical Techniques Lab**

- |   |   |   |
|---|---|---|
| 1 | Sterilization of bioactive molecules by membrane filtration                       | 2 |
| 2 | Separation of biomolecules using dialysis technique                               | 2 |
| 3 | Fractionation sub-cellular components by density gradient centrifugation          | 2 |
| 4 | Separation of biomolecules by size exclusion chromatography                       | 2 |
| 5 | Determination of pKa value of p-nitrophenol by using UV-visible spectrophotometer | 2 |
|   | Visit to research institute or Biotechnology Industry/institutes                  | 2 |

**Protein Analysis Lab**

- |    |  |   |
|----|--|---|
| 6  | <b>Explore Protein Primary Databases: Protein database on NCBI/ Protein database on EMBL, PIR-PSD, UniProt KB/SwissProt, ExPasy, InterPro</b>  | 5 |
| 7  | <b>To explore:</b>   | 5 |
|    | <ul style="list-style-type: none"> <li>• Structural databases: PDB, MMDB, SCOP, CATH.</li> <li>• 3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</li> <li>• Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.</li> <li>• 3D structure validation databases: PROSA, Ramchandran Plot, Procheck</li> </ul>  |   |
| 8  | <b>Explore Proteomics databases:</b>   |   |
|    | <ul style="list-style-type: none"> <li>• Trans-Proteomic Pipeline (TPP)</li> <li>• PeptideProphet</li> <li>• iProphet</li> <li>• ProteinProphet</li> <li>• Xpress &amp; ASAPRatio</li> <li>• SpectraST</li> <li>• Corra &amp; PIPE2</li> <li>• PeptideAtlas &amp; SRMATlas</li> <li>• PIPE2, TIQAM, &amp; ATAQS</li> </ul>   |   |
| 9  | <b>Explore Protein-Protein Interaction Networks, databases and software:</b>   |   |
|    | <ul style="list-style-type: none"> <li>• DIP (Database of Interacting Proteins)</li> <li>• PPI Server</li> <li>• BIND - Biomolecular Interaction Network Database</li> <li>• PIM –Hybrigenics</li> <li>• PathCalling Yeast Interaction Database</li> <li>• MINT - a Molecular Interactions Database</li> <li>• GRID - The General Repository for Interaction Datasets</li> <li>• InterPreTS - protein interaction prediction through tertiary structure</li> </ul> |   |
| 10 | <b>To explore:</b>   |   |
|    | <ul style="list-style-type: none"> <li>• Structural databases: PDB, MMDB, SCOP, CATH.</li> <li>• 3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</li> </ul>   |   |

- Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.
  - 3D structure validation databases: PROSA, Ramchandran Plot, Procheck
3. Explore Proteomics databases: 5
- Trans-Proteomic Pipeline (TPP)
  - PeptideProphet
  - iProphet
  - ProteinProphet
  - Xpress & ASAPRatio
  - SpectraST
  - Corra & PIPE2
  - PeptideAtlas & SRMATlas
  - PIPE2, TIQAM, & ATAQS

**References:**

1. Introductory Practical biochemistry, S.K sawhney&Randhir Singh (eds) Narosa Publishing House, New Delhi, ISBN 81-7319-302-9, p 195-303
2. Standard Methods of Biochemical Analysis, S.K Thimmaiah (ed), Kalayani Publishers, Ludhiana ISBN 81-7663-067-5, p12-18
3. Experimental Biochemistry: A Student companion, Beedu Sasidhar Rao & Vijay Deshpande (ed), I.K International Pvt. LTD, New Delhi ISBN 81-88237-41-8, p 13-17, p 49-72
4. Practical Biochemistry, R.C Gupta & Bhargava (eds) CBS Publishers and distributors, New Delhi, ISBN 81-239-0124-0 p 9-27
5. Practical Clinical Chemistry, Harold Varley, CBS Publishers and distributors, New Delhi.
6. Gradwhols Clinical Laboratory Techniques. Stanley & Raphael. W.E. company, London, UK
7. <http://www.proteomecenter.org>
8. Protein Microarray Technology , Kambhampati, D. (ed) (2004) Front Matter, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, FRG. doi: 10.1002/3527601554.
9. Bioinformatics in the Post-Genomic Era: Genome, Transcriptome, Proteome, and Information-Based Medicine, Jeff Augen Addison-Wesley Professional , 2004 ISBN:0321173864.
10. Modern Protein Chemistry: Practical Aspects edited by Gary C. Howard, William E. Brown, 2002. CRC Press.
11. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Bussiness Media, LLC.
12. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003, Marcel Dekker

**MBT&Med BT 209: Immunology and Nanobiotechnology Lab****Core Course – Practical; 4 Credits****Immunology Lab**

1	Ouchterlony double diffusion	1
2	Radial immune diffusion	1
3	Lymphocyte separation from blood	1
4	Lymphocyte transformation	2
5	ELISA	2

**Nanobiotechnology Lab**

1	Synthesis of Gold nanoparticles by reduction method	1
2	Synthesis of Silver nanoparticles by reduction method	1
3	Synthesis of Metal oxide nanoparticles (MONs)	1
4	Purification of nanoparticles	1
5	Synthesis of Magnetic nanoparticles co-precipitation method	1
6	Green Synthesis of nanoparticles (Using Microorganisms, Plants)	1
7	Characterization of nanoparticles using UV-Vis absorption technique	1
8	Study on stabilization of nanoparticles	2
9	Effect of Gold and silver nanoparticles on growth of pathogenic bacteria and fungi	2
10	Visit to different laboratories	

**References:**

1. Goldsby A., Thomus J.K., Barbara A. O. and Kuby J. Immunology, 5th eds.
2. Deives P.J., Seamus J.M. and Raoitt E. M. (2006) Essential Immunology, 11th eds. Blackwell Publ.
3. Jaeway C. Travers, Walport and Shlomchik Immunobiology 6th eds. Garland Sc. Publ.
4. 4. Nanoscience: Nanobiotechnology and Nanobiology, Boisseau, Patrick, Lahmani, Marcel, Springer, 2009.



**MBT&Med BT 210: Option I (210.1) Bio-entrepreneurship** **Total**  
**Elective Course I – Theory; 2 Credits** **30L**

**UNIT I**

1	Sectors: Pharma, Biotech, Food, Agri-biotech, Research, Diagnostics, Analytic Labs	<b>3</b>
2	Developing flair for business in students	<b>1</b>
3	Short-term opportunities available for business	<b>2</b>
4	Import substitute product list	<b>2</b>
5	Regulatory Affairs: SSI, MSME, FICCI, MCC, IEC	<b>3</b>
6	Firm registration, GST registration, SME Loan, ISO 22000/14000 etc.,	<b>3</b>
7	Export counsel	<b>1</b>

**UNIT II**

8	Finance: Banking, MoFPI, SIDBI, Foreign collaboration, Investors	<b>3</b>
9	Subsidies: BIRAC, SSI, MSME, MoFPI	<b>2</b>
10	Marketing: Promotion, Distribution, Rolling Cycle	<b>2</b>
11	Business Concept and Competitors' knowledge	<b>1</b>
12	Export benefits, procedures	<b>2</b>
13	Make In India	<b>1</b>
14	Knowledge about taxation, GST, custom duty, excise	<b>3</b>
15	Packaging suitability knowledge	<b>1</b>

**References:**

1. Forbat, John, "Entrepreneurship" New Age International. 2. Havinal, Veerbhadrapa, "Management and Entrepreneurship" New Age International 3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.
2. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill,
3. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House 3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4). 4. Management Fundamentals – Concepts, Application, Skill Development – RobersLusier – Thomson – 5. Entrepreneurship Development – S.S.Khanka – S.Chand& Co. 6. Management – Stephen Robbins – Pearson Education/PHI – 17 th Edition, 2003.

<b>MBT&amp;MedBT 210: Option II (210.2) – Intellectual property rights I (IPR-I)</b>	<b>Total</b>
<b>Elective Course I – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1 Introduction to Intellectual Property</b>	<b>15</b>
General Introduction to IP & IPR; Introduction, History & role of International Conventions & Treaties- GATT, WTO, WIPO, TRIPS, Budapest Treaty, CBD, Nagoya Protocol; International framework for the protection of IP; IP as a factor in R&D; IPs of relevance to Biotechnology, Agriculture, Bioinformatics and Pharma sector	

**UNIT II**

<b>2 Types of IP Industries: Patents, Trademarks, Copyright &amp; Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Plant variety and Protection of New GMOs</b>	<b>8</b>
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<b>3 Concept of 'prior art'</b>	<b>7</b>
Need of Prior Art for IP types, Classification search and its implications; Invention in context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, India etc.); Analysis and Report formation	

**References:**

1. Intellectual property rights in agricultural biotechnology By Frederic H. Erbisch, Karim M. Maredia, Biotechnology in Agriculture Series No 28,
2. The role of intellectual property rights in biotechnology innovation By David Castle, Edward Elgar Publishing
3. <http://www.wipo.int/portal/index.html.en>
4. [http://www.ipr.co.uk/IP\\_conventions/patent\\_cooperation\\_treaty.html](http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html)
5. [www.patentoffice.nic.in](http://www.patentoffice.nic.in)
6. [www.iprlawindia.org/](http://www.iprlawindia.org/) - 31k - Cached - Similar page
7. <http://www.cbd.int/biosafety/background.shtml>

SEMESTER III

<b>MBT 301: Environmental Biotechnology</b>	<b>Total</b>
Core Course- Theory; 3 Credits	<b>45L</b>

**UNIT I : Environment and Waste water treatment technology**

- |          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Basic concepts</b> , Its ingredients – soil, water, air, biota and non-biota and its significance   | <b>3</b> |
| <b>2</b> | <b>Environmental issues, Environmental pollution</b> - Types, measurement, effects on health & food, Air pollution and its control through Biotechnology, Water pollution and its control, Soil pollution sources, pesticides, heavy metals and agrochemical and its control, Noise pollution: effects and control, Degradation of Xenobiotic compounds in Environment | <b>4</b> |
| <b>3</b> | <b>Detection and control of micro-organisms</b> in environmental fresh water, in source and drinking water; Potable and non-potable water<br>Biosensors - types and applications in environmental pollution detection and monitoring   | <b>4</b> |

**UNIT II**

- |          |  |                      |
|----------|--|----------------------|
| <b>4</b> | <b>Biological treatment:</b> stabilization pond, aerated lagoon, activated sludge process, trickling filter anaerobic treatment  | <b>2</b>             |
| <b>5</b> | Sewage and waste water treatments systems; Primary, secondary and tertiary treatments; Measurement of treatment efficiencies   | <b>3</b>             |
| <b>6</b> | Bioreactors for waste water treatments; Reactors types and design; Reactors in series; Development and optimization of membrane bioreactor process for use in sanitary and industrial sewage treatment<br>Biological treatment: stabilization pond, aerated lagoon, activated sludge process, trickling filter anaerobic treatment | <b>3</b><br><b>2</b> |

**UNIT III**

- |           |   |          |
|-----------|---|----------|
| <b>7</b>  | <b>Global Environmental Issues</b><br>Solid waste Management, physicochemical characters, hazardous and non hazardous wastes, bio-degradable and non-biodegradable wastes, collection and transport of solid waste, composting, vermin-composting and methane production. | <b>4</b> |
| <b>8</b>  | Global warming: climate change, ozone depletion, UV- B and green house effects, acid rain, its effects  | <b>3</b> |
| <b>9</b>  | Biotechnological approaches for solid waste management  | <b>3</b> |
| <b>10</b> | Carbon credit   | <b>1</b> |

**Unit IV****Biotechnological approach for improving the Environment:**

- |           |  |          |
|-----------|--|----------|
| <b>11</b> | Characteristics of industrial effluents, Conventional treatments, kinetics of biodegradation of waste, Advances in aerobic and anaerobic treatments, genetically modified organisms for improving the environment, Techno-economic feasibility of conversion of waste into energy. | <b>2</b> |
|-----------|--|----------|

- |           |  |          |
|-----------|--|----------|
| <b>12</b> | Environmental pollution control- Bioremediation, Bioaugmentation, Biostimulation and Phytoremediation  | <b>2</b> |
| <b>13</b> | Desalination technique: Reverse osmosis, quality of input and output water, cost effectiveness, byproducts of desalination and industrial application  | <b>2</b> |
| <b>14</b> | Biotechnological approach for improving the Environment:   | <b>2</b> |
| <b>15</b> | Characteristics of industrial effluents, Conventional treatments, kinetics of biodegradation of waste, Advances in aerobic and anaerobic treatments, genetically modified organisms for improving the environment, Techno-economic feasibility of conversion of waste into energy. | <b>2</b> |
| <b>16</b> | Environmental pollution control- Bioremediation, Bioaugmentation, Biostimulation and Phytoremediation  | <b>2</b> |

**References:**

1. Rittmann B. E. and Mc Carty P. L. (2001), Environmental Biotechnology: Principles and Applications, International Edition, McGraw-Hill, New York
2. Methods of Air Sampling & Analysis (1977), 2nd Edition –APHA intersociety Committee APHA, Washington D.C
3. Standard Methods for the Examination of Water and Wastewater (1986) 15th Edition APHA-AWWA-WPCF
4. Brunner R.C., (1989), Hazardous Waste Incineration, McGraw Hill Inc.
5. Milton Wainwright, An Introduction to Environmental Biotechnology, Kluwer Academic Publishers, Boston. Hardbound, 1999.

<b>Med BT 302: Plant Biotechnology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Biodiversity hotspots in India:</b> Characterization of biodiversity through different biochemical and molecular methods (chemical printing of biodiversity),	<b>3</b>
<b>2 Conservation strategies of biodiversity,</b> threatened and extinct species	<b>2</b>
<b>3 Bio-prospecting</b> of biodiversity for product development	<b>2</b>
<b>UNIT II</b>	
<b>4 Plant tissue culture and micropropagation</b> Introduction, Different systems and stages in axillary shoot proliferation, organogenesis, somatic embryogenesis with examples..	<b>4</b>
<b>5 Cell culture technology</b> and its application for the production of artificial seeds and secondary metabolites..	<b>4</b>
<b>6 Homozygous plant production</b> through anther and pollen culture, Embryo rescue and embryo culture in rearing viable hybrid plants, Endosperm culture and production of triploids, Somaclonal and gametoclonal variations and their applications	<b>4</b>
<b>7 Protoplast technology</b> for the production of somatic hybrids and cybrids.Applications in crop improvement.	<b>3</b>
<b>UNIT III</b>	
<b>8 Transgenic Plants</b> Introduction, vertical versus horizontal gene transfer, vectors, reporter genes	<b>3</b>
<b>9 Direct and indirect methods for gene transformation,</b> plant cell and chloroplast transformation,	<b>3</b>
<b>10 Introduction to markers,</b> Marker – Assisted Crop Improvement, Genetic Markers and Linkage Maps	<b>3</b>
<b>Unit IV</b>	
<b>10 Applications of transgenic plants</b> Development of transgenes for the production of biofuels, single cell proteins, pigments, neutraceuticals, pharmaceuticals, biopesticides, pharmaceuticals, vaccines, plantibodies, value addition, bio-fortification.	<b>3</b>
<b>11 Selection and characterization of transformants</b> for biotic and abiotic stress tolerance, for increase in crop and timber productivity	<b>3</b>
<b>12 Marker Technology</b> in Crop Improvement	<b>3</b>

**References:**

1. Altman A, Hasegawa PM (Ed) (2012) – Plant Biotechnology and agriculture. Prospects for the 21st century (Academic press).
2. Bhojwani S S. &Razdan M K (1996). - Plant Tissue Culture : Theory and Practice (Elsevier)
3. Slater A, Scott NW, Fowler MR (2008) – Plant Biotechnology: the genetic manipulation of plants (Oxford Press)
4. Plant Molecular Breeding, (2009), Newbury HJ, John Wiley and Sons., USA.

<b>MBT 303: Microbial Technology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Introduction</b>	
2 Microbial metabolites and recombinant products	1
3 Batch, continuous and fed batch culture , growth kinetics	2
4 Culture preservation methods	1
5 Improvement of industrial microorganisms	3
6 Fermentation media and media sterilization	2
7 Statistical designs	2
<b>UNIT II</b>	
6 Sterilization: Del factor, filter sterilization	2
7 Inoculum development: bacterial and fungal processes	1
8 Fermenter design	2
9 Types of fermenters e.g. air lift fermenter, packed tower fermenter	1
10 Aeration and agitation: Determination of $K_{La}$ value and factors affecting $K_{La}$ value	2
11 Measurement of Process variables: Temperature, pressure, foam, dissolved oxygen, pH, redox	2
12 Downstream processing	1
<b>UNIT III</b>	
13 Production of organic acids e.g. lactic acid	1
14 Microbial enzymes and applications	2
15 Production of antibiotics e.g penicillin	2
16 Production of vitamins e.g. vitamin B12	1
17 Biopolymers e.g xanthan, PHA	3
18 Biotransformation of sterols	2
<b>Unit IV</b>	
19 Plant growth promoting bacteria (PGPB): Nitrogen fixation and genetic engineering of nitrogenase gene cluster, Improved nitrogen fixation Nodulation,Hydrogenase	5
20 Microbial insecticides: <i>Bacillus thuringiensis</i> toxin, mode of action and genetic engineering of toxin genes	3
21 Biocontrol of pathogens: siderophorres, antifreeze proteins	2
22 Small biological molecules: indigo, lycopene	2
<b>References:</b>	
1. L.E.J.R. Casida, 2nd edition (2016), Industrial Microbiology, New Age International Publishers	
2. Glick B.R., Pasternack J.J., Patten C.L., 4 <sup>th</sup> edition (2010), Molecular Biotechnology, ASM Press, Washington, DC	

3. Peppler and Periman , 2<sup>nd</sup> edition (2004), Microbial technology, Academic Press, New York
4. Barredo, José-Luis (Ed.), (2005), Microbial Processes and Products. Springer
5. Glare, Travis R., Moran-Diez, Maria E. (Eds.) (2016) Microbial-Based Biopesticides, Springer

<b>MBT 304: Food Biotechnology</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>
<b>UNIT I</b>	
1 Introduction: Scope and importance of food processing: national and international perspectives	1
2 Food additives like preservatives, antioxidants, emulsifiers, sequesterants, humectants, stabilizers with respect to chemistry, food uses and functions in formulations.	4
3 Nutraceuticals, functional foods, fortified foods	4
4 Food rheology and texture	3
5 Nutrigenomics	3
<b>UNIT II</b>	
6 Fermented foods: Fermented milk products. cheese, cheese spread, Yoghurt, dahi shrikhand and similar products Other fermented foods like beer, wine and vinegar, Traditional fermented foods like idli and dosa.	6
7 Mushroom cultivation: use of biotechnological methods to produce high quality mushrooms	3
8 Role of Biotechnology in food packaging	2
9 Natural food colours and flavors	2
10 Genetically modified foods: safety, risks and public concerns	2
<b>References:</b>	
1. K. Shetty, G. Paliyath, A. Pometto, R. Levin (Eds), 2nd edition, (2006) Food Biotechnology, CRC Press	
2. John E. Smith, Biotechnology , Fifth edition (2009), Cambridge University Press	
3. S. Bielecki J. Polak J. Tramper (Eds), Food Biotechnology, Volume 171st Edition (2000), Elsevier	
4. W.A. Gould , Fundamentals of Food Processing and Technology 1st edition, (1997), Woodhead Publishing	
5. Toledo, Romeo T. (2007) Fundamentals of Food Process Engineering, Springer	



**MBT&Med BT 305: Biostatistics** **Total**  
**Core Course -Theory; 2 Credits,** **30L**

**UNIT I**

- |          |  |          |
|----------|--|----------|
| <b>1</b> | Introduction to Biostatistics, Common terms, notions and Applications; .<br>Statistical population and Sampling Methods              | <b>5</b> |
| <b>2</b> | Types of variables; Independent and dependant variables; Nominal, Ordinal,<br>ratio and discrete variable types                      | <b>5</b> |
| <b>3</b> | Classification and tabulation of Data, Diagrammatic and graphical<br>presentation; Frequency Distribution, Measures of central value | <b>5</b> |

**UNIT II**

- |           |  |          |
|-----------|--|----------|
| <b>6</b>  | Descriptive Statistics; Measures of variability; Standard deviation, standard<br>Error, Range, Mean, Deviation, Coefficient of variation, Analysis of variance | <b>4</b> |
| <b>7</b>  | Inferential Statistics; Statistical power; Hypothesis testing, Test of significance;<br>t-test, chi-square test;   | <b>3</b> |
| <b>8</b>  | Regression; Basic of regression, regression analysis, Estimation, Testing,<br>Prediction, checking   | <b>3</b> |
| <b>9</b>  | Non-parametric statistical methods; Man-Whiteny U test, Wilcoxon test;<br>Kruskal-Wallis test.   | <b>3</b> |
| <b>10</b> | Descriptive Statistics; Measures of variability; Standard deviation, standard<br>Error, Range, Mean, Deviation, Coefficient of variation, Analysis of variance | <b>3</b> |

**References:**

1. Biostatistics: A guide to design, Analysis and Discovery, Peter Fritz, Elsevier India.
2. Biostatistics: A foundation for analysis 7th Edition, Ferric Darvas
3. Applied statistical designs for the researcher, Neil Ed Taylor and Francis Groop.

**MBT&MedBT 306: Research Methodology** **Total**  
**Core Course – Theory; 2 Credits** **30L**

**UNIT I**

- |          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Basic concepts of Research</b>  | <b>5</b> |
|          | Introduction, Definition and basic concepts, objectives of research, Research approaches, types of research, techniques of research, hypothesis, literature survey, selection of topic, compiling records. |          |
| <b>2</b> | <b>Research Design</b>   | <b>5</b> |
|          | Important concepts in research design – basic principles of research design, need of research design, features of good research design.  |          |
| <b>3</b> | <b>Sampling and Data collection &amp; Analysis</b>   | <b>5</b> |
|          | Collection of primary and secondary data - parameters, techniques for data collection, methods of data presentations, classification and tabulation of data, graphical representation                      |          |

**UNIT II**

- |          |  |          |
|----------|--|----------|
| <b>6</b> | <b>Data Analysis</b>   | <b>4</b> |
|          | Statistical methods of data analysis: Applications of statistics in research, measures of central tendency and dispersion  |          |
| <b>7</b> | <b>Testing hypothesis</b>  | <b>3</b> |
|          | What is a Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Tests of Hypotheses, Important Parametric Tests, Hypothesis Testing of Means |          |
| <b>8</b> | <b>Technical Writing:</b> Different types of scientific documents, review paper, book reviews, research paper, thesis, project reports (for the scientific community), Plagiarism, Research Ethics, Patents and IPR.   | <b>3</b> |

**Objective:**

To provide the knowledge of how to define research problem, hypothesis testing, literature survey, research designs, data collection and analysis. Topics covered in this course includes, from meaning of research to technical writing.

**Teaching – Learning Methodology:**

Lectures and Tutorials: This is a compulsory subject offered by RGITBT for all M Sc. Biotech students. Lectures, tutorials, group discussion, paper presentation, assignments will be used as a teaching – learning process. There will be a recommended course books. Students are expected to read the research / review articles of their chosen topic of interest, develop research problem for their research project to be undertaken in the forthcoming semester.

**Expected Learning Outcome:**

Students are expected to learn key concepts in research methodology, data collection and data analysis, presentation of data, interpretation and technical write-up. It is expected that students will learn how different research methods

are useful in developing working hypothesis, establish theories, models or concepts. It is expected that the students will practice reading and interpreting research papers, review articles, understanding key concepts of research approaches used by investigators, literature survey, data analysis, interpretation and presentation.

Through this course, it is expected that students should able to independently develop a research plan or research ideas in their areas of research interest for the forthcoming semester.

**References:**

1. Research Methodologies: Methods and Techniques. Kothari CK. 2004, 2<sup>nd</sup> Ed, New Age International, New Delhi
2. Research Methodologies, Paneerselvam R, 2004, Pentice Hall of India, New Delhi
3. Research Methodologies, Bulakh PM, Patki PS, Choudhary AS, 1<sup>st</sup> edition, Expert Trading Corporation, Mumbai
4. Introduction to Biostatistics and Research Methodology, 4<sup>th</sup> edition, Sunder Rao P.S.S, J.Richard
5. Fundamentals of statistics Gupta, S.C. (2013).Himalaya Publishing House.
6. The Role of IPR in Biotechnology Innovations by David Castle, Edward Elgar Publishing
7. Profits and plagiarism: The case of medical ghostwriting – Anekwe TD, Bioethics, 2010. 24(6): 267–272.

**MBT 307: Environment & Plant Biotech Lab****Core Course – Practical; 4 Credits****Environmental Biotechnology Lab**

1	Determination of particulate matter 10 <sub>µ</sub> (PM) concentration from ambient air by high volume sampler	1
2	Determination of SO <sub>x</sub> and NO <sub>x</sub> concentration from ambient air by high volume sampler	1
3	Determination of equivalent noise level (Leq) of the surrounding air	1
4	Determination of dissolved oxygen (DO) in given water sample	1
5	Determination of biochemical oxygen demand (B.O.D) in given water sample	2
6	Determination of chemical oxygen demand (C.O.D) in given water sample	2
7	Determination of organic matter phosphate/ calcium / magnesium from given soil sample	2
8	Determination of sodium / potassium	2
9	Visit to waste water treatment plant(Industrial visit)	4
10	Determination of particulate matter 10 <sub>µ</sub> (PM) concentration from ambient air by high volume sampler	4

**Plant Biotech Lab**

11	Nutrient media composition, preparation and sterilization	1
12	Micropropagation via adventitious shoot proliferation	1
13	Micropropagation via somatic embryogenesis	1
14	Anther/microspore/embryoculture	1
15	Protoplast isolation and culture	1
16	Histological and cytological techniques for plant cultures	1
17	<i>Agrobacterium</i> - mediated transformation studies	1
18	Extraction and quantification of secondary metabolites from callus	1
19	Visit to commercial Plant Biotechnology industry	1

**References:**

1. D.S. Ramtane and C. A. Moghe, Manual on water and waste water analysis, NEERI, Nagpur, 1988
2. Gabriel Bitton, Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd Edition, 1999.
3. Trivedy,R.K. and Goel,P.K.(1987).Practical Methods in Ecology and Environmental Science,Environmental Publications, Karad.
4. Standard Methods for Waste and Water Analysis APHA 21<sup>st</sup>Edition
5. Gaurd.R.S. Gupta.G.D and Gukhade.S.B.2000. Practical Biotechnology: Nirali park Ashan Publishers. Pune
6. Tejovathi.G, Vimala.Y and Rekha Bhadauria, 1996. A practical manual for plant
7. Biotechnology. CBS publishers and distributors. New Delhi.

**MBT 308: Microbial & Food Biotech Lab****Core Course: Practical 4 Credits****Microbial Technology Lab**

1	Isolation, screening and optimization of conditions for production	1
2	Solid state fermentation: enzymes, alcohol	1
3	Submerged fermentation: enzymes, exopolysaccharide, organic acids	1
4	Estimation, recovery and purification of fermentation products-enzymes, antibiotics, organic acids, alcohol, exopolysaccharide	1
5	Influence of different parameters on immobilization of cells and enzymes	1
6	Isolation of probiotic culture from various sources • Evaluation and efficacy of probiotic culture	1
7	Production of fermented food and characterization of acidity, alkalinity and its microbial profile	1

**Food Biotech Lab**

11	Detection of siderophore production by <i>Azospirillum</i> and <i>Pseudomonas</i>	1
12	Analysis of milk, milk pasteurization and sterilization. Analysis of milk products	1
13	Preparation of cream, butter, cheese, paneer, milk sweets and ice cream. Visit to dairy plants.	1
14	Sensory analysis and hedonic rating of food.	1
15	Identification and ranking of food product attributes, sensory and instrumental methods for measuring food attributes.	1
16	Determination of food additives in foods.	1
17	Rheological properties of foods. Detection of adulteration of fats and oil.	1

**References:**

1. Joslyn, M.A. Ed. 1970. Methods in Food Analysis. Academic Press, New York.
2. King, R.D. Ed. 1978. Developments in Food Analysis Techniques-1. Applied Science Publishers Ltd., London.
3. Morris, C.J. and Morris, P. 1976. Separation Methods in Biochemistry 2nd Ed. Pitman Pub., London.
4. Raghuramulu, N., Madhavan Nair, K., and Kalyanasundaram, S. Ed. 1983. A Manual of Laboratory Techniques. National Institute of Nutrition, ICMR, Hyderabad.
5. Aneja, K.R. Experiments in Microbiology, Plant Pathology, Tissue Culture and Microbial Biotechnology (2018), 5<sup>th</sup> edition

**MBT 309: Biostatistics Lab****Core Course – Practical; 2 Credits****Biostatistics Lab:**

- |          |  |          |
|----------|--|----------|
| <b>1</b> | <b>Numerical Exercises:</b> Elementary statistics using Spread sheets, Representation of Data using Charts   | <b>1</b> |
| <b>2</b> | <b>Scatter Plots,</b> Curve fitting on Spread sheets , Add trendline Tool  | <b>1</b> |
| <b>3</b> | <b>Outside Class room Activity:</b> One sample survey (mini) using Google forms and inferencing - simple frequencies , means and std deviation (to be counted as a Practical)  | <b>1</b> |
| <b>4</b> | <b>Exercises:</b> Creating PDF, PMF using Spread sheets  | <b>1</b> |
| <b>5</b> | <b>Numerical Exercises : On spread sheet, data analysis tool-pack</b><br>t,z - Tests for a single Mean<br>Comparing Two Means ,t-tests: Paired – Unpaired<br>Inference for Proportions   | <b>1</b> |
| <b>6</b> | <b>Exercises :</b> One way ANOVA, Two way ANOVA ( using Data Analysis pack on Spread sheet or On SPSS/PSPP), F-tests, and Use of Least significant differences,<br>Exercises: Using SPSS or Data Analysis pack on spread sheets. | <b>2</b> |

**References:**

1. Probability statistics, and reliability for engineers by Boca Raton, Ayyub B. M. & McCuen, R H, CRC Press, 1997.
2. Statistical methods in bioinformatics: an introduction by Ewens, W. J. & Grant, G. R., New York. Springer, 2001.
3. Handbook of computational statistics: concepts and methods by Gentle, J.E., Hardle, W. & Mori, Y., Berlin, Springer-Verlag, 2004.
4. Statistical design and analysis of industrial experiments by Ghosh, Subir, Ed., 1990.
5. Scan Statistics by Glaz, J., Naus, J. & Wallenstein S, New York, Springer, 2001.
6. Statistical design for research by Kish, L., Wiley series in probability and mathematical statistics, New York, John Wiley & Sons, 1987.
7. Introduction to probability and statistics by Lipschutz, S. & Schiller, J. J., New York. McGraw-Hill, 1999.
8. Ian Freshney, Culture of Animal cells (5<sup>th</sup> edition)2006, Wiley-Liss publication.

**MBT&Med BT 310: Option I (310.1) – Biomedical Waste Management** **Total**  
**Elective Course II – Theory; 2 Credits** **30 L**

**UNIT I**

- 1 Introduction**, definition, classification/ categories, composition and sources. **15**
- Radioactive waste
  - Health Impacts, direct and Indirect hazards
  - Modern technology for handling biomedical waste
  - Basic steps in waste management, segregation, collection and handling of waste
  - On site pre-treatment of waste
  - Mechanical treatment and chemical disinfections
  - store and off-site transportation
  - Common treatment facilities in-site and off-site
  - Liquid waste treatment and different technologies, cost aspect

**UNIT II**

- 2 Technologies available for treatment of biomedical waste** **15**

**Conventional treatment technologies**

- a) Wet thermal technology
- b) Incineration - different models

**Treatment of general/non-infectious waste**

- a) Composting, rotating jumbling system French composting
- b) Vermi-composting

**Disposal Technologies**

- a) Sharp disposal pit
- b) Deep- burial pit
- c) Secured land

Controls applied to waste management,  
 Environmental safety, risks & public issues,  
 Instrumentation and monitoring, Crematories,  
 Risk management in hospitals -Environment issues in hospitals -Risk analysis  
 Legislation and policies on health care waste management.

**References:**

1. Principles of Hospital Management - S. A. Tabish
2. Hospital Management - S. L. Goel
3. Hospital Administration - Francis
4. Bio-Medical Waste Act & Rules Govt. of India
5. Current Issues In BMW Waste Handling-ISHA, Bangalore
6. Management and Handling Rules for: municipal solid waste, biomedical waste, hazardous waste and radioactive wastes, Government of India Publications.
7. Bio-Medical Waste Management- Sushma Sahai

<b>MBT &amp; Med BT 310: Option II (310.2): Drug Designing</b>		<b>Total</b>
<b>Elective Course II – Theory; 2 Credits</b>		<b>30 L</b>
<b>UNIT I</b>		
<b>1</b>	Drug discovery process, role of Bioinformatics in drug design.	<b>2</b>
<b>2</b>	Target identification and validation, lead optimization and validation. Structure-based drug design and ligand based drug design.	<b>2</b>
<b>3</b>	Modeling of target-small molecule interactions.	<b>2</b>
<b>4</b>	Structure Activity Relationship: QSARs and QSPRs, QSAR Methodology.	<b>3</b>
<b>5</b>	Various descriptors used in QSARs: Electronics; Topology; Quantum Chemical based descriptors. 3D QSAR techniques: CoMFA and CoMSIA.	<b>3</b>
<b>6</b>	Training data, test data and external validation data, applicability domain in QSAR, Cross validation techniques, Pubchem BioAssay data for QSAR studies.	<b>3</b>
<b>UNIT II</b>		
<b>7</b>	Pharmacophore features, Pharmacophore model, Receptor-based and ligand-based pharmacophore modeling.	<b>3</b>
<b>8</b>	Virtual screening based on pharmacophore model.	<b>4</b>
<b>9</b>	Receptor site, molecular docking study, flexible docking, rigid docking, molecular interactions.	<b>4</b>
<b>10</b>	Scoring functions, correlation between ligand-based and receptor-based studies	<b>4</b>
<b>References:</b>		
<b>1.</b>	Computer-Aided Molecular Design: Theory and Applications by Jean-Pierre Doucet, J. P. Doucet, Jacques Weber, Elsevier Science & Technology Books.	
<b>2.</b>	Receptor-based Drug Design edited by Paul Leff, Marcel Dekker Inc., New York.	
<b>3.</b>	Advanced Drug Design and Development: A Medicinal Chemistry Approach by P. N. Kourounakis, 1994, Taylor & Francis.	
<b>4.</b>	Biopharmaceutical Drug Design and Development by Susanna Wu-Pong, Yon Rojanasakul, 2008, Humana Press.	
<b>5.</b>	Combinatorial Library Design and Evaluation: Principles, Software, Tools, and Applications in Drug Discovery by Arup Ghose, Vellerkad Viswanadhan, 2001.	
<b>6.</b>	Computer-Aided Drug Design and Delivery Systems by Ahindra Nag, Baishakhi De, 2010, McGraw-Hill Professional.	



**MBT& Med BT 310: Option III (310.3) – Intellectual property rights II (IPR II) Elective Total**  
**Course II - Theory; 2 Credits 30 L**

**UNIT I**

**1 Basics of Patents 5**

Indian Patent Act 1970; Patent Rules, 2003; Recent Amendments; Definitions, non-patentable subject matter, patentability criteria, anticipation, infringement, opposition, biopiracy; Precautions before patenting-disclosure/non-disclosure.

**2 Types of patents 5**

Provisional and Complete specification; Contents of specification

**3 Introduction to Patent drafting 5**

National, PCT and Convention patent applications; PCT and Implications; Role of a Country Patent Office; Procedure for filing requirements National and international Patent application, Forms, fees and timelines  
 Cost and financial assistance for patenting, introduction to existing schemes

**UNIT II**

**4 Relevant case studies (3-4 cases) related to patentability criteria, anticipation, infringement, opposition, bio-piracy 12**

**5 Career opportunities in the field of IPR. 3**

**References:**

1. Erbisch, Karim M. Maredia, Intellectual property rights in agricultural biotechnology  
 By Frederic H. Biotechnology in Agriculture Series No 28,
2. David Castle, The role of intellectual property rights in biotechnology innovation,  
 Edward Elgar Publishing
3. <http://www.wipo.int/portal/index.html.en>
4. [http://www.ipr.co.uk/IP\\_conventions/patent\\_cooperation\\_treaty.html](http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html)
5. [www.patentoffice.nic.in](http://www.patentoffice.nic.in)
6. [www.iprlawindia.org/](http://www.iprlawindia.org/) - 31k - Cached - Similar page
7. <http://www.cbd.int/biosafety/background.shtm>

**SEMESTER IV****MBT&MedBT 401: RESEARCH PROJECT****Core Course – 20 Credits****Guidelines for Research Project and Dissertation Submission during Sem IV for Master of Science (M. Sc.) in Biotechnology****Eligibility:**

- If student fails to pay any of the pending dues before the beginning of the project date, he/ she will not be considered to be eligible to undertake research project.

**Project Duration, Dissertation writing and Submission:**

- The project duration will be from beginning till the end of Semester IV
- Students shall submit dissertation title, name of research guide, name of co-guide (for off-campus only), name & place of research work within 10 days after the start date of semester IV. (As per the format enclosed).
- Student must have to submit Two hard copies (copy of Library/ Co-Guide & Student's copy) and one soft copy (Guide) of Dissertation only in the prescribed format (read below), duly approved by Research Guide(s) on or before April 15th of every year. The dissertation will not be accepted for evaluation for those who submit after March 15th, their presentation will be taken along with the next year batch.
- Students must acknowledge all the figures, maps, tables, methods, texts, etc., that are used, taken from other sources for writing the dissertation, except for original work that they have carried out. Dissertation having more than 10 % of plagiarism found will not be considered for evaluation.
- Dissertation must be written in specified format only as mentioned below:
  - a. The paper used for printing shall be of A4 size;
  - b. Printing shall be in a standardized form (word size of 12, font in Times New Roman) on one side of the paper and in 1.5 line spacing;
  - c. A margin of 1.5 inches shall be on the left hand side, top, bottom and right hand margin shall be of 1 inch.
  - d. The card for cover shall not be more than 330 GSM.
  - e. The title of the dissertation, name of the candidate, degree, name of the guide, co-guide, place of research and the date, month and year of submission shall be printed on the title page and on the front cover.
  - f. The hard- bound thesis cover shall be of black color. Spine of the binding [side cover] should mention 'M Sc. Biotechnology or Medical Biotechnology or Bioinformatics dissertation on the top, name of the candidate and date, month and year.
- Student must follow following chapter scheme for Dissertation submission:

### Chapter Scheme of Dissertation :

- ✓ Introduction
- ✓ Review of Literature
- ✓ Aims and Objectives
- ✓ Materials & Methods
- ✓ Observations and Results
- ✓ Discussion
- ✓ Summary
- ✓ Conclusions
- ✓ Bibliography –Reference etc.

### **Place of Research Project:**

- Student may prefer to undertake his/ her research project in-house or off-campus. Students those preferring to pursue research at off-campus will have to undertake research work only in any of the Department of Scientific and Industrial research (DSIR), Government of India recognized laboratory (Government, State-Government, Private).

### **Research Guide(s):**

- Students who are opting for off-campus will have one Major Research Guide from the host organization (Preferably a Ph D. qualified scientist), however, a Co-Guide from RGITBT will be appointed.

### **Dissertation Evaluation:**

- Students will have to submit **Two progress reports (45 days of Intervals) (Format Enclosed) and One evaluation report from Research Guide having 40 % weight age (Format Enclosed)** at the time of dissertation submission on the execution of research project duly signed by Guide / Co-Guide. The progress report will include, attendance percentage, review collection, research progress, sincerity, topic understanding, and systematic execution of research project, data collection and management. The evaluation report will include attendance, review work, project execution, critical thinking, originality of work, presentation of result, understanding of research, dissertation write-up, presentation of tables, figures, maps, references, etc.
- Student will have to give 20 min presentation on the work done in the presence of expert committee (between **April 21 to May 5 of every year**). (Note only working dates will be considered). The power point presentation format shall contain project title, name of candidate, place of research work, name of Guide/ Co-Guide, introduction, review, objectives, significance of the work, methodology, results & discussion, conclusion, references and acknowledgement. The presentation shall be of 12-15 min with 5-8 minutes of discussion.
- The presentation will carry **60 % of weight age** based on the following consideration. The overall understanding of the research project, objectives, methodology. The outcome of research work, data analysis and statistics, clarity in presentation and question – answer session (**Format Enclosed**).
- Student will be assigned a grade as per the Rules mentioned.



**RAJIV GANDHI INSTITUTE OF IT AND BIOTECHNOLOGY**

“Write here **approved title** of the Dissertation in all upper-case (capital letters) with a 'centre' alignment. Place this title on the upper central part of the cover with sufficient margin from top and both sides. Use font size suitable to length of the title”

A DISSERTATION SUBMITTED TO

**RAJIV GANDHI INSTITUTE OF I.T. AND BIOTECHNOLOGY,  
BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY, PUNE**

FOR AWARD OF DEGREE OF  
**MASTER OF SCIENCE in BIOTECHNOLOGY**

SUBMITTED BY

.....

UNDER THE GUIDANCE OF

.....  
.....

Name of Co-Guide  
Guide

Name of

RESEARCH CENTRE

.....  
.....  
.....

WRITE HERE DATE, MONTH & YEAR OF SUBMISSION

**CERTIFICATE**

This is to certify that the work incorporated in the dissertation entitled “.....” for the degree of ‘Master of Science’ in the subject of Biotechnology under the faculty of Interdisciplinary Science has been carried out by Mr/ Mrs..... Rajiv Gandhi Institute of I.T and Biotechnology, Bharati Vidyapeeth Deemed to be University, Dhankawadi, Pune (OR NAME OF THE LABORATORY, PLACE OF THE WORK) during the period from ..... to.....under the guidance of Dr.....

Place: Pune

(Signature of Head of the Institute with seal)

Date :

Principal / Director  
Seal

**CERTIFICATION OF GUIDE**

This is to certify that the work incorporated in the dissertation entitled  
 “ .....  
 ”

Submitted by..... for the degree of 'Master of Science' in the subject of  
 'Biotechnology' under the faculty of Interdisciplinary Science has been carried  
 out in the Department (laboratory) of....., RGITBT, BVDU (**Institute/  
 Private Lab, Govt Lab etc**) ....., Pune (**OR Place**) during the period from  
 .....to....., under my direct supervision/ guidance.

Place : ( Signature of Research Guide)

Date : (Name & Designation)

Place : Pune ( Signature of Research Co-Guide)

Date : (Name & Designation)

**DECLARATION BY THE CANDIDATE**

I hereby declare that the dissertation entitled “ \_\_\_\_\_  
”  
\_\_\_\_\_ submitted by me to  
(Title of thesis)

the Bharati Vidyapeeth Deemed to be University, Pune for the degree of Master of Science (M Sc.) in Biotechnology under the Faculty of Interdisciplinary Science is original piece of work carried out by me under the supervision of \_\_\_\_\_  
(Name of Guide) and

\_\_\_\_\_. I further declare that it has not been submitted to  
(Name of Co-guide (if any))

this or any other university or Institution for the award of any degree or Diploma.

I also confirm that all the material which I have borrowed from other sources and incorporated in this dissertation is duly acknowledged. If any material is not duly acknowledged and found incorporated in this dissertation, it is entirely my responsibility. I am fully aware of the implications of any such act which might have been committed by me advertently or inadvertently.

Place :  
Date : / /

Name & signature of  
Research Student

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A<sup>+</sup> Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Progress Report – I**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Dec 1 – Jan 15

Name & Place of Research Work :

Objectives of Research Work : 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:**

**Place & Date:**



**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A+ Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Progress Report – II**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Jan 16 – Feb 28

Name & Place of Research Work :

Objectives of Research Work: 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:**

**Place & Date:**

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A<sup>+</sup> Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Internal Evaluation Report**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

**(of 40 % weight age )**

	<b>Out of</b>	<b>Marks obtained</b>
Percent Attendance	10	
Getting well acquainted with colleague and laboratory procedures, sincerity	5	
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management	20	
Overall Performance	5	
<b>Total</b>		

1. Name of Research Guide with signature and seal:

2. Name of Research Guide:

Place & Date:

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**  
**(Re-accredited with A grade by NAAC in 2011, Accredited with A<sup>+</sup> Grade by NAAC in 2017)**  
**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Evaluation Report on Presentation**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

**(of 60 % weight age )**

	<b>Out of</b>	<b>Marks obtained</b>
Overall understanding of the research project - Research Objectives	10	
Significance of Research / Review	10	
Results – Data presentation, statistical analysis, Softwares used, Result Interpretation	15	
Presentation – Clarity, power point slides, communication skills, question – answer session.	15	
Significant outcome – Technical abstract, Seminar, etc.	10	
<b>Total</b>		

Name & Signature of Expert Pane - 1. (External):

- 2. (Internal):

- 3. (Internal):

Signature of Principal (RGITBT):

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**  
 (Re-accredited with A grade by NAAC in 2011, Accredited with A<sup>+</sup> Grade by NAAC in 2017)  
**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
 Pune-Satara Rd, Katraj, Pune – 411 046

**Plan of Research Outline**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Proposed Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Proposed Research Objectives :

Start Date of Research project :

Likely Date of Project Completion :

Significance of Research Project :


Name & Sign of Student

**Approved by**

1. Name of Research Guide with signature and seal:

Place & Date:

2. Name of Research Guide (Co-Guide) with signature and seal:

Place & Date:



BVDU-RGITBT-M.Sc. mED.  
Biotech.



# Bharati Vidyapeeth (Deemed to be University) Pune, India.



Hon'ble Dr. Patangrao Kadam  
M.A., LL.B., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Accredited with 'A+' Grade (2017) by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



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## NOTIFICATION NO. 894

It is hereby notified for the information of all concerned that the Academic Council, at its 55<sup>th</sup> meeting held on 26-3-2018, has resolved to approve the revised course structures, syllabi and rules of examinations of M.Sc. Biotechnology and M.Sc. Medical Biotechnology under Choice Based Credit System to be implemented from the academic year 2018-19.

Copies of revised course structures, syllabi and rules of examinations of M.Sc. Biotechnology and M.Sc. Medical Biotechnology under Choice Based Credit System are enclosed.

All the concerned may please note.

Ref. No. BVDU/2017-18/ 5333

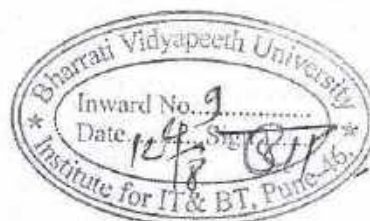
Date: April 10, 2018

*G. Rajkumar*  
Registrar

To

1. The Dean, Faculty of Science, BVDU, Y. M. College, Pune 38
2. The Dean, Faculty of Interdisciplinary Studies, BVDU, College of Engineering, Pune 43
- ✓ 3. The Principal, BVDU Rajiv Gandhi Institute of IT and BT, Pune 43
4. The Controller of Examinations, BVDU.
5. The IT Cell for uploading in the Website.

Notification AC26-3-2018(55-5.7)



**BHARATI VIDYAPEETH DEEMED TO BE  
UNIVERSITY**

**PUNE**

**REVISED SYLLABUS FOR**

**MASTER OF SCIENCE**

**M.Sc. IN MEDICAL BIOTECHNOLOGY**

**UNDER**

**FACULTY OF INTERDISCIPLINARY STUDIES**

**SYLLABUS OF SEM I – SEM IV UNDER**

**CHOICE BASED CREDIT SYSTEM**

**To be effective from Academic Year**

**2018-19**

Bharati Vidyapeeth Deemed To Be University is a multidisciplinary, multicampus university having 32 Institutions imparting quality education in various disciplines. All programmes of the University are approved by UGC and respective statutory councils. BVDU has been re accredited for the third time with 'A+' grade by NAAC in 2017. UGC has accorded 12B Status [UGC ACT1956] to the university. Ministry of Human Resource and Development, Government of India has awarded "A" category to the University in 2012 based on parameters including innovative programs, research and infrastructure facilities. The University is a member of Association of Indian Universities [AIU] which has ranked BVDU among top 10 universities of India for International students' enrollment. BVDU is also a member of International Association of Universities.

Rajiv Gandhi Institute of IT and Biotechnology is a constituent unit of BVDU established in 2003. The Institute is approved by UGC to conduct graduate and post graduate courses in Biotechnology. The Institute has excellent infrastructure, state-of-the-art laboratories and competent faculty facilitating appropriate learning environment. The Institute offers one undergraduate and four postgraduate programmes in Biotechnology.



## **INTRODUCTION**

The Master of Science (M.Sc.) in Medical Biotechnology is a full time post graduate programme offered by Bharati Vidyapeeth Deemed to be University (BVDU) in its constituent unit Rajiv Gandhi Institute of IT and Biotechnology. The course was initiated in the year 2012 and was designed to facilitate empowerment of students to face cutting edge technological applications biomedical and pharmaceutical biotechnology sector. The main advantage of proposing this course was availability of the expertise in biotechnology and medical disciplines in the same campus. The course received very encouraging response from all its stakeholders. On its implementation for five years, the curriculum is being revised to embrace newer emerging disciplines and value added courses. The revised M.Sc. Medical Biotechnology is a full time 104 credits Programme to be implemented in Rajiv Gandhi Institute of IT and Biotechnology from the academic year 2017-18. The feedback of students, alumni, faculty, employers and parents has a substantial contribution in designing of this curriculum.

## **OBJECTIVES**

1. To impart deep knowledge of the discipline
2. Develop skills in relevant areas to enhance employment opportunities
3. Introduce emerging areas of pharma and biotech sector
4. Build interdisciplinary approach
5. Foster global competence among students
6. Inculcate social and moral values and sense of scientific responsibilities in students

## **ELIGIBILITY FOR ADMISSION TO THE COURSE**

Candidates satisfying following criteria are eligible to apply for M.Sc. Medical Biotechnology Course

1. The candidate should have passed the Bachelors degree course in Biotechnology/ any branch of life science/ Pharmacy & Medicine from the recognized university with minimum of 50% or 45% aggregate marks for open and SC / ST category respectively graduate level university examination.
2. Subject to above conditions, the admission will be based on the merit at Entrance Examination conducted by Bharati Vidyapeeth Deemed to be University.

## **DURATION OF THE COURSE**

The course will be executed in four semesters. The medium of instruction and examination will be only English.

**RULES FOR THE COURSE**

1. The entire course is of 104 credits.
2. One credit for theory course is equivalent to 15 lectures/tutorials; while one credit for practical course is equivalent to 25 – 30 hrs. of lab /field work or demonstration.
3. The curriculum comprises of Core and Value Added courses. The Core Courses are compulsory where as Value Added are elective.
4. The Core Courses are aimed at providing fundamental knowledge of the discipline. The Value Added Courses intend to develop skills in relevant Biotechnology Industry sector. The teaching schedule for the 3 credits and 2 credits theory courses will be 3 and 2 lectures per week respectively. All courses will have one tutorial fortnightly.
5. The respective elective course will be implemented only if more than 10 students enroll for that course.
6. Some of the core courses in Semester I and Semester II are common in two master's programmes; M.Sc. Medical Biotechnology and M.Sc. Biotechnology.
7. The teaching and evaluation for these courses will be combined for both disciplines.
8. The shared courses are coded as MBT&MedBT whereas the courses which are exclusive for M.Sc. Medical Biotechnology are coded as MedBT
9. All core courses will be evaluated by University Examination. The Elective courses will be assessed by Continuous Assessment.
10. Two extra credits will be awarded to students if there is any significant outcome of their dissertation study. The research outcome in terms of publication in indexed national/International journal; filing of patent; or commercialization of technology will be considered for the award of credits.

**RULES FOR EXAMINATION****A: Nature of Examination:**

1. Each course will have 40% marks for internal assessment and 60% marks for semester-end examination.
2. The assessment for 1, 2, 3 and 4 Credits courses will be as given in following table

Table 1: Evaluation pattern for One to Four Credit Courses

Course Credits	Marks for UE (60% Weightage)	Marks for IE (40% weightage)	Total Marks for evaluation
1	15	10	25
2	30	20	50
3	45	30	75
4	60	40	100

- The duration of 60 Marks UE theory paper will be 3.00 Hrs; for 45 Marks 2.00 Hrs and for 30 Marks 1.30 Hrs. respectively.
- The Internal Assessments (IA) will be conducted by the Institute and an end-of-the term University Examination (UE) conducted by the university. The UE will be based on the entire syllabus.

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course.

#### STANDARD OF PASSING

**A: Grading System:** A 10-point absolute grading system will be adapted for grading in each head of passing. The system will have seven grade points, the highest being 10. The grading system shall be as shown in Table-1 below. The performance indicators O, A+, A, B+, B, C, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, Satisfactory, and Poor.

Table-1: The grading system under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} \leq 80$	9	A+
$60 \leq \text{Marks} \leq 70$	8	A
$55 \leq \text{Marks} \leq 60$	7	B+
$50 \leq \text{Marks} \leq 55$	6	B
$40 \leq \text{Marks} \leq 50$	5	C
$\text{Marks} < 40$	0	D

1. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table) shall be the GPA for the course.**

2. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses up to and including the current semester. The CGPA of a student when he/she completes the programme is his/her final result.

3. The SGPA is calculated by the formula ,  $SGPA = \frac{\sum Ck \times GPAk}{\sum Ck}$  where  $Ck$  is the

$$\sum Ck$$

credit-value assigned to a course and  $GPAk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

4. The CGPA is calculated by the formula ,  $CGPA = \frac{\sum Ck \times GPAk}{\sum Ck}$  where  $Ck$  is the

$$\sum Ck$$

credit-value assigned to a course and  $GPAk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

5. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result grace marks of 1, 2 or 3 may be awarded to a candidate at UE as per the university rules. **B: Standards of Passing and ATKT rules:**

1. For all Core Courses, both UE and IE constitute separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits

- (a) the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA;

OR

(b) If he/she fails in IA, then also the learner passes in the course, **provided that a minimum of 25% is obtained in IA and GPA for the course is at least 6.0 (50%marks ) in aggregate.** The GPA for a course will be calculated only if the learner passes in that course.

1. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP. **A student who passes in aggregate in a course need not reappear even if he failed at IA if he/she obtains 25% at IA.**
2. The students of Semester I and II & III will be admitted to next Semester even if he/she gets backlog in any of the course. They can reappear in the next semester examination as a backlog candidate.

#### C: AWARD OF HONOURS:

1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade and CGPA only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 2.

**Table 2: Criteria for the award of honours at the end of the programme**

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq CGPA \leq 10.00$	O	Outstanding	$80 \leq Marks \leq 100$
$9.00 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks \leq 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks \leq 70$
$7.00 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks \leq 60$
$6.00 \leq CGPA \leq 6.99$	B	Average	$50 \leq Marks \leq 55$
$5.00 \leq CGPA \leq 5.99$	C	Satisfactory	$40 \leq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks below 40

#### THE FORMAT OF THE TRANSCRIPTS

The transcripts may be acquired by the students indicating his/her performance in every semester examination. The transcript shall show the performance indicators given in the following table, in addition to any other information.

Course Number	Course Discription	Number of Credits	University Examination		IA/CA		Grade Point Average (GPA)	Result
			Grade	Grade Point	Grade	Grade Point		
Total Cumulative Credits Completed		SGPA	CGPA	Equivalent Marks (%)	<b>Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be GPA</b>			

**PATTERN FOR ASSESSMENT**

**A: Pattern of Evaluation for Internal Assessment of Theory Courses:**

The weightage for Internal Assessment is 40%. Students for IA of every theory course will be assessed for total of 30 marks for 3 credit course and for 20 marks for 2 credit course which will be cumulative marks obtained in two separate assessments specified below.

1. Two internal written examinations of 15 marks each for 3 credit course and 10 marks each for 2 credit course. A total of the two tests will be considered.
2. An optional assignment/ oral/ open book examination may be undertaken if desired.

**B. Pattern of Evaluation for Internal Assessment of Practical Courses:**

The Internal Assessment for every practical course will be of 20 Marks for 2 credits and 40 marks for 4 credits practical courses. The students for IA will be assessed on the basis of;

1. Performance for every practical: 10 Marks/20 Marks for 2/4 Credits practical courses respectively. (Marks to be distributed depending on total number of practicals)
2. Assignment/ Oral examination/Tour Report: 10/20 Marks for 2/4 Credits courses

**C: Pattern of question paper at University Examination**

University Examination for 3 credit and 2 credit theory course will be of 45 marks and 30 marks respectively. For 3 credit course, the question paper will comprise of 6 questions, 3 questions

each in section I and section II. Q1 of section I will be of 6 marks while Q2 and Q3 will be of 8 marks each. Q 4 of section II will be of 7 marks while Q 5 and Q6 will be of 8 marks each. All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 3 credit course of university theory examination of M.Sc. Medical Biotechnology 2018 CBCS Course**

**(Total Marks:45, Tme:2.00 Hrs.)**

**Instructions to Paper Setter:**

- I. Question paper of each course will comprise of total 6 questions,
- II. Section I will have 3 questions and Section II 3 questions.
- III. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
- IV. Q. no 1 will be objective, comprising of 7 questions of 1 mark each. They will be based on entire portion of Section I. Students will have to attempt any 6 out of these.
- V. Q no 4 will be objective, comprising of 8 questions of 1 mark each. They will be based on entire portion of Section II. Students will have to attempt any 7 out of these.
- VI. Questions 2 & 3 of **Section I** and 5 & 6 of **Section II** will be descriptive and contain 3 sub-questions of 4 marks each out of which students will attempt any two.
- VII. Q 2 and 3 will be based solely on Unit I and II whereas Q 5 and 6 will be based on Unit III and IV of the syllabus respectively..
- VIII. Students will attempt answers to Section I and Section II in separate answer books

**SECTION I**

**Q. 1 Attempt Any Six** of the following (06)

- a.
- b.
- c.
- d.
- e.
- f..
- g.

**Q. 2 Attempt Any Two** of the following (08)

- a.
- b.
- c.

**Q. 3 Write short notes on Any Two** of the following (08)

- a.
- b.
- c.

**SECTION II**

**Q. 4 Attempt Any Seven** of the following (07)

- a.
- b.
- c.
- d.**
- e.
- f.
- g.
- h.

**Q. 5 Attempt Any Two of the following**

(08)

- a.
- b.
- c.

**Q. 6 Write short notes on Any Two of the following**

(08)

- a.
  - b.
  - c.
- 

**For 2 credit course,** the question paper will comprise of 4 questions, 2 questions each in section I and section II. Q1 of section I and Q3 of section II will be of 7 marks each while Q2 and Q4 will be of 8 marks each. All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 2 credit course of university theory examination of M.Sc. Medical Biotechnology 2018 CBCS Course**  
(Total Marks:30, Tme:1.50 Hrs.)

**Instructions to Paper Setter:**

- IX. Question paper of each course will comprise of total 4 questions,
- X. Section I will have 2 questions and Section II 2 questions.
- XI. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
- XII. Questions 1 of section I and 3 of section II will be objective, and contain 8 questions of 1 mark each out of which students will attempt any 7. They will be based on entire portion of Section I and section II respectively.
- XIII. Questions 2 of **Section I** and 4 of **Section II** will be descriptive and contain 3 sub-questions of 4 marks each out of which students will attempt any two.
- XIV. Q 2 and 4 will be based solely on Unit I and II of the syllabus respectively..
- XV. Students will attempt answers to Section I and Section II in separate answer books



## SECTION I

- Q. 1** Attempt **Any seven** of the following (07)
- I.
  - li.
  - lii.
  - lv.
  - v.
  - vi.
  - vii.
  - viii.

- Q. 2** Attempt **Any Two** of the following (08)
- I.
  - ii.
  - lii.

## SECTION II

- Q.3** Attempt **Any seven** of the following (07)
- I.
  - li.
  - lii.
  - lv.
  - v.
  - vi.
  - vii.
  - viii.

- Q. 4** Attempt **Any Two** of the following (07)
- I.
  - li
  - lii.

**Pattern of Question Paper for 2 and 4 Credits Practical Courses at University Examination**

**D: Pattern for question paper of University Practical Examination of M.Sc. Medical Biotechnology 2018 CBCS Course**

**(Total Marks:30/60 for 2/4 credit courses, Time: 3 .00/6.00 Hrs.)**

- |                               |         |
|-------------------------------|---------|
| Q.1 Major Practical           | (10/20) |
| Q.2 Spotting/Minor Experiment | (10/20) |
| Q.3 Viva                      | (05/10) |
| Q.4 Journal                   | (05/10) |

Course structure of M.Sc. Degree Course in Medical Biotechnology  
Under Choice Based Credit System

## SEMESTER I

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT&amp;MedBT 101</b> Core Course-Theory	Microbiology	3	40	60	<b>25</b>
<b>MBT&amp;MedBT 102</b> Core Course –Theory	Biochemistry	3	40	60	
<b>MBT&amp;MedBT 103</b> Core Course –Theory	Cell & Developmental Biology	3	40	60	
<b>MBT&amp;MedBT 104</b> Core Course –Theory	Genetics	3	40	60	
<b>MBT&amp;MedBT 105</b> Core Course –Theory	Molecular Biology	3	40	60	
<b>MBT&amp;MedBT 106</b> Core Course –Practical	Biochemistry & Molecular Biology Lab	4	40	60	
<b>MBT&amp;MedBT 107</b> Core Course –Practical	Cell Biology & Genetics Lab	4	40	60	
<b>MBT&amp;MedBT 108</b> Core Course –Practical	Microbiology Lab	2	40	60	

## SEMESTER II

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT&amp;MedBT 201</b> Core Course –Theory	Genetic Engineering	3	40	60	
<b>MBT&amp;MedBT 202</b> Core Course –Theory	Analytical Biotechnology	3	40	60	
<b>MBT&amp;MedBT 203</b> Core Course –Theory	Immunology	3	40	60	
<b>MBT&amp;MedBT 204</b> Core Course –Theory	Genomics & Proteomics	3	40	60	
<b>MBT&amp;MedBT 205</b> Core Course - Theory	Nanobiotechnology	2	40	60	
<b>MedBT 206</b> Core Course -Theory	Human Physiology	3	40	60	
<b>MBT&amp;MedBT 207</b> Core Course –Practical	Genetic Engineering and GenomicsLab	4	40	60	
<b>MBT&amp;MedBT 208</b> Core Course –Practical	Analytical Techniques and Proteomics Lab	4	40	60	
<b>MBT&amp;MedBT 209</b> Core Course - Practical	Immunology & Nanobiotechnology Lab	4	40	60	
<b>MBT&amp;MedBT 210</b> Elective Course I	Elective Bioentrepreneurship/ IPR I	2	Continuous Assessment		
					<b>31</b>

Elective Courses in Sem II: 1) MBT 210: Elective Course I; Option I: Bioentrepreneurship, Option II: IPR I

## SEMESTER III

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MedBT 301</b> Core Course –Theory	Animal Tissue Culture & Stem Cell Biology	3	40	60	
<b>MedBT 302</b> Core Course –Theory	Medical Biochemistry & Drug Discovery	3	40	60	
<b>MedBT 303</b> Core Course –Theory	Infectious Diseases	3	40	60	
<b>MedBT 304</b> Core Course –Theory	Pharmaceutical Biotechnology & Molecular Diagnostics	3	40	60	
<b>MBT&amp;MedBT 305</b> Core Course-Theory	Biostatistics	2	40	60	
<b>MBT&amp;MedBT 306</b> Core Course-Theory	Research Methodology	2	40	60	
<b>MedBT 307</b> Core Course-Practical	ATC & Pharma Biotech Lab	4	40	60	
<b>MedBT 308</b> Core Course-Practical	Infectious Diseases & Biostatistics Lab	4	40	60	
<b>MedBT 309</b> Core Course-Practical	Medical Biochemistry & Drug Discovery Lab	2	40	60	
<b>MBT&amp;MedBT 310</b> Elective Course II	Biomedical Waste Management/ Drug designing/ IPR II	2	Continuous Assessment		

Elective Courses in Sem III: 1) MBT 310: Elective Course I; Option I: Biomedical Waste Management, Option II: Drug designing, Option III: IPR II

## SEMESTER IV

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBT&amp;MedBT 401</b> Core Course	Research Project	20	40	60	<b>20</b>

Total Credits Offered: 25 C, Sem I+ 31 C, Sem II +28 C, Sem III+ 20C, Sem IV = 104 C

SEMESTER I

MBT&MedBT 101: Microbiology	Total
Core Course – Theory; 3 Credits	45L
<b>UNIT I</b>	
1 <b>Microbial diversity:</b>	3
Bacteria	
Archaea	
2 <b>Cell structure and functions of bacteria.</b>	3
3 <b>Cell structure and functions of archaea and fungi.</b>	4
<b>UNIT II</b>	
4 <b>Microbial growth:</b>	4
Growth kinetics, cytokinesis, factors affecting growth of microorganisms.	
5 <b>Growth on different environment</b>	3
Extremophiles and their adaptations	
6 <b>Anaerobic microorganisms, cultivation and applications.</b>	3
<b>UNIT III</b>	
7 <b>Microbial interactions:</b> Symbiotic interactions, parasitism, ammensalism and competition;	5
8 <b>Microbial flora of healthy human host:</b> Distribution and occurrence of normal flora in humans	5
9 <b>Microbial pathogenesis:</b> Host-microbe interactions; Bacterial, fungal and protozoal pathogenesis in humans.	4
<b>UNIT IV</b>	
10 <b>Effect of Antimicrobial drugs:</b> on bacterial, fungal and viral pathogens	4
11 <b>Virology:</b> Diversity, Classification of virus, Cytopathic effect of virus	3
12 <b>Taxonomy,</b> Molecular methods, Bergey's manual of systematic bacteriology.	4
<b>References</b>	
1. Brock Biology of Microorganisms 13 <sup>th</sup> eds, , Michael T. Madigan	
2. Prescott's Microbiology, 9 <sup>th</sup> eds, Joanne M. Willey	
3. Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY	
4. General Microbiology - Stanier R.Y., 5th edition, (1987) Macmillan Publication UK.	
5. Introduction to Microbiology, 2nd Edn. Ingraham, J. L. and Ingraham C. A., Thompson Asia Pvt. Ltd., Singapore (2002).	

MBT&MedBT 102: Biochemistry	Total
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I: Biomolecules structure, functions</b>	
<b>1 Introduction:</b> Scope and importance of biochemistry in biotechnology.	<b>1</b>
<b>2 Carbohydrates, lipids and proteins -</b> Structure, properties and biological role (functions) of carbohydrates, Proteins and lipids. Protein structure and Lectins- overview. Lipids and cell membranes – types of membrane lipids, phospholipids and glycolipids from bimolecular sheets. Monoglycerides and diglycerides- structure, properties and applications.	<b>7</b>
<b>3 Hydrolytic products of polysaccharides &amp; their applications.</b> Bulk production of Malt, peptides, malto-dextrin, glue.	<b>3</b>
<b>UNIT II: Metabolism</b>	
<b>4 Metabolism of carbohydrates and protein-</b> Glycolysis, Glucogenesis, Citric acid cycle and Glycogen metabolism. Protein turnover and Amino acid catabolism, Biosynthesis of amino acids, urea cycle. Biosynthesis of carbohydrate and proteins-overview	<b>5</b>
<b>5 Fatty acid metabolism and nucleic acid metabolism-</b> Overview of Fatty Acid Metabolism, synthesis and degradation of fatty acids, De novo synthesis of Nucleotides	<b>4</b>
<b>6 Oxidative phosphorylation and photophosphorylation</b> Oxidative Phosphorylation – regulation – light reactions of Photosynthesis	<b>3</b>
<b>UNIT III: Enzymology</b>	
<b>7 Introduction to enzymes-</b> Classification of enzymes, specificity of enzyme action – monomeric and oligomeric enzymes. Allosteric enzymes. Structural Components of Enzymes – apoenzymes, prosthetic group, cofactors,	<b>4</b>
<b>8 Mechanisms of reactions catalysed by enzymes –</b> Metal activated enzymes – metalloenzymes –involvement of co enzymes, Enzyme Inhibition	<b>4</b>
<b>9 Biotechnological applications of enzymes</b> in various industries like fruit juice extraction, leather processing, Meat tenderization, Baking and dairy industry.	<b>3</b>
<b>UNIT IV: Techniques</b>	
<b>10 Free and immobilised enzyme kinetics-</b> Rationale and Methods of immobilization of enzymes: covalent coupling, cross-linking and entrapment methods. Properties of immobilized enzymes, Whole cell immobilization, Advantages of immobilization, Types of Carriers,. Applications of Immobilized enzymes: Production of High fructose corn syrup, invert sugar, synthetic penicillin.	<b>4</b>
<b>11 Chromatography-</b> Principle, types- gel, affinity, ion exchange, applications	<b>3</b>
<b>12 Electrophoresis</b> Principle of separation, factors affecting separation, types - paper, agarose gel, PAGE, 2D- gel electrophoresis, western blotting	<b>4</b>
<b>References</b>	
1. Biochemistry by Jeremy M.Berg, John L.Tymozko, Lubert Stryer, 5th Eds,	
2. Lehninger Principles of Biochemistry Edition 4, Nelson, David L. Cox, Michael M. Lehninger, Albert L. W, H Freeman & Co	
3. Student Companion to Accompany Biochemistry, Richard I. Gumpport, Jeremy M. Berg, Nancy Counts Gerber, Frank H. Deis, Jeremy Berg, W H Freeman & Co	

<b>MBT&amp;Med BT 103: Cell &amp; Developmental Biology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Structure of cell</b>	<b>6</b>
Structure of cell organelles: Endoplasmic reticulum, mitochondria, golgi apparatus, lysosomes, chloroplast, nucleus, cell wall. Comparison of prokaryotic and eukaryotic cells	
<b>2 Cytoskeleton: Organization and functions cytoskeleton, Actin filaments, actin binding proteins, Intermediate filaments, Microtubules, Structure and functions of cilia and flagella.</b>	<b>5</b>
<b>UNIT II</b>	
<b>4 Plasma Membrane:</b>	<b>7</b>
Plasma membrane structure and functions, membrane models, Transport across membrane- passive diffusion, osmosis, active transport, Ion Channels, Na <sup>+</sup> and K <sup>+</sup> pump, Ca <sup>2+</sup> ATPase pump, co-transport, symport, antiport, endocytosis and exocytosis. Membrane vesicle trafficking	
<b>5 Specialized Cells (Muscle &amp; Nerve cells):</b>	<b>4</b>
Structure & functions of muscles (Straited, nonstraited and cardiac). Structure of neuron, Neurotransmitters and their receptors	
<b>UNIT III</b>	
<b>6 Cell – Cell Interactions</b>	<b>3</b>
Cell adhesion molecules, cadherins, Integrins, transmembrane proteoglycanc, Claudins and occludens, gap junctions, tight junctions, adherens, desmosomes and hemidesmosomes, plasmodesmata	
<b>7 Cell Cycle</b>	<b>2</b>
Molecular events of cell division and cell cycle, regulation of cell cycle events- Cyclins, Cyclin dependent kinases, inhibitors. Apoptosis and necrosis.	
<b>8 Cell Signaling</b>	<b>6</b>
General principles of cell signaling, signaling via G-protein coupled receptors, kinase receptors, role of secondary messengers.	
<b>UNIT IV</b>	
<b>9 Developmental Biology</b>	<b>5</b>
Gametogenesis (Spermatogenesis, Oogenesis), Meiosis and its significance, types of eggs, fertilization and implantation, types and patterns of cleavage, Blastulation	
<b>10 Stages of fetal development</b>	<b>4</b>
Gastrulation in Frog, Germ layer formation, fetal membranes, placenta formation in mammals	
<b>11 Concept of dedifferentiation, redifferentiation, transdifferentiation and regeneration</b>	<b>3</b>

### References

1. Alberts, B., Bray, D., Lewis, J., Raf, M., Roberts, K., Watson, J.D. (1994). Molecular Biology of the Cell
2. Cooper, G.M. (1997).The Cell: A molecular approach, ASM Press, USA.
3. Hallwell, B., Gutteridge, J.M.C. (2002). Free Radicals Biology and Medicine. Oxford Press.UK.

4. Karp, G. (1996). Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.
5. Lodish, H., Baltimore, D., Berk, A., Zipursky, B.L., Mastysdaira, P., Darnell, J. (2004). Molecular Cell Biology, Scientific American Books Inc. NY.
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8. Human Embryology and Developmental Biology, Author: Carlson, Bruce M.Edition: 3, Publisher: Elsevier - Health Sciences Division ISBN-13: 9780323014878.
9. Balinsky : introduction to Embryology (CBS College Publishers)
10. Subramanyan, T : Developmental Biology (Narosa Publishing House) Arumugam N.A. text book of embryology (Saras publication)



MBT&Med BT 104: Genetics	Total
Core Course – Theory; 3 Credits	45L
<b>UNIT I</b>	
<b>1 Overview of genetics:</b>	<b>5</b>
Genes and Expression, Allele, multiple alleles, pseudoallele, complementation tests, Genetic variation, Molecular basis of allelic variation. Methodologies used in genetic studies, Model organisms. Genes-Environment interaction.	
<b>2 Modes of inheritance:</b> Mendelian and Non Mendelian Inheritance: Lethal alleles, Epistasis, Penetrance and expressivity, Pleiotropy, Phenocopies, mitochondrial inheritance	<b>6</b>
<b>UNIT II</b>	
<b>3 Structure and function of human chromosome:</b>	<b>3</b>
Ultra structure of human chromosome, Classification of chromosomes, Sex chromosome, Origin of Y chromosome, SRY genes and its effects. Dosage compensation	
<b>4 Human chromosomal Abnormalities:</b> Aneuploidy and Structural, associated syndromes	<b>4</b>
<b>5 Pedigree analysis of human:</b>	<b>2</b>
X linked and autosomal disorders. Linkage maps, Lod scores to assess linkage in human pedigrees	
<b>6 Diagnostics:</b> Prenatal diagnosis, Karyotype analysis, FISH, Genetic counseling	<b>3</b>
<b>UNIT III</b>	
<b>7 Population genetics:</b> Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.	<b>5</b>
<b>8 Brain, Behavior and Evolution:</b>	<b>6</b>
Approaches and methods in study of behavior; Proximate and ultimate causation; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism; Neural basis of learning, memory, cognition, sleep and arousal; Biological clocks; Development of behavior; Social communication; Social dominance; Use of space and territoriality; Mating systems, Parental investment and Reproductive success; Parental care; Aggressive behavior; Habitat selection and optimality in foraging; Migration, orientation and navigation; Domestication and behavioral changes.	
<b>Unit IV</b>	
<b>9 Cancer genetics;</b> genetic control of cell cycle, mutations that prevent normal checkpoints, inherited cancer syndromes, cancers acquired due to chromosomal abnormalities	<b>6</b>
<b>10 Reproductive Technologies</b>	<b>5</b>
<b>References:</b>	
1. Human genetics: Concepts and applications. Ricky Lewis. 11 <sup>th</sup> Ed. Mc Graw – Hill Higher Education IncPubl 2015	
2. Essential genetics, A genomics perspective. Daniel L. Hartl. 6 <sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014	
3. Human molecular genetics, 4 <sup>th</sup> Ed. T Stranchan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010	
4. Human Genetics. A Gardner, T. Davies. 2 <sup>nd</sup> Ed. Springer Verlag Publ 2010.	

<b>MBT&amp;Med BT 105: Molecular Biology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Genomes and its content</b>	<b>8</b>
Basic concepts, flow of information transfer, genetic code, types of mutations	
Genome sizes of different organisms, C Value	
Gene families, clusters, pseudogenes, super-families, organelle genomes	
Organization of prokaryotic genome, Structure of nucleosome and organization of chromatin, structure of chromosome, centromere and telomere	
<b>UNIT II</b>	
<b>2 DNA replication &amp; repair</b>	<b>6</b>
DNA polymerases, mechanism of replication in prokaryotes and eukaryotes, DNA damage, Mechanisms of DNA repair in prokaryotes and eukaryotes,	
<b>3 Homologous and site specific recombination</b>	<b>4</b>
Insertion elements	<b>3</b>
<b>UNIT III</b>	
<b>4 Transcription and posttranscriptional mechanisms</b>	<b>12</b>
RNA polymerase and mechanism of prokaryotic transcription	
Eukaryotic RNA polymerases and their promoters, activating transcription, role of enhancers, gene silencers, CpG Islands, post transcriptional modifications, RNA splicing reactions, catalytic RNA, Regulatory RNA, MicroRNAs & RNA interference	
<b>Unit IV</b>	
<b>5 Translation</b>	<b>7</b>
Mechanism of translation in prokaryotes and eukaryotes, post translational modifications, transport of proteins, role of chaperons	
<b>6 Gene regulation</b>	<b>5</b>
Operon, Induction and repression, positive and negative regulation, attenuation, lactose, arabinose and tryptophan operon, Eukaryotic transcription regulation	
<b>7 Epigenetic effects</b>	<b>2</b>
Heterochromatin nucleation, Chromatin remodeling, epigenetic inheritance, genomic imprinting.	
<b>References:</b>	
1. Human genetics: Concepts and applications. Ricky Lewis. 11 <sup>th</sup> Ed. Mc Graw – Hill Higher Education IncPubl 2015	
2. Essential genetics, A genomics perspective. Daniel L. Hartl. 6 <sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014	
3. Human molecular genetics, 4 <sup>th</sup> Ed. T Stranahan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010	
4. Human Genetics. A Gardner, T. Davies. 2 <sup>nd</sup> Ed. Springer Verlag Publ 2010.	

**MBT&Med BT 106: Biochemistry & Molecular Biology Lab****Core Course –Practical; 4 Credits****Biochemistry Lab**

- |   |  |   |
|---|--|---|
| 1 | To prepare an Acetic - Na Acetate Buffer system and validate the Henderson-Hasselbach equation.  | 2 |
| 2 | To determine an unknown protein concentration by plotting a standard graph of BSA using UV-Vis Spectrophotometer and validating the Beer- Lambert's Law.   | 2 |
| 3 | Titration of Amino Acids and separation of aliphatic, aromatic and polar amino acids by TLC.   | 2 |
| 4 | AN ENZYME PURIFICATION THEME (such as E.coli Alkaline phosphatase or any enzyme of choice).<br>(a) Preparation of cell-free lysates<br>(b) Ammonium Sulfate precipitation<br>(c) Ion-exchange Chromatography<br>(d) Gel Filtration<br>(e) Affinity Chromatography<br>(f) Generating a Purification Table | 6 |
| 5 | Enzyme Kinetic Parameters: Km, Vmax and Kcat   | 3 |
| 6 | Assessing purity by SDS-PAGE Gel Electrophoresis   | 2 |
| 7 | Estimation of diagnostic markers- glucose, urea  | 3 |

**Molecular Biology Lab**

- |    |   |   |
|----|---|---|
| 1  | Understanding of basic principles, equipments and molecular biology grade reagents, Preparation of buffers and reagents | 1 |
| 2. | Isolation of DNA from bacteria and eukaryotic cells, blood & plant  | 5 |
| 3. | Analysis of DNA preparations by UV spectrometry and agarose gel electrophoresis   | 2 |
| 4. | Isolation and estimation of RNA from bacteria/yeast/eukaryotic cells  | 2 |
| 5. | Amplification of DNA by PCR   |   |
| 6. | Evaluation of gene expression using Real Time PCR (Demonstration)   | 2 |
| 7. | DNA sequencing (Demonstration)  | 1 |

**References:**

1. Sambrook J and Russell D. (2011) Molecular cloning A Laboratory Manual 3rd Ed, Cold spring harbor laboratory press, New York.
2. Wilson K. and Walker J. (2005) Principles and Techniques of Biochemistry and Molecular Biology, Cambridge University Press, New York.

**MBT&Med BT 107: Cell Biology & Genetics Lab**

Core Course –Practical; 4 Credits

**Cell Biology Lab**

1	Study of mitosis with onion root tip chromosomes	1
2	Observation of permanent slides of meiosis	1
3	Temporary preparation of Polytene chromosomes from Chironomus salivary gland	2
4	Isolation of nuclei from rat liver	2
5	To determine Erythrocyte (RBC) & Leucocytes (WBC) count of a blood sample	2
6	Chlorophyll estimation: Spectrum and light scatter	1
7	Study of frog development, observation of frog embryo of different development stages	2
8	Study of eggs and sperms from animal samples	2

**Genetics Lab**

1	Planting of blood culture	1
2	Preparation of chromosome spreads from lymphocyte culture	2
3	Banding of metaphase slides	1
4	Karyotyping and analysis	1
5	Isolation and staining of lampbrush chromosomes	2
6	Cultivation of drosophila and study of Mendelian inheritance	5
7	Demonstration of cytogenetic analysis using FISH	1

**References:**

1. Development Biology, 9th edition, (2010), Gilbert S.F.(Sinauer Associates, (USA)
2. Principles of Development, 4th edition (2010), Wilbert L and Tickle C, Publisher: Oxford University Press, USA.
3. Developmental Biology Laboratory Manual. S.R. Scadding and S. Frombach. 5<sup>th</sup> Ed.
4. Essential genetics, A genomics perspective. Daniel L. Hartl. 6<sup>th</sup> Ed. Burlington, Mass Jones & Bartlett Learning Publ. USA, 2014
5. Human molecular genetics, 4<sup>th</sup> Ed. T Strachan and A. Read. Garland Publishing, Taylor & Francis Group, NY, USA. 2010
6. Human Genetics. A. Gardner, T. Davies. 2<sup>nd</sup> Ed., Springer VerlagPubl, 2010

**MBT&MedBT 108: Microbiology Lab****Core Course – Practical; 2 Credits**

1	Microscopy	2
2	Isolation of thermophile / halophile from soil, (media preparation, serial dilution, spread plating, streaking, staining and microscopy)	3
3	Checking the purity of pharmaceutical samples.	3
4	Use of differential media for isolation of various bacteria	2
5	Isolation of fungi from soil / clinical samples	2
6	Isolation of actinomycetes from soil/ water samples.	2
7	Cultivation of lactiobacillus under anaerobic condition	2
8	Antibiotic susceptibility testing	2
9	Ames test	2

**References:**

1. Brock Biology of Microorganism 13<sup>th</sup>eds, , Michael T.Madigan
2. Prescott's Microbiology, 9<sup>th</sup>eds, Joanne M. Willey
3. Microbiology–6th Edition (2006), Pelczar M.J., Chan E.C.S., Krieg N.R., The McGraw Hill Companies Inc. NY
4. General Microbiology - Stanier R.Y., 5th edition, (1987)Macmillan Publication UK.
5. Introduction to Microbiology, 2nd Edn. Ingraham, J. L. and Ingraham C. A., Thompson Asia Pvt. Ltd., Singapore (2002).

SEMESTER II

<b>MBT&amp;Med BT 201: Genetic Engineering</b>		<b>Total</b>
<b>Core course- Theory; 3 credits</b>		<b>45L</b>
<b>UNIT I : Fundamental techniques and Vectors</b>		
1	Restriction-modification systems, Various enzymes in gene manipulation: nucleases, polymerases, kinases, phosphatases, ligases.	1
2	Cohesive and blunt end ligation	1
3	Plasmid based vectors (pBR and pUC)	1
4	λ based vectors	1
5	Cloning vectors for eukaryotes	2
6	Special purpose vectors e.g. expression vectors, tag vector	3
7	DNA labelling methods	1
8	Different methods to introduce recombinant DNA into host cell	1
<b>UNIT II : Gene cloning and Sequencing</b>		
9	Construction of genomic and cDNA library	1
10	Library screening methods (hybridization and immunochemical methods)	1
11	Polymerase chain reaction and its types e.g. real time PCR, multiplex PCR Reverse transcriptase PCR, Inverse PCR, Nested PCR	3
12	DNA sequencing- Maxam-Gilbert method, Sanger's Dideoxy chain termination method, Automated DNA sequencing method.	3
13	Pyrosequencing- microarrays technology	2
14	Human genome sequencing	1
15	Genetic and Physical mapping techniques	1
<b>UNIT III: Gene Expression and Mutagenesis</b>		
16	Tools for analyzing gene expression: Reporter genes, Analysis of gene regulation, Techniques for transcript analysis	3
17	Techniques for analysis of translation product	1
18	Introduction to si RNA technology: principle and applications	2
19	Micro RNA and detection methods	1
20	Differential gene expression, Protein-protein interactions: phage-display, yeast two-hybrid system	2
21	Mutagenesis techniques	1
22	Nucleic acid hybridization assays and micro-assays	2
<b>UNIT IV : Applications</b>		
23	Production of recombinant proteins from pro and eukaryotic hosts	2
24	Expression of industrially important products	1
25	Electrophoretic methods for mutation detection: SSCP, hetero-duplex analysis, DGGE MCC (Mismatch Chemical Cleavage), ASA (Allele Specific Amplification), PTT (Protein Truncation Test)	3
26	Gene therapy – ex vivo, in vivo, delivery systems, viral and non viral	gene 3
27	Bio-pharming	1
<b>References:</b>		
1.	Brown T. A., 7 <sup>th</sup> edition (2016), Gene cloning and DNA analysis, Blackwell publishing, UK	
2.	Primrose S., Twyman R. M. , 8 <sup>th</sup> edition (2016), Principles of Gene Manipulation and Genomics, Blackwell Publishing, UK	

3. Nicholl D. S. T., 2<sup>nd</sup> edition (2002), Introduction to Genetic Engineering, Cambridge University Press, UK
4. Channarayappa (2006), Molecular Biotechnology: Principles and Practices, University Press, New Delhi, India
5. Watson J. and Stephen, 7<sup>th</sup> edition (2014), Molecular biology of the gene, Pearson, US
6. From Genes to Genomes, 2nd edition, (2008), J.Dale and M.Schantz, John Wiley & Son Ltd.USA
7. From Gene to Clones ; Introduction to gene technology, 4th edition, (2003), E. Winnacker, Panima Publisher, India
8. Molecular Biology Problem solver: A laboratory guide (2004), A. Gerstein, A John Wiley & Sons, Inc., Publication, USA

<b>MBT&amp;Med BT 202: Analytical Biotechnology</b>		<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>		<b>45L</b>
<b>UNIT I</b>		
<b>1</b>	<b>Introduction:</b> Scope and importance of various techniques in biotechnology. The goal of structural biology.	<b>2</b>
<b>2</b>	<b>Cell disruption methods:</b> physical and chemical	<b>2</b>
<b>3</b>	<b>Filtration techniques:</b> Gross filtration, steri-pad filtration, membrane filtration (macro-filtration, micro-filtration, ultra-filtration), reverse osmosis, dialysis, their applications in industry. Merits and limitations	<b>5</b>
<b>UNIT II</b>		
<b>4</b>	<b>Centrifugation-</b> Table top, high speed, microfuge, refrigerated, ultra, density gradient centrifugation, applications in biotech industry.	<b>3</b>
<b>5</b>	<b>Microscopy:</b> Structure and working of bright field and dark field microscopes. Principle, working and applications of phase contrast microscope,	<b>4</b>
<b>6</b>	<b>Advance microscopy:</b> confocal microscopy, fluorescence microscope, electron microscope, atomic force microscopy,	<b>4</b>
<b>UNIT III</b>		
<b>7</b>	<b>Biophysical methods:</b> Analysis of biomolecules using UV/visible spectrophotometer, fluorescence, circular dichroism	<b>4</b>
<b>8</b>	NMR and ESR spectroscopy, structure determination using X-ray diffraction	<b>3</b>
<b>9</b>	Different types of mass spectrometry, MALDI-TOF and surface plasma resonance methods.	<b>4</b>
<b>Unit IV</b>		
<b>10</b>	<b>Radio labeling techniques:</b> Properties of different types of radioisotopes normally used in biology, their detection and measurement; safety guidelines. Incorporation of radioisotopes in biological tissues and cells. Molecular imaging of radioactive material	<b>3</b>
<b>11</b>	<b>HPLC-</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control	<b>4</b>
<b>12</b>	<b>GC:</b> Concept, principle, procedure (analytical and preparatory), separation on the basis of detectors, accuracy, applications in research and quality control	<b>4</b>
<b>References:</b>		
<b>1.</b>	Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J. Cambridge University Press, New York (2005).	
<b>2.</b>	Analytical Biotechnology, C. van Dijk, Elsevier Science, The Netherlands,	
<b>3.</b>	Analytical Biotechnology, Thomas G.M. Schalkhammer, Springer Basel AG, 2002	
<b>4.</b>	Analytical Biochemistry & Separation Techniques, Dr. P. Palanivelu, IV Edition - Lab manual (IV Edition, 2009), Twenty first Century Publications	
<b>5.</b>	Techniques and Methods in Biology, Ghatak K.L. Prentice Hall India Learning Private Limited (2011)	



<b>MBT&amp;Med BT 203: Immunology</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I : Introduction</b>	
<b>1 Immunity</b> – Types of Immunity, components of Innate and Acquired Immunity Cells and organs of immune system, Antigen presenting cells, endogenous and exogenous pathways of antigen presentation, presentation of non-peptide antigens	<b>4</b>
<b>2 Antigens</b> - Immunogenicity versus Antigenicity, Factors that influence immunogenicity, Epitopes - Properties of B-cell epitopes and T-cell epitopes, haptens and adjuvants, Antigen engineering-Increasing Immunogenicity	<b>3</b>
<b>3 Antibodies</b> - Basic structure of Immunoglobulins - The role of multiple myeloma in understanding Ig structure, domains-variable and constant region, Immunoglobulin classes and functions, application and engineering of monoclonal antibodies	<b>3</b>
<b>UNIT II : Lymphocyte ontology</b>	
<b>4 B- cell maturation, activation and differentiation</b> Antigen dependant and antigen independent stages of B- cell maturation, B-cell activation and proliferation by Thymus independent and Thymus dependant antigens, B-cell differentiation, class-switching and generation of plasma cells and memory cells, primary and secondary response kinetics, significance in vaccination programs.	<b>3</b>
<b>5 T cell maturation, activation and differentiation</b> Stages of T cell maturation, Positive and negative selection in thymus, role of TH1 and TH2 cells, mechanism of CTL mediated cytotoxicity, co-stimulatory molecules and signals, super antigen induced T cell activation, NK cell mediated lysis, ADCC	<b>3</b>
<b>6 Complement system and Cytokines</b> Classical, alternate and lectin pathways of complement activation and function of complement system, Types and general properties Cytokines, receptors, cytokine network, Immunoregulatory role of IL-4, IFN- $\gamma$ and TNB- $\beta$ .	<b>3</b>
<b>UNIT III : Immunogenetics</b>	
<b>7 Immunoglobulin genes and proteins</b> Multigene organization of Ig genes, Generation of antibody diversity.	<b>3</b>
<b>8 TCR genes, gene products and co-repressors:</b> Structure and types ( $\alpha\beta$ and $\gamma\delta$ ), gene organization and rearrangement, T cell accessory membrane molecules, Role of TCR-CD3 complex in immune activation and signal transduction pathways.	<b>3</b>
<b>9 Major Histo-compatibility complex</b> General organization and inheritance of MHC; MHC Haplotypes, the structure of MHC class-I and class-II molecules; organization of MHC class I and class II genes, peptide binding of MHC molecules, Polymorphism of MHC class I and class II molecules; the role of HLA typing in organ transplantation and disease susceptibility/resistance.	<b>3</b>
<b>Unit IV : Clinical Immunology</b>	
<b>10 Clinical Immunology</b> <b>Hypersensitivity</b> – Type I, II, III and IV- outline of mechanism with examples.	<b>2</b>
<b>11 Immune tolerance and autoimmunity</b> - establishment and failure of tolerance; Autoimmunity; Types of autoimmune diseases with one example; Mechanism and role of CD4+ T cells.	<b>3</b>

- 12 **Transplantation immunology** - basis and manifestation of graft rejection, 3  
 General immune-suppressive therapy. Specific immune suppressive therapy.  
 Immune tolerance to allograft.
- 13 **Tumor immunology**- Malignant transformation of cells and immune responses. 3  
 Tumor antigens, Tumor evasion of the immune system, immuno-surveillance,  
 Cancer immune-therapy.
- 14 **Immunotechniques**: Immuniprecipitation, agglutination, RIA, ELISA, ELISPOT,  
 Western blotting, fluorescence based imaging technique, HLA typing, Flow  
 cytometry, and animal systems

**References:**

1. Immunology and Serology in Laboratory Medicine Turgeon Mary Louise 4<sup>th</sup> Ed. 2009
2. A Textbook of Microbiology & Immunology, Parija Subhash Chandra 2009
3. Immunology , Kuby, 7<sup>th</sup> edition, Richard A. Goldsby, T. J. Kindt and B. A. Osborna, WHfreeman and Co., New-York
4. Riott's essential Immunolgy, I. M. Riott, Evan M. riot and Peter J. Delves, 10<sup>th</sup> edition

<b>MBT&amp;Med BT 204: Genomics and Proteomics</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
<b>1 Introduction to Bioinformatics:</b>	<b>1</b>
Introduction to Bioinformatics: Definition, History, Goal, Scope, Applications, Limitations	
<b>2 Introduction to Biological Databases:</b>	<b>5</b>
Hierarchy of Biological databases: Primary, Secondary, Derived and knowledgebase	
<b>3 Sequence Alignment &amp; Analysis</b>	<b>6</b>
<ul style="list-style-type: none"> <li>• Sequence alignment methods: Local and global, Pairwise sequence alignment, Multiple sequence alignment</li> <li>• Sequence alignment algorithm: Needleman &amp; Wunsch , Smith &amp; Waterman</li> <li>• Sequence Similarity Search Tools: Dot Plot, BLAST, FASTA, ClustalW, ClustalX</li> <li>• Sequence analysis methods: AMAS, CINEMA, MaxAlign</li> </ul>	
<b>UNIT II</b>	
<b>4 Genomics:</b>	<b>3</b>
Genome sequencing: strategies & approaches, conventional DNA sequencing methodologies, NGS(Next generation sequencing), Third generation sequencing, Microarray Technology	
<b>5 Genomics Tools:</b>	<b>6</b>
<ul style="list-style-type: none"> <li>• Tools for Genomic Data Mining: Basic Aspects of Genome Annotation</li> <li>• Database Search Engines: Special tools for searching genomic data</li> <li>• Prediction of genes: ORFs, Prediction of Signal sequences (Promoters, Primers, splice sites, UTRs etc.), Operons</li> <li>• Identification of Disease Genes: Identification of Drug Targets, Metabolic diseases and Pathogenic diseases, Gene Expression Analysis</li> <li>• Structural Genomics and Functional Genomics</li> <li>• Genetic Disorders Databases: OMIM, OMIA, Genetic Association Database, Genetic Disorder Guide, IGDD, DisGenet, Genetic Disorder UK</li> </ul>	
<b>6 Genome mapping:</b> Genetic maps and physical maps	<b>2</b>
<b>UNIT III</b>	
<b>7 Comparative genomics and it's applications Methods:</b>	<b>4</b>
<ul style="list-style-type: none"> <li>• Genome Alignments: BLAST2, MUMmer , PipMaker , VISTA</li> <li>• Comparison of Gene Order: GeneOrder , Gene synteny</li> <li>• Comparative Genomics of organisms: Viruses, Microbes, Pathogens, Eukaryotes</li> <li>• Comparative Genomics Databases : COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb</li> </ul>	
<b>8 Proteomics:</b>	<b>1</b>
Introduction to proteomics, scope	
<b>9 Classification of proteins:</b> Primary, secondary, tertiary, quaternary.	<b>6</b>
<b>Protein Primary Databases:</b> Protein database on NCBI/ Protein database on EMBL, PIR-PSD, UniProt KB/SwissProt, Expasy, InterPro	

## Unit IV

- 10 Proteomics Applications:** 4  
Strategies for protein identification, Protein sequencing, Protein engineering: Protein chips and functional proteomics; Clinical and biomedical application of proteomics.
- 11 Proteomics tools:** 5  
Structural databases: PDB, MMDB, SCOP, CATH.  
3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D  
Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.  
3D structure validation databases: PROSA, Ramchandran Plot, Procheck
- 12 Protein-protein interaction :** 2  
Protein-Protein Interaction Networks, databases and software:  
BIND - Biomolecular Interaction Network Database, STRING

**References:**

1. Guide to Human Genome Computing by Martin J. Bishop, Academic Press. ISBN 0-12-102051-7.
2. From Genome to Therapy: Integrating new technologies with drug development by Novartis Foundation, John Wiley. ISBN 0-471-62744-5.
3. Genome mapping and sequencing By Ian Dunham, Horizon, ISBN1-898486-50-6.
4. The Genome by Ram S. Verma, VCH, ISBN 1-56081-043-2.
5. Bioinformatics - from genomes to drugs (vol. 1), basic technologies (vol.1) by Lengauer, T., Germany, Wiley-VCH, 2002.
6. Principles of Genome Analysis And Genomics (3<sup>rd</sup> Ed.) by Primrose, S.B. & Twyman, R.M., UK. Blackwell Publishing Company, 2003.
7. Bioinformatics approach Guide to the analysis of genes and proteins by Andceas Baxevanis and B.F. Francis Ouellette. John Wiley 2004.
8. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
9. Patterson, B.K., Techniques in Quantification and Localization of Gene Expression.
10. Singer, M. and Barg, P. Exploring Genetic Mechanism.
11. Bowtell, D. and Sambrook, J. DNA Microarrays.
12. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Business Media, LLC.

MBT&MedBT 205: Nanobiotechnology Core Course – Theory; 2 Credits	Total 30L
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## UNIT I

- |   |  |   |
|---|--|---|
| 1 | <b>Introduction to nanoscience</b> , properties of nanoparticles, Types of nanomaterial<br>Carbon nanomaterials (fullerene, nanotube, nanofibres, nanowires) Quantum dots,<br>magnetic nanoparticles | 5 |
| 2 | <b>Nanostructures:</b> Organic and Inorganic nanoparticles, Bionanostructures-protein,<br>carbohydrate and lipid, DNA based  | 4 |
| 3 | <b>Synthesis of nanoparticles</b> , Top down and Bottom up approach, Physical, Chemical<br>and Biological methods of synthesis   | 5 |

## UNIT II

- |   |   |   |
|---|---|---|
| 4 | <b>Characterization of nanoparticles:</b> Optical (UV-Vis, FTIR, Photoluminescence<br>spectroscopy) X-ray diffraction, Microscopy (SEM,TEM,AFM,STM) Surface and<br>composition (ECSA, EDAX), Particle size analysis and charge distribution analysis,<br>Toxicity Evaluation of nanomaterials; Cyto-toxicity, Geno-toxicity In vivo tests/assays<br>etc containment | 7 |
| 5 | <b>Applications of Nano-Materials in Biosystems;</b> Nanomedicines, Targeted Drug<br>Delivery, Disease diagnosis at proteomic level, Biosensors (Nucleic acid based, protein<br>based), Lab on Chip, Applications in Gene therapy, cancer Biology. Bionanomachines  | 5 |
| 6 | <b>Application of nanobiotechnology in agriculture and environment:</b> desalination,<br>monitoring water quality, detection of pollutants  | 4 |

## References:

1. T. Pradeep, Nano, The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Limited, 2007
2. Tuan Vo, Dinh. Ed. Nanotechnology in Biology and Medicine: methods, device and applications. CRC Press, 2007
3. NANOBIO TECHNOLOGY BioInspired Devices and Materials of the Future, Shoseyov, Oded, Levy, Ilan, Springer, 2008
4. Nanoscience: Nanobiotechnology and Nanobiology, Boisseau, Patrick, Lahmani, Marcel, Springer, 2009.
5. Nanobiotechnology Inorganic Nanoparticles vs Organic Nanoparticles, Jesus M. de la Fuente and V. Grazu, Elsevier, 2012

Med BT 206: Human Physiology	Total
Core Course – Theory; 3 Credits	45L

## UNIT I

- |   |  |   |
|---|--|---|
| 1 | <b>Introduction to various systems, complexities of system</b>   | 3 |
| 2 | <b>Digestive system</b> - Digestion, absorption, energy balance, BMR.  | 3 |
| 3 | <b>Blood and circulation</b> - Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis. | 5 |

## UNIT II

- |   |   |   |
|---|---|---|
| 4 | <b>Respiratory system</b> - Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration. | 4 |
| 5 | <b>Nervous system</b> - Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.                           | 4 |
| 6 | <b>Sense organs</b> - Vision, hearing and tactile response.   | 3 |

## UNIT III

- |   |   |   |
|---|---|---|
| 7 | <b>Excretory system</b> - Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of.             | 4 |
| 8 | Water balance, blood volume, blood pressure, electrolyte balance, acid-base balance. Water, Minerals including trace elements, Vitamins, Recommended dietary allowances | 3 |
| 9 | <b>Thermoregulation</b> - Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization   | 4 |

## UNIT IV

- |    |  |  |
|----|--|--|
| 10 | <b>Endocrinology and</b> - Endocrine glands, basic mechanism of hormone action, hormones and diseases; neuroendocrine regulation   |  |
| 11 | <b>Reproductive system:</b> reproductive processes, gametogenesis, ovulation   |  |
| 12 | <b>Nutrition:</b> The relationship between nutrition, health and disease, Proximate principles, Balance Diet, Energy Metabolism, Nutrition throughout life cycle, Malnutrition and Chronic Energy Deficit, Micronutrient disorders, Maternal and child nutrition, Neutrigenomics and nutrient gene interaction |  |

**References:**

1. Guyton and Hall Textbook of Medical Physiology, 13e (Guyton Physiology) by John E. Hall PhD, 2015, Saunders Publisher

2. Clinical Biochemistry Second Ed., Godkar, P. B. and Godkar, D. B., Bhalani Publishing House, Mumbai 2003
3. A Textbook of Human Physiology by H. Gurumurthy, H. K. Makari, H. S. Ravi Kumar Patil, and S. V. Sowmya

**MBT&Med BT 207: Genetic Engineering and Genomics Lab**

**Core Course – Practical; 4 Credits**

**Genetic Engineering Lab**

- |   |  |   |
|---|--|---|
| 1 | Competent cells preparation and GFP cloning in <i>E.Coli</i> | 4 |
| 2 | Southern Hybridization                                       | 3 |
| 3 | DNA fingerprinting   | 2 |
| 4 | Phage titration  | 3 |
| 5 | Restriction mapping  | 2 |

**Genomics Lab**

- |    |  |   |
|----|--|---|
| 1  | <b>Explore primary resource institutes NCBI, EBI, DDBJ</b>   | 5 |
|    | Explore Genomic databases  |   |
|    | Explore Sequence Alignment & Analysis  |   |
|    | <ul style="list-style-type: none"> <li>• Sequence Similarity Search Tools: Dot Plot, BLAST, FASTA, ClustalW, ClustalX</li> <li>• Explore Sequence analysis methods: AMAS, CINEMA, MaxAlign</li> </ul>  |   |
| 2. | <b>Explore comparative genomics databases:</b>   | 5 |
|    | <ul style="list-style-type: none"> <li>• COG</li> <li>• VirGen,</li> <li>• CORG,</li> <li>• HOBACGEN,</li> <li>• Homophila,</li> <li>• XREFdb,</li> <li>• Gramene etc</li> </ul>   |   |
| 3. | <b>Explore Comparative genomics and it's applications Methods:</b>   | 5 |
|    | <ul style="list-style-type: none"> <li>• Genome Alignments: BLAST2, MUMmer , PipMaker , VISTA</li> <li>• Comparison of Gene Order: GeneOrder , Gene synteny</li> <li>• Comparative Genomics Databases : COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb</li> <li>• Explore NGS data analysis methods: Bowtie, TopHat</li> </ul> |   |

**References:**

1. Green and Sambrook, 4<sup>th</sup> edition (2012), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory Press
2. Molecular cloning: a laboratory manual, Volume 1, Joseph Sambrook, E. F. Fritsch, Tom Maniatis, Edition 2, Cold Spring Harbor Laboratory, ISBN 0879693096, 9780879693091.
3. Guide to Human Genome Computing by Martin J. Bishop, Academic Press. ISBN 0-12-102051-7.
4. From Genome to Therapy: Integrating new technologies with drug development by Novartis Foundation, John Wiley. ISBN 0-471-62744-5.
5. Genome mapping and sequencing By Ian Dunham, Horizon, ISBN 1-898486-50-6.
6. The Genome by Ram S. Verma, VCH, ISBN 1-56081-043-2.
7. Bioinformatics - from genomes to drugs (vol. 1), basic technologies (vol.1) by Lengauer, T., Germany, Wiley-VCH, 2002.
8. Principles of Genome Analysis And Genomics (3<sup>rd</sup> Ed.) by Primrose, S.B. & Twyman, R.M., UK. Blackwell Publishing Company, 2003.
9. Bioinformatics approach Guide to the analysis of genes and proteins by Andreas Baxevanis and B.F. Francis Ouellette. John Wiley 2004.



- 10.** Bioinformatics in the Post-Genomic Era: Genome, Transcriptome, Proteome, and Information-Based Medicine, Jeff Augen Addison-Wesley Professional , 2004 ISBN:0321173864.
- 11.** Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Business Media, LLC

**MBT&Med BT 208: Analytical Techniques and Proteomics Lab****Core Course – Lab; 4 Credits****Analytical Techniques Lab**

- |   |   |   |
|---|---|---|
| 1 | Sterilization of bioactive molecules by membrane filtration                       | 2 |
| 2 | Separation of biomolecules using dialysis technique                               | 2 |
| 3 | Fractionation sub-cellular components by density gradient centrifugation          | 2 |
| 4 | Separation of biomolecules by size exclusion chromatography                       | 2 |
| 5 | Determination of pKa value of p-nitrophenol by using UV-visible spectrophotometer | 2 |
| 6 | Visit to research institute or Biotechnology Industry/institutes                  | 2 |

**Protein Analysis Lab**

- |   |   |   |
|---|---|---|
| 1 | <b>Explore Protein Primary Databases:</b> Protein database on NCBI/ Protein database on EMBL, PIR-PSD, UniProt KB/SwissProt, Expasy, InterPro   | 5 |
| 2 | <b>To explore:</b> <ul style="list-style-type: none"> <li>• Structural databases: PDB, MMDB, SCOP, CATH.</li> <li>• 3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</li> <li>• Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.</li> <li>• 3D structure validation databases: PROSA, Ramchandran Plot, Procheck</li> </ul>  | 5 |
| 3 | <b>Explore Proteomics databases:</b> <ul style="list-style-type: none"> <li>• Trans-Proteomic Pipeline (TPP)</li> <li>• PeptideProphet</li> <li>• iProphet</li> <li>• ProteinProphet</li> <li>• Xpress &amp; ASAPRatio</li> <li>• SpectraST</li> <li>• Corra &amp; PIPE2</li> <li>• PeptideAtlas &amp; SRMATlas</li> <li>• PIPE2, TIQAM, &amp; ATAQS</li> </ul>   | 5 |
| 4 | <b>Explore Protein-Protein Interaction Networks, databases and software:</b> <ul style="list-style-type: none"> <li>• DIP (Database of Interacting Proteins)</li> <li>• PPI Server</li> <li>• BIND - Biomolecular Interaction Network Database</li> <li>• PIM –Hybrigenics</li> <li>• PathCalling Yeast Interaction Database</li> <li>• MINT - a Molecular Interactions Database</li> <li>• GRID - The General Repository for Interaction Datasets</li> <li>• InterPreTS - protein interaction prediction through tertiary structure</li> </ul> | 5 |
| 5 | <b>To explore:</b> <ul style="list-style-type: none"> <li>• Structural databases: PDB, MMDB, SCOP, CATH.</li> <li>• 3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</li> <li>• Secondary structure prediction algorithms: Chou Fasman, Jpred, Psipred, GOR methods; analysis of results.</li> <li>• 3D structure validation databases: PROSA, Ramchandran Plot, Procheck</li> </ul>  | 5 |

- 6 Explore Proteomics databases: 5
- Trans-Proteomic Pipeline (TPP)
  - PeptideProphet
  - iProphet
  - ProteinProphet
  - Xpress & ASAPRatio
  - SpectraST
  - Corra & PIPE2
  - PeptideAtlas & SRMATlas
  - PIPE2, TIQAM, & ATAQS

**References:**

1. Introductory Practical biochemistry, S.K sawhney&Randhir Singh (eds) Narosa Publishing House, New Delhi, ISBN 81-7319-302-9, p 195-303
2. Standard Methods of Biochemical Analysis, S.K Thimmaiah (ed), Kalayani Publishers, Ludhiana ISBN 81-7663-067-5, p12-18
3. Experimental Biochemistry: A Student companion, Beedu Sasidhar Rao & Vijay Deshpande (ed), I.K International Pvt. LTD, New Delhi ISBN 81-88237-41-8, p 13-17, p 49-72
4. Practical Biochemistry, R.C Gupta & Bhargava (eds) CBS Publishers and distributors, New Delhi, ISBN 81-239-0124-0 p 9-27
5. Practical Clinical Chemistry, Harold Varley, CBS Publishers and distributors, New Delhi.
6. Gradwhols Clinical Laboratory Techniques. Stanley & Raphael. W.E. company, London, UK
7. <http://www.proteomecenter.org>
8. Protein Microarray Technology , Kambhampati, D. (ed) (2004) Front Matter, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, FRG. doi: 10.1002/3527601554.
9. Bioinformatics in the Post-Genomic Era: Genome, Transcriptome, Proteome, and Information-Based Medicine, Jeff Augen Addison-Wesley Professional , 2004 ISBN:0321173864.
10. Modern Protein Chemistry: Practical Aspects edited by Gary C. Howard, William E. Brown, 2002. CRC Press.
11. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Bussiness Media, LLC.
12. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003, Marcel Dekker

**MBT&Med BT 209: Immunology and Nanobiotechnology Lab****Core Course – Practical; 4 Credits****Immunology Lab**

1	Ouchterlony double diffusion	1
2	Radial immune diffusion	1
3	Lymphocyte separation from blood	1
4	Lymphocyte transformation	2
5	ELISA	2

**Nanobiotechnology Lab**

1	Synthesis of Gold nanoparticles by reduction method	1
2	Synthesis of Silver nanoparticles by reduction method	1
3	Synthesis of Metal oxide nanoparticles (MONs)	1
4	Purification of nanoparticles	1
5	Synthesis of Magnetic nanoparticles co-precipitation method	1
6	Green Synthesis of nanoparticles (Using Microorganisms, Plants)	1
7	Characterization of nanoparticles using UV-Vis absorption technique	1
8	Study on stabilization of nanoparticles	2
9	Effect of Gold and silver nanoparticles on growth of pathogenic bacteria and fungi	2
10	Visit to different laboratories	

**References:**

1. Goldsby A., Thomus J.K., Barbara A. O. and Kuby J. Immunology, 5th eds.
2. Deives P.J., Seamus J.M. and Raoitt E. M. (2006) Essential Immunology, 11th eds. Blackwell Publ.
3. Jaeway C. Travers, Walport and Shlomchik Immunobiology 6th eds. Garland Sc. Publ.
4. 4. Nanoscience: Nanobiotechnology and Nanobiology, Boisseau, Patrick, Lahmani, Marcel, Springer, 2009.

<b>MBT&amp;Med BT 210: Option I (210.1) Bio-entrepreneurship</b>	<b>Total</b>
<b>Elective Course I – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1</b> Sectors: Pharma, Biotech, Food, Agri-biotech, Research, Diagnostics, Analytic Labs	<b>3</b>
<b>2</b> Developing flair for business in students	<b>1</b>
<b>3</b> Short-term opportunities available for business	<b>2</b>
<b>4</b> Import substitute product list	<b>2</b>
<b>5</b> Regulatory Affairs: SSI, MSME, FICCI, MCC, IEC	<b>3</b>
<b>6</b> Firm registration, GST registration, SME Loan, ISO 22000/14000 etc.,	<b>3</b>
<b>7</b> Export counsel	<b>1</b>

**UNIT II**

<b>8</b> Finance: Banking, MoFPI, SIDBI, Foreign collaboration, Investors	<b>3</b>
<b>9</b> Subsidies: BIRAC, SSI, MSME, MoFPI	<b>2</b>
<b>10</b> Marketing: Promotion, Distribution, Rolling Cycle	<b>2</b>
<b>11</b> Business Concept and Competitors' knowledge	<b>1</b>
<b>12</b> Export benefits, procedures	<b>2</b>
<b>13</b> Make In India	<b>1</b>
<b>14</b> Knowledge about taxation, GST, custom duty, excise	<b>3</b>
<b>15</b> Packaging suitability knowledge	<b>1</b>

**References:**

1. Forbat, John, "Entrepreneurship" New Age International. 2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International 3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.
2. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill,
3. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House 3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4). 4. Management Fundamentals – Concepts, Application, Skill Development – RobersLusier – Thomson – 5. Entrepreneurship Development – S.S.Khanka – S.Chand& Co. 6. Management – Stephen Robbins – Pearson Education/PHI – 17 th Edition, 2003.

MBT&MedBT 210: Option II (210.2) – Intellectual property rights I (IPR-I) Elective Course I – Theory; 2 Credits	Total 30L
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**UNIT I**

<b>1 Introduction to Intellectual Property</b>	<b>15</b>
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General Introduction to IP & IPR; Introduction, History & role of International Conventions & Treaties- GATT, WTO, WIPO, TRIPS, Budapest Treaty, CBD, Nagoya Protocol; International framework for the protection of IP; IP as a factor in R&D; IPs of relevance to Biotechnology, Agriculture, Bioinformatics and Pharma sector

**UNIT II**

<b>2 Types of IP Industries:</b> Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Plant variety and Protection of New GMOs	<b>8</b>
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<b>3 Concept of 'prior art'</b>	<b>7</b>
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Need of Prior Art for IP types, Classification search and its implications; Invention in context of "prior art"; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, India etc.); Analysis and Report formation

**References:**

1. Intellectual property rights in agricultural biotechnology By Frederic H. Erbisch, Karim M. Maredia, Biotechnology in Agriculture Series No 28,
2. The role of intellectual property rights in biotechnology innovation By David Castle, Edward Elgar Publishing
3. <http://www.wipo.int/portal/index.html.en>
4. [http://www.ipr.co.uk/IP\\_conventions/patent\\_cooperation\\_treaty.html](http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html)
5. [www.patentoffice.nic.in](http://www.patentoffice.nic.in)
6. [www.iprlawindia.org/](http://www.iprlawindia.org/) - 31k - Cached - Similar page
7. <http://www.cbd.int/biosafety/background.shtml>

SEMESTER III

<b>MedBT 301: Animal Tissue Culture &amp; Stem Cell Biology</b>	<b>Total</b>
<b>Core Course; (3 Credits, 3L)</b>	<b>45L</b>
<b>UNIT I</b>	<b>11</b>
1 Introduction to animal tissue culture. Overview of its applications in research, industry & therapeutics	
2 Systems of tissue culture with distinguishing features, advantages and limitations	
3 Growth characteristics of cells growing in culture, molecular basis of cell adhesion, contact inhibition, anchorage dependent and independent cells	
4 Aseptic techniques and its significance in ATC	
5 Tissue culture media, role of balanced salt solution, individual constituents and serum; Serum free media	
<b>UNIT II</b>	<b>12</b>
6 Techniques for primary culture and routine maintenance of cell lines, quantitation of cells, estimation of viability, cryopreservation of cell lines	
7 Characterization of cells, various methods for characterization, FACS analysis	
8 Cytotoxicity assays: Viability, survival, metabolic assays, transformation and mutagenesis, testing for carcinogenicity and inflammation	
9 Scale up of anchorage independent and dependent cells, bioreactors, microcarriers, perfused monolayer cultures	
10 Applications of animal cell culture for in vitro testing of drugs, in production of monoclonal antibodies, viral vaccines and therapeutic proteins	
<b>UNIT III</b>	<b>11</b>
11 Three dimensional cell culture, organ culture, organotypic culture, advantages and limitations	
12 Stem cells – Introduction, basic properties, and classification	
13 Types of stem cells: Hematopoietic, mesenchymal, embryonic and fetal stem cells; their characteristics, isolation, culture and characterization	
14 Applications of stem cells	
<b>UNIT IV</b>	<b>11</b>
15 Introduction to tissue engineering – Morphogenesis, approaches for in vitro engineering of tissues, scope in therapeutics and drug screening	
16 Microscale patterning of cells and their environment	
17 Scaffolds – Basic properties and types	
18 Modes of cells and tissue delivery	
19 Examples of Bio-constructs and their applications	
20 Islet cell transplantation and bioartificial pancreas	
21 Bioprinting of organs and tissues	
<b>References:</b>	
1. R. Lanza, J. Geachart et. Al. (Eds.) Essentials of stem cell biology (2009), Elsevier Academic Press	
2. R. Lanza, I Klimanskaya. Essential stem cell methods. (2009), Academic Press	
3. J. J. Mao, G. Wunjak – Novakovic et. al. (Eds): Translational approaches in tissue engineering & regenerative medicine. (2008), Artech House, INC Publications	

4. Robert Lanza *et. al.* Principles of tissue engineering. 3<sup>rd</sup> Eds (2007) Stein *et. al.* Human stem cell technology and biology: A research guide and laboratory manual. Wiley – Blackwell (2011)
5. Lanza *et. al.* Handbook of stem cells. Volume I – Embryonic stem cells Volume II – Adult and fetal stem cells. Academic Press (2004)
6. Gordana Vunjak-Novakovic, R. Ian Freshney, *Culture of Cells for Tissue Engineering*, WIS, 2006



<b>MedBT 302: Medical Biochemistry &amp; drug discovery</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>
<b>UNIT I</b>	
1 Introduction of health and disease. Molecular basis of diseases. Recent discoveries in medical and health sector	3
2 <b>Disorders of carbohydrate metabolism:</b> Diabetes mellitus, types, diagnosis, hypo-glycemias, ketone bodies, Glycogen storage diseases.	4
3 <b>Physiology of lipids/lipoproteins:</b> Lipoprotein, metabolism, fatty liver, Diagnostic tests for lipid profile, atherosclerosis. Clinical inter-relationships of lipids (sphingolipidosis and multiple sclerosis).	4
<b>UNIT II</b>	
4 <b>Inborn errors of metabolism:</b>	3
a) Disorders of amino acid metabolism- phenylketonuria, alkaptonuria, albinism.	
b) Disorders of nucleic acid metabolism- Disorders in purine/ pyrimidine metabolism.	
5 <b>Biochemical aspects of hematology:</b> Blood, composition, hemogram, hemoglobinopathies, thalassemias and anemias. blood clotting, Laboratory tests to measure coagulation and thrombolysis.	4
6 <b>Detoxification in the body:</b> Mechanism of Detoxification of Xenobiotics, Phase I Reactions, Phase II Reactions	4
<b>UNIT III</b>	
8 <b>Drug discovery:</b> History of Drug Development, Introduction to Clinical Research, Terminologies and definition in Clinical Research, Difference between Clinical Research and Clinical Practice, Types of Clinical Research	3
9 <b>Pharmacology &amp; Drug development:</b> Introduction to Pharmacology, types of drugs (antidiabetic), Routes of Drug Administration, Introduction to Sources of Drugs, Approaches to Drug Discovery, Pharmacovigilance, Pharmacodynamic /pharmacokinetic (PK/PD) correlation, Factors affecting drug response,	4
10 <b>Drug development process:</b> Methods involved in the development of new drugs. Drug Discovery, Preclinical toxicological studies. Calculation of LD50 & ED50. Acute, subacute and chronic toxicity studies. Irwin profile test, Pre-clinical pharmacokinetic and dynamic studies. Lipinski's rule for drug like molecule.	4
<b>Unit IV</b>	
10 <b>Therapeutic drug monitoring:</b> Basic principles of TDM. Therapeutic index. Trough level monitoring and dosage adjustments. Drug delivery systems: sustained release, enteric coated formulations and liposome etc. Pharmacovigilance, Pharmacoeconomics, Pharmacogenetics	4
11 <b>Drug regulations:</b> Drugs and Cosmetics Act, Drug Price Control order, Application for Investigational New Drug (IND), Application for New Drug Discovery (NDD) according to Indian Control Authority & USFDA guidelines. Ethical considerations in utilizing human subjects for drug, Ethical guidelines in utilising animals for experimental purposes.	4
12 <b>RNA interference</b> and its applications in prevention of cancer, a Therapeutic genome editing- ZFN, CRISPR-Cas gene editing technology (HIV), TALENS (Leukaemia)	4
<b>References:</b>	

1. Lehninger Principles of Biochemistry 5th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company.
2. Medical Biochemistry (Paperback) By John W. Baynes and Marek Dominiczak. Publisher: Mosby.
3. Clinical Biochemistry: An Illustrated Colour Text (Paperback) 3rd Ed By Allan Gaw,
4. Harper's Biochemistry (Lange Medical Books) (Paperback) By Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell. Publisher: Appelton and Lange.
5. Goodman Gillman's The Pharmacological basis of therapeutics. (2001) Ed. Hardman JG, Limbird LE (Tenth Edition) McGraw Hill press New York.
6. Applied biopharmaceutics and pharmacokinetics (1999) Ed. Sargel L. (IV Edition) Prentice-Hall, International, London.
7. Fundamentals of experimental pharmacology. (1984) Ed. Ghosh MN. Scientific book agency, Calcutta.

MedBT 303: Infectious Diseases	Total
Core Course – Theory; 3 Credits	45L
<b>UNIT I</b>	
<b>1 Etiology, pathogenesis, laboratory diagnosis , treatment &amp; prophylaxis of :</b>	<b>11</b>
a. Diseases caused by Gram positive cocci- Staphylococci, Streptococci & Pneumococci	
b. Diseases caused by Gram negative cocci- Neisseria species	
c. Diseases caused by Gram positive bacilli- Corynebacterium species, Bacillus anthracis & Clostridium species	
<b>UNIT II</b>	
<b>2 Diseases caused by:</b>	<b>12</b>
a. Enterobacteriaceae -1	
b. Enterobacteriaceae -2	
c. Enterobacteriaceae -3	
d. Vibrio	
e. Pseudomonas	
f. Gram negative coccobacilli	
g. Mycobacterium tuberculosis	
h. Mycobacterium leprae & atypical mycobacteria	
i. Spirochaetes- Treponema, Borrelia & Leptospira	
<b>UNIT III</b>	
<b>3 Diseases caused by:</b>	<b>11</b>
a. Pox viruses- Variola, Vaccinia, Small pox	
b. Herpes viruses- HSV, VZ, HZ, Cytomegalio, E-B viruses	
c. Adeno viruses	
d. Picorna viruses	
e. Orthomyxo viruses	
f. Arbo viruses	
g. Hepatitis viruses	
h. Miscellaneous viruses: Rubella, SARA, Rota viruses	
i. Oncogenic viruses: DNA & RNA viruses	
j. HIV: AIDS	
<b>Unit IV</b>	
<b>4 1. Diseases caused by fungi:</b>	<b>11</b>
a) Superficial mycoses- surface infections, cutaneous infections, Dermatophytoses, Candidiosis	
b) Deep mycoses: subcutaneous & syatemic mycoses	
c) Opportunistic mycoses	
<b>2. Diseases caused by Parasites:</b>	
a) Protozoal infections: EH, Trichomonas, MP, Leishmaniasis.	
b) Helminthic infections caused by- Cestodes, Nematodes & Trematodes	
<b>References:</b>	
1. A Text Book of Microbiology by R Anantnarayan & CK Jayaram Panikar-9 <sup>th</sup> edition	
2. A Text Book of Medical parasitology by CK Jayaram Panikar	
3. Medical parasitology- R. karyakarate-2 <sup>nd</sup> edi.	
4. Text book of Microbiology- Baveja C.P.	
5. Text book of Medical Mycology- Chander Jagdish, 3 <sup>rd</sup> edi.	
6. Principles & Practices of infectious diseases- Vol-1 &2 by Mandell G Gerald L. Gerald L.	

7. Diagnostic Medical Microbiology -colour atlas by Stephen Allen, Elmer Konman .
8. Diagnostic Microbiology by Bailey A. Forbes, Daniel Lehman & Alice S Weissfeld.
9. Parasitology & Helminthology by K D Chatterjee- 13<sup>th</sup> edi.

<b>MedBT 304: Pharmaceutical Biotechnology and Molecular diagnostics</b>		<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>		<b>45L</b>
<b>UNIT I : Chemotherapeutic agents</b>		
1	Types of antimicrobial agents, concept of bioassay, therapeutic index, MIC and LD <sub>50</sub>	1
2	Mechanism of action of antibacterial agents; antibiotics acting on cell-wall, cell membrane, nucleic acids and protein synthesis	3
3	Anti-fungal and anti-viral drugs	2
4	Adverse drug effects and resistance to antibiotics	2
5	Multiple Drug Resistance	1
6	Cloning biosynthesis genes, synthesis of novel antibiotics, Improving antibiotic production	3
<b>UNIT II : Vaccines</b>		
7	Animal cell bioreactors and fermentors: types, design and controls	3
8	Vaccines; Definition and Types	1
9	Subunit Vaccines (Herpes Simplex Virus, Foot and Mouth Disease)	1
10	Peptide Vaccines	1
11	Attenuated Vaccines (Cholera)	1
12	Vector Vaccines	1
13	DNA vaccines	1
14	Safety and potency of vaccines	1
15	Sterility testing	2
16	Animal cell bioreactors and fermentors: types, design and controls	1
<b>UNIT III : Molecular Diagnostics</b>		
17	Immunological diagnostic procedures: ELISA, Monoclonal antibodies	2
18	Bio florescence and bio luminescent systems: coloured florescent proteins, luciferase, microbial biosensors	2
19	Nucleic acid based diagnostic systems: Hybridization Probes, DNA fingerprinting, Immunoquantitative Real-Time PCR	2
20	Molecular diagnosis if genetic diseases: Cystic fibrosis, Sickle-cell anemia	2
21	Cloning Human Disease gene: Detection of Mutations in Human Genes, Functional Gene cloning, Candidate Gene cloning	2
22	Human Gene Therapy: Ex-vivo and In-vivo	2
<b>UNIT IV: Protein Therapeutics</b>		
23	Human Interferons	1
24	Human Growth Hormone	1
25	DNase I and Alginate lyase	1
26	Interlekin 10	1
27	Recombinant antibodies: Hybrid Human-Mouse Monoclonal antibodies, Human Monoclonal antibodies	2
28	Antibody fragments	1
29	Chemically-linked Monoclonal antibodies	1
30	Anti-cancer antibodies	1
<b>References:</b>		
1.	Hugo and Russell's, 8 <sup>th</sup> edition, Pharmaceutical Microbiology, Blackwell Scientific Publications	
2.	Glick B.R., Pasternack J.J., Patten C.L., 4 <sup>th</sup> edition (2010), Molecular Biotechnology, ASM Press, Washington, DC	

3. Gary Walsh, Pharmaceutical Biotechnology: Concepts and Applications (2007), Wiley Publications
4. Crommelin, Daan J. A., Sindelar, Robert D., Meibohm, Bernd (Eds.) (2013)
5. Pharmaceutical Biotechnology: Fundamentals and Applications
6. Chandrakant Kokate Pramod H.J , 1<sup>st</sup> edition (2011)Textbook of Pharmaceutical Biotechnology, Elsevier publications

<b>MBT&amp;Med BT 305: Biostatistics</b>		<b>Total</b>
<b>Core Course -Theory; 2 Credits,</b>		<b>30L</b>
<b>UNIT I</b>		
<b>1</b>	Introduction to Biostatistics, Common terms, notions and Applications; . Statistical population and Sampling Methods	<b>5</b>
<b>2</b>	Types of variables; Independent and dependant variables; Nominal, Ordinal, ratio and discrete variable types	<b>5</b>
<b>3</b>	Classification and tabulation of Data, Diagrammatic and graphical presentation; Frequency Distribution, Measures of central value	<b>5</b>
<b>UNIT II</b>		
<b>6</b>	Descriptive Statistics; Measures of variability; Standard deviation, standard Error, Range, Mean, Deviation, Coefficient of variation, Analysis of variance	<b>4</b>
<b>7</b>	Inferential Statistics; Statistical power; Hypothesis testing, Test of significance; t-test, chi-square test;	<b>3</b>
<b>8</b>	Regression; Basic of regression, regression analysis, Estimation, Testing, Prediction, checking	<b>3</b>
<b>9</b>	Non-parametric statistical methods; Man-Whiteny U test, Wilcoxon test; Kruskal-Wallis test.	<b>3</b>
<b>10</b>	Descriptive Statistics; Measures of variability; Standard deviation, standard Error, Range, Mean, Deviation, Coefficient of variation, Analysis of variance	<b>3</b>
<b>References:</b>		
1. Biostatistics: A guide to design, Analysis and Discovery, Peter Fritz, Elsevier India.		
2. Biostatistics: A foundation for analysis 7th Edition, Ferric Darvas		
3. Applied statistical designs for the researcher, Neil Ed Taylor and Francis Groop.		

<b>MBT&amp;MedBT 306: Research Methodology</b>		<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>		<b>30L</b>
<b>UNIT I</b>		
<b>1</b>	<b>Basic concepts of Research</b> Introduction, Definition and basic concepts, objectives of research, Research approaches, types of research, techniques of research, hypothesisation, literature survey, selection of topic, compiling records.	<b>5</b>
<b>2</b>	<b>Research Design</b> Important concepts in research design – basic principles of research design, need of research design, features of good research design.	<b>5</b>
<b>3</b>	<b>Sampling and Data collection &amp; Analysis</b> Collection of primary and secondary data - parameters, techniques for data collection, methods of data presentations, classification and tabulation of data, graphical representation	<b>5</b>
<b>UNIT II</b>		
<b>6</b>	<b>Data Analysis</b> Statistical methods of data analysis: Applications of statistics in research, measures of central tendency and dispersion	<b>4</b>
<b>7</b>	<b>Testing hypothesis</b> What is a Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Procedure for Hypothesis Testing, Flow Diagram for Hypothesis Testing, Measuring the Power of a Hypothesis Test, Tests of Hypotheses, Important Parametric Tests, Hypothesis Testing of Means	<b>3</b>
<b>8</b>	<b>Technical Writing:</b> Different types of scientific documents, review paper, book reviews, research paper, thesis, project reports (for the scientific community), Plagiarism, Research Ethics, Patents and IPR. <b>Objective:</b>  To provide the knowledge of how to define research problem, hypothesis testing, literature survey, research designs, data collection and analysis. Topics covered in this course includes, from meaning of research to technical writing.	<b>3</b>
<b>Teaching – Learning Methodology:</b>		
Lectures and Tutorials: This is a compulsory subject offered by RGITBT for all M Sc. Biotech students. Lectures, tutorials, group discussion, paper presentation, assignments will be used as a teaching – learning process. There will be a recommended course books. Students are expected to read the research / review articles of their chosen topic of interest, develop research problem for their research project to be undertaken in the forthcoming semester.		
<b>Expected Learning Outcome:</b>		
Students are expected to learn key concepts in research methodology, data collection and data analysis, presentation of data, interpretation and technical write-up. It is expected that students will learn how different research methods are useful in developing working hypothesis, establish theories, models or concepts. It is expected that the students will practice reading and interpreting		



research papers, review articles, understanding key concepts of research approaches used by investigators, literature survey, data analysis, interpretation and presentation.

Through this course, it is expected that students should be able to independently develop a research plan or research ideas in their areas of research interest for the forthcoming semester.

**References:**

1. Research Methodologies: Methods and Techniques. Kothari CK. 2004, 2<sup>nd</sup> Ed, New Age International, New Delhi
2. Research Methodologies, Paneerselvam R, 2004, Pentice Hall of India, New Delhi
3. Research Methodologies, Bulakh PM, Patki PS, Choudhary AS, 1<sup>st</sup> edition, Expert Trading Corporation, Mumbai
4. Introduction to Biostatistics and Research Methodology, 4<sup>th</sup> edition, Sunder Rao P.S.S, J.Richard
5. Fundamentals of statistics Gupta, S.C. (2013).Himalaya Publishing House.
6. The Role of IPR in Biotechnology Innovations by David Castle, Edward Elgar Publishing
7. Profits and plagiarism: The case of medical ghostwriting – Anekwe TD, Bioethics, 2010. 24(6): 267–272.

**MedBT 307: ATC & Pharma Biotech Lab****Core Course – Practical; 4 Credits****Animal Tissue Culture Lab**

1	Sterilization and sterile handling techniques	1
2	Formulation of tissue culture medium	1
3	Subculturing of cell line	1
4	Cell counting and estimation of viability	1
5	Culture of lymphocytes	2
6	Primary culture of chick fibroblast using explant and cold trypsin method	2
7	Drug toxicity testing using MTT assay	2
8	Virus titration assay	2
9	Isolation and culture mesenchymal stem cells from rat bone marrow	4
10	Differentiation of mesenchymal stem cells	4

**Pharma Biotech Lab**

11	Minimum Inhibitory Concentration (MIC) of antibiotics	3
12	Bioassay of Penicillin	3
13	Phenol coefficient of a disinfectant	3
14	Sterility Testing of Pharmaceutical products	3

**References:**

1. Hugo and Russell's, 8th edition, Pharmaceutical Microbiology, Blackwell Scientific Publications
2. Glick B.R., Pasternack J.J., Patten C.L., 4th edition (2010), Molecular Biotechnology, ASM Press, Washington, DC
3. Gary Walsh, Pharmaceutical Biotechnology: Concepts and Applications (2007), Wiley Publications

**MedBT 308: Infectious Diseases & Biostatistics Lab****Core Course – Practical; 4 Credits****Infectious Diseases Lab**

- |   |   |   |
|---|---|---|
| 1 | Isolation & identification of opportunistic pathogens – Escherichia coli, Klebsiella, Proteus, Pseudomonas & Staphylococci from clinical specimens. | 5 |
| 2 | Demonstration of Mycobacterium tuberculosis & Mycobacterium leprae in clinical specimens.   | 1 |
| 3 | Acid-fast staining of sputum sample.  | 2 |
| 4 | Isolation & identification of fungi from clinical specimens- Candida albicans.  | 2 |
| 5 | Microscopic examination of pathogenic & opportunistic fungi.  | 2 |
| 6 | Virology- demonstration of various routes of inoculation of chick-embryo.   | 2 |
| 7 | Parasitology- demonstration of various cysts of pathogenic protozoa- EH, Giardia & eggs of cestodes & nematodes.                                    | 4 |
| 8 | Study of haemo-parasites by blood films examination.  | 2 |

**Biostatistics Lab**

- |    |  |   |
|----|--|---|
| 11 | Numerical Exercises: Elementary statistics using Spread sheets, Representation of Data using Charts  | 2 |
| 12 | Scatter Plots, Curve fitting on Spread sheets, Add trendline Tool  | 2 |
| 13 | <b>Outside Class room Activity:</b> One sample survey (mini) using Google forms and inferencing - simple frequencies, means and std deviation (to be counted as a Practical)   | 2 |
| 14 | <b>Exercises:</b> Creating PDF, PMF using Spread sheets  | 2 |
| 15 | <b>Numerical Exercises : On spread sheet, data analysis tool-pack</b><br>t, z - Tests for a single Mean<br>Comparing Two Means, t-tests: Paired - Unpaired<br>Inference for Proportions  | 2 |
| 16 | <b>Exercises :</b> One way ANOVA, Two way ANOVA ( using Data Analysis pack on Spread sheet or On SPSS/PSPP), F-tests, and Use of Least significant differences,<br>Exercises: Using SPSS or Data Analysis pack on spread sheets. | 7 |

**References:**

1. A Text Book of Microbiology by R Anantnarayan & CK Jayaram Panikar-9<sup>th</sup> edition
2. A Text Book of Medical parasitology by CK Jayaram Panikar
3. Medical parasitology- R. Karyakarate-2<sup>nd</sup> edi.
4. Text book of Microbiology- Baveja C.P.
5. Text book of Medical Mycology- Chander Jagdish, 3<sup>rd</sup> edi.
6. Principles & Practices of infectious diseases- Vol-1 & 2 by Mandell G Gerald L.
7. Diagnostic Medical Microbiology -colour atlas by Stephen Allen, Elmer Konman .
8. Diagnostic Microbiology by Bailey A. Forbes, Daniel Lehman & Alice S Weissfeld.
9. Parasitology & Helminthology by K D Chatterjee- 13<sup>th</sup> edi.

10. Probability statistics, and reliability for engineers by Boca Raton, Ayyub B. M. & McCuen, R H, CRC Press, 1997.
11. Statistical methods in bioinformatics: an introduction by Ewens, W. J. & Grant, G. R., New York. Springer, 2001.
12. Handbook of computational statistics: concepts and methods by Gentle, J.E., Hardle, W. & Mori, Y., Berlin, Springer-Verlag, 2004.
13. Statistical design and analysis of industrial experiments by Ghosh, Subir, Ed., 1990.
14. Scan Statistics by Glaz, J., Naus, J. & Wallenstein S, New York, Springer, 2001.
15. Statistical design for research by Kish, L., Wiley series in probability and mathematical statistics, New York, John Wiley & Sons, 1987.
16. Introduction to probability and statistics by Lipschutz, S. & Schiller, J. J., New York. McGraw-Hill, 1999.
17. Schaum's outline of theory and problems of statistics by Spiegel, M. R. & Stephens, L. J., Ed. 3, New Delhi, Tata McGraw-Hill Publishing Co. Ltd., 2001.
18. Mathematical and statistical methods for genetic analysis by Lange, K., 2<sup>nd</sup> Ed., New York. Springer-Verlag, 2002.

**MedBT 309: Medical biochemistry and Drug discovery Lab****Core Course – Practical; 4 Credits**

1	Glucose tolerance test	2
2	Liver function tests- Estimation of Alkaline Phosphatase and Alanine Transferase	3
3	Renal Function tests- Estimation of blood creatinine	2
4	Studies of enzymes distribution in the cell	3
5	Experiments with hemoglobin	2
6	Analysis of normal and abnormal urine samples	2
7	Estimation of streptomycin/ penicillin by chemical assay method	2
8	Determination of LD50 & ED50 of selected drug	2
9	To perform the sterility test on injectables.	2
10	Pathology lab and animal house visit	2

**References:**

1. Introductory Practical biochemistry, S.K Sawhney & Randhir Singh (eds) Narosa Publishing House, New Delhi, ISBN 81-7319-302-9, p 195-303
2. Standard Methods of Biochemical Analysis, S.K Thimmaiah (ed), Kalayani Publishers, Ludhiana ISBN 81-7663-067-5, p12-18
3. Experimental Biochemistry: A Student companion, Beedu Sasidhar Rao & Vijay Deshpande (ed), I.K International Pvt. LTD, New Delhi ISBN 81-88237-41-8, p 13-17, p 49-72
4. Practical Biochemistry, R.C Gupta & Bhargava (eds) CBS Publishers and distributors, New Delhi, ISBN 81-239-0124-0, P 9-27
5. Practical Clinical Chemistry, Harold Varley, CBS Publishers and distributors, New Delhi.
6. Basic and Clinical Pharmacology, Prentice hall, International, Katzung, B.G.

<b>Med BT 310: Option I (310.1) – Biomedical Waste Management</b>	<b>Total</b>
<b>Elective Course II – Theory; 2 Credits</b>	<b>30 L</b>
<b>UNIT I</b>	
<b>1</b> Introduction, definition, classification/ categories, composition and sources. Radioactive waste Health Impacts, direct and Indirect hazards Modern technology for handling biomedical waste Basic steps in waste management, segregation, collection and handling of waste On site pre-treatment of waste Mechanical treatment and chemical disinfections store and off-site transportation Common treatment facilities in-site and off-site Liquid waste treatment and different technologies, cost aspect	<b>15</b>
<b>UNIT II</b>	
<b>2</b> Technologies available for treatment of biomedical waste <b>Conventional treatment technologies</b> a) Wet thermal technology b) Incineration - different models <b>Treatment of general/non-infectious waste</b> a) Composting, rotating jumbling system French composting b) Vermi-composting <b>Disposal Technologies</b> a) Sharp disposal pit b) Deep- burial pit c) Secured land Controls applied to waste management, Environmental safety, risks & public issues, Instrumentation and monitoring, Crematories, Risk management in hospitals -Environment issues in hospitals -Risk analysis Legislation and policies on health care waste management. <b>References:</b> 1. Principles of Hospital Management - S. A. Tabish 2. Hospital Management - S. L. Goel 3. Hospital Administration - Francis 4. Bio-Medical Waste Act & Rules Govt. of India 5. Current Issues In BMW Waste Handling-ISHA, Bangalore 6. Management and Handling Rules for: municipal solid waste, biomedical waste, hazardous waste and radioactive wastes, Government of India Publications. 7. Bio-Medical Waste Management- Sushma Sahai	<b>15</b>

<b>Med BT 310: Option II (310.2): Drug Designing</b>		<b>Total</b>
<b>Elective Course II – Theory; 2Credits</b>		<b>30 L</b>
<b>UNIT I</b>		
<b>1</b>	Drug discovery process, role of Bioinformatics in drug design.	<b>2</b>
<b>2</b>	Target identification and validation, lead optimization and validation. Structure-based drug design and ligand based drug design.	<b>3</b>
<b>3</b>	Modeling of target-small molecule interactions.	<b>3</b>
<b>UNIT II</b>		
<b>4</b>	Structure Activity Relationship: QSARs and QSPRs, QSAR Methodology.	<b>3</b>
<b>5</b>	Various descriptors used in QSARs: Electronics; Topology; Quantum Chemical based descriptors. 3D QSAR techniques: CoMFA and CoMSIA.	<b>4</b>
<b>6</b>	Training data, test data and external validation data, applicability domain in QSAR, Cross validation techniques, Pubchem BioAssay data for QSAR studies.	<b>4</b>
<b>UNIT III</b>		
<b>7</b>	Pharmacophore features, Pharmacophore model, Receptor-based and ligand-based pharmacophore modeling.	<b>2</b>
<b>8</b>	Virtual screening based on pharmacophore model.	<b>2</b>
<b>UNIT IV</b>		
<b>9</b>	Receptor site, molecular docking study, flexible docking, rigid docking, molecular interactions.	<b>1</b>
<b>10</b>	Scoring functions, correlation between ligand-based and receptor-based studies	<b>2</b>
<b>References:</b>		
<b>1.</b>	Computer-Aided Molecular Design: Theory and Applications by Jean-Pierre Doucet, J. P. Doucet, Jacques Weber, Elsevier Science & Technology Books.	
<b>2.</b>	Receptor-based Drug Design edited by Paul Leff, Marcel Dekker Inc., New York.	
<b>3.</b>	Advanced Drug Design and Development: A Medicinal Chemistry Approach by P. N. Kourounakis, 1994, Taylor & Francis.	
<b>4.</b>	Biopharmaceutical Drug Design and Development by Susanna Wu-Pong, Yon Rojanasakul, 2008, Humana Press.	
<b>5.</b>	Combinatorial Library Design and Evaluation: Principles, Software, Tools, and Applications in Drug Discovery by Arup Ghose, Vellerkad Viswanadhan, 2001.	
<b>6.</b>	Computer-Aided Drug Design and Delivery Systems by Ahindra Nag, Baishakhi De, 2010, McGraw-Hill Professional.	

Med BT 310: Option III (310.3) – Intellectual property rights II (IPR II) Elective		Total
Course II - Theory; 2 Credits		30 L
<b>UNIT I</b>		
<b>1</b>	<b>Basics of Patents</b>	<b>5</b>
	Indian Patent Act 1970; Patent Rules, 2003; Recent Amendments; Definitions, non-patentable subject matter, patentability criteria, anticipation, infringement, opposition, biopiracy; Precautions before patenting-disclosure/non-disclosure.	
<b>2</b>	<b>Types of patents</b>	<b>5</b>
	Provisional and Complete specification; Contents of specification	
<b>3</b>	<b>Introduction to Patent drafting</b>	<b>5</b>
	National, PCT and Convention patent applications; PCT and Implications; Role of a Country Patent Office; Procedure for filing requirements National and international Patent application, Forms, fees and timelines	
	Cost and financial assistance for patenting, introduction to existing schemes	
<b>UNIT II</b>		
<b>4</b>	<b>Relevant case studies</b> (3-4 cases) related to patentability criteria, anticipation, infringement, opposition, bio-piracy	<b>12</b>
<b>5</b>	<b>Career opportunities</b> in the field of IPR.	<b>3</b>
	<b>References:</b>	
	1. Erbisch, Karim M. Maredia, Intellectual property rights in agricultural biotechnology By Frederic H. Biotechnology in Agriculture Series No 28,	
	2. David Castle, The role of intellectual property rights in biotechnology innovation, Edward Elgar Publishing	
	3. <a href="http://www.wipo.int/portal/index.html.en">http://www.wipo.int/portal/index.html.en</a>	
	4. <a href="http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html">http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html</a>	
	5. <a href="http://www.patentoffice.nic.in">www.patentoffice.nic.in</a>	
	6. <a href="http://www.iprlawindia.org/">www.iprlawindia.org/</a> - 31k - Cached - Similar page	
	7. <a href="http://www.cbd.int/biosafety/background.shtm">http://www.cbd.int/biosafety/background.shtm</a>	



**SEMESTER IV****MBT&MedBT 401: RESEARCH PROJECT****Core Course – 20 Credits****Guidelines for Research Project and Dissertation Submission during Sem IV for Master of Science (M. Sc.) in Medical Biotechnology****Eligibility:**

- If student fails to pay any of the pending dues before the beginning of the project date, he/ she will not be considered to be eligible to undertake research project.

**Project Duration, Dissertation writing and Submission:**

- The project duration will be from beginning till the end of Semester IV
- Students shall submit dissertation title, name of research guide, name of co-guide (for off-campus only), name & place of research work within 10 days after the start date of semester IV. (As per the format enclosed).
- Student must have to submit Two hard copies (copy of Library/ Co-Guide & Student's copy) and one soft copy (Guide) of Dissertation only in the prescribed format (read below), duly approved by Research Guide(s) on or before April 15th of every year. The dissertation will not be accepted for evaluation for those who submit after March 15th, their presentation will be taken along with the next year batch.
- Students must acknowledge all the figures, maps, tables, methods, texts, etc., that are used, taken from other sources for writing the dissertation, except for original work that they have carried out. Dissertation having more than 10 % of plagiarism found will not be considered for evaluation.
- Dissertation must be written in specified format only as mentioned below:
  - a. The paper used for printing shall be of A4 size;
  - b. Printing shall be in a standardized form (word size of 12, font in Times New Roman) on one side of the paper and in 1.5 line spacing;
  - c. A margin of 1.5 inches shall be on the left hand side, top, bottom and right hand margin shall be of 1 inch.
  - d. The card for cover shall not be more than 330 GSM.
  - e. The title of the dissertation, name of the candidate, degree, name of the guide, co-guide, place of research and the date, month and year of submission shall be printed on the title page and on the front cover.
  - f. The hard- bound thesis cover shall be of black color. Spine of the binding [side cover] should mention 'M Sc. Biotechnology or Medical Biotechnology or Bioinformatics dissertation on the top, name of the candidate and date, month and year.
- Student must follow following chapter scheme for Dissertation submission:

**Chapter Scheme of Dissertation :**

- ✓ Introduction
- ✓ Review of Literature
- ✓ Aims and Objectives
- ✓ Materials & Methods
- ✓ Observations and Results
- ✓ Discussion
- ✓ Summary
- ✓ Conclusions
- ✓ Bibliography –Reference etc.

**Place of Research Project:**

- Student may prefer to undertake his/ her research project in-house or off-campus. Students those preferring to pursue research at off-campus will have to undertake research work only in any of the Department of Scientific and Industrial research (DSIR), Government of India recognized laboratory (Government, State-Government, Private).

**Research Guide(s):**

- Students who are opting for off-campus they will have one Major Research Guide from the host organization (Preferably a Ph D. qualified scientist), however, a Co-Guide from RGITBT will be appointed.

**Dissertation Evaluation:**

- Students will have to submit **Two progress reports (45 days of Intervals) (Format Enclosed) and One evaluation report from Research Guide having 40 % weight age (Format Enclosed)** at the time of dissertation submission on the execution of research project duly signed by Guide / Co-Guide. The progress report will include, attendance percentage, review collection, research progress, sincerity, topic understanding, and systematic execution of research project, data collection and management. The evaluation report will include attendance, review work, project execution, critical thinking, originality of work, presentation of result, understanding of research and topic, dissertation write-up, presentation of tables, figures, maps, references, etc.
- Student will have to give 20 min presentation on the work done in the presence of expert committee (between **April 21 to May 5 of every year**). (Note only working dates will be considered). The power point presentation format shall contain project title, name of candidate, place of research work, name of Guide/ Co-Guide, introduction, review, objectives, significance of the work, methodology, results & discussion, conclusion, references and acknowledgement. The presentation shall be of 12-15 min with 5-8 minutes of discussion.
- The presentation will carry **60 % of weight age** based on the following consideration. The overall understanding of the research project, objectives, methodology. The outcome of

research work, data analysis and statistics, clarity in presentation and question – answer session (**Format Enclosed**).

- Student will be assigned a grade as per the Rules mentioned.



**RAJIV GANDHI INSTITUTE OF IT AND BIOTECHNOLOGY**

“Write here **approved title** of the Dissertation in all upper-case (capital letters) with a 'centre' alignment. Place this title on the upper central part of the cover with sufficient margin from top and both sides. Use font size suitable to length of the title”

A DISSERTATION SUBMITTED TO

**RAJIV GANDHI INSTITUTE OF I.T. AND BIOTECHNOLOGY,  
BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY, PUNE**

FOR AWARD OF DEGREE OF  
**MASTER OF SCIENCE in MEDICAL BIOTECHNOLOGY**

SUBMITTED BY

.....

UNDER THE GUIDANCE OF

.....  
.....

Name of Co-Guide

Name of Guide

RESEARCH CENTRE

.....  
.....  
.....

WRITE HERE DATE, MONTH & YEAR OF SUBMISSION

**CERTIFICATE**

This is to certify that the work incorporated in the dissertation entitled “.....” for the degree of ‘Master of Science’ in the subject of Medical Biotechnology under the faculty of Interdisciplinary Science has been carried out by Mr/ Mrs..... Rajiv Gandhi Institute of I.T and Biotechnology, Bharati Vidyapeeth Deemed to be University, Dhankawadi, Pune (OR NAME OF THE LABORATORY, PLACE OF THE WORK) during the period from ..... to.....under the guidance of Dr.....

Place: Pune

(Signature of Head of the Institute with seal)

Date :

Principal / Director  
Seal

**CERTIFICATION OF GUIDE**

This is to certify that the work incorporated in the dissertation entitled  
 “ .....  
 ”

Submitted by..... for the degree of ‘Master of Science’ in the subject of  
 ‘Medical Biotechnology’ under the faculty of Interdisciplinary Science has been  
 carried out in the Department (laboratory) of....., RGITBT, BVDU  
 (**Institute/ Private Lab, Govt Lab etc**) ....., Pune (**OR Place**) during the  
 period from .....to....., under my direct supervision/ guidance.

Place : ( Signature of Research Guide)

Date : (Name & Designation)

Place : Pune ( Signature of Research Co-Guide)

Date : (Name & Designation)

**DECLARATION BY THE CANDIDATE**

I hereby declare that the dissertation entitled “  
 ”  
 \_\_\_\_\_ submitted by me to  
 (Title of thesis)

the Bharati Vidyapeeth Deemed to be University, Pune for the degree of Master of Science (M Sc.) in Medical Biotechnology under the Faculty of Interdisciplinary Science is

original piece of work carried out by me under the supervision of \_\_\_\_\_  
 (Name of Guide) and

\_\_\_\_\_. I further declare that it has not been submitted to  
 (Name of Co-guide (if any))

this or any other university or Institution for the award of any degree or Diploma.

I also confirm that all the material which I have borrowed from other sources and incorporated in this dissertation is duly acknowledged. If any material is not duly acknowledged and found incorporated in this dissertation, it is entirely my responsibility. I am fully aware of the implications of any such act which might have been committed by me advertently or inadvertently.

Place :  
 Date : / /

Name & signature of  
 Research Student

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A+ Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Progress Report – I**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Dec 1 – Jan 15

Name & Place of Research Work :

Objectives of Research Work : 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:**

**Place & Date:**



**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**  
(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A+ Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Progress Report – II**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Jan 16 – Feb 28

Name & Place of Research Work :

Objectives of Research Work: 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:**

**Place & Date:**

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A<sup>+</sup> Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Internal Evaluation Report**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

(of 40 % weight age )

	<b>Out of</b>	<b>Marks obtained</b>
Percent Attendance	10	
Getting well acquainted with colleague and laboratory procedures, sincerity	5	
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management	20	
Overall Performance	5	
<b>Total</b>		

1. Name of Research Guide with signature and seal:

2. Name of Research Guide:

Place & Date:

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**  
 (Re-accredited with A grade by NAAC in 2011, Accredited with A<sup>+</sup> Grade by  
 NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Evaluation Report on Presentation**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

**(of 60 % weight age )**

	<b>Out of</b>	<b>Marks obtained</b>
Overall understanding of the research project - Research Objectives	10	
Significance of Research / Review	10	
Results – Data presentation, statistical analysis, Softwares used, Result Interpretation	15	
Presentation – Clarity, power point slides, communication skills, question – answer session.	15	
Significant outcome – Technical abstract, Seminar, etc.	10	
<b>Total</b>		

Name & Signature of Expert Pane - 1. (External):

- 2. (Internal):

- 3. (Internal):

Signature of Principal (RGITBT):

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY**  
 (Re-accredited with A grade by NAAC in 2011, Accredited with A+ Grade by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
 Pune-Satara Rd, Katraj, Pune – 411 046

**Plan of Research Outline**

(To be submitted to Principal, RGITBT, BVDU., Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Proposed Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Proposed Research Objectives :

Start Date of Research project :

Likely Date of Project Completion :

Significance of Research Project :


Name & Sign of Student

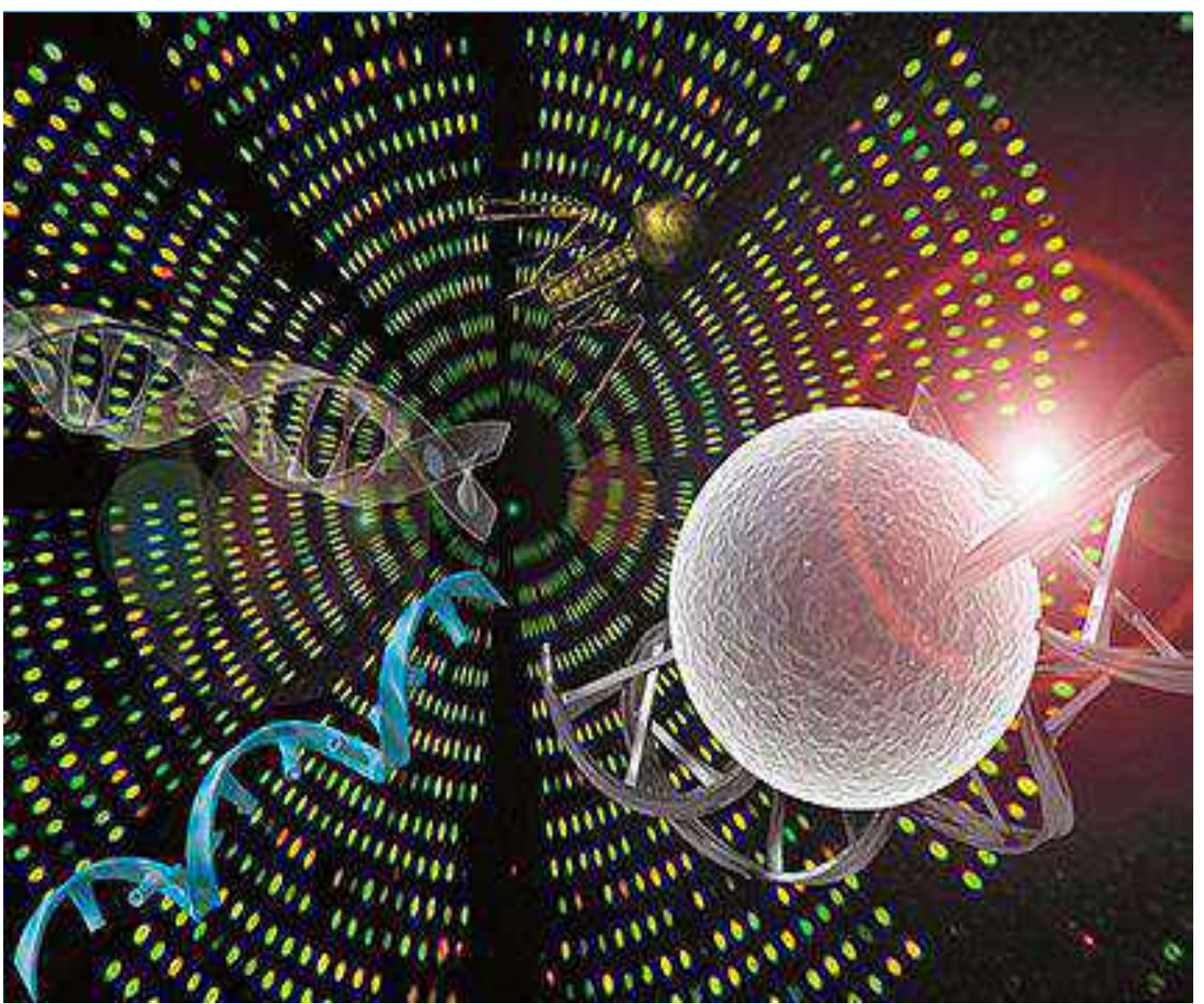
**Approved by**

1.Name of Research Guide with signature and seal:

Place & Date:

2. Name of Research Guide (Co-Guide) with signature and seal:

Place & Date:



# BVDU-RGITBT-M.Sc. Bioinformatics Syllabus

**2019**



**Bharati Vidyapeeth**  
(Deemed to be University)  
Pune, India.



Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Chancellor

Prof. Dr. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Founder Chancellor : Dr. Patangrao Kadam

★ Accredited with 'A' Grade (2017) by NAAC ★  
★ Category-I University Status by UGC ★  
★ NIRF Ranking - 86 ★

"Social Transformation Through Dynamic Education"

Dr. Vishwajeet Kadam  
B.Tech., M.B.A., Ph.D.  
Pro Vice Chancellor

G. Jayakumar  
M.Com., Dip. in Admin.  
Registrar

**NOTIFICATION NO. 988**

It is hereby notified for the information of all concerned that the University authorities have approved the revised course structure, syllabus and rules of examinations of M.Sc. Bioinformatics and Advanced Diploma in Bioinformatics under the Faculty of Interdisciplinary Studies to be implemented from the academic year 2019-20.

A copy of the revised course structure, syllabus and rules of examinations of M.Sc. Bioinformatics and Advanced Diploma in Bioinformatics is enclosed.

All the concerned are requested to make a note of this.

Ref. No. BVDU/2019-20/ 162

Date : June 8, 2019

*G. Jayakumar*  
Registrar

To,

1. The Dean, Faculty of Interdisciplinary Studies, College of Engineering, Pune 411043.
2. The Principal, Rajiv Gandhi Institute of IT & BT, Pune 411043.
3. The Controller of Examinations, BVDU.
- ✓ 4. The IT Cell for uploading in the website.

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY  
PUNE**

**REVISED SYLLABUS FOR  
MASTER OF SCIENCE  
M.Sc. IN BIOINFORMATICS**

**UNDER  
FACULTY OF INTERDISCIPLINARY STUDIES**



**SYLLABUS OF SEM I – SEM IV UNDER  
CHOICE BASED CREDIT SYSTEM**

**To be effective from Academic Year  
2019-20**

Bharati Vidyapeeth Deemed To Be University is a multidisciplinary, multicampus university having 32 Institutions imparting quality education in various disciplines. All programmes of the University are approved by UGC and respective statutory councils. BVDU has been re accredited for the third time with 'A+' grade by NAAC in 2017. UGC has accorded 12B Status [UGC ACT1956] to the university. Ministry of Human Resource and Development, Government of India has awarded "A" category to the University in 2012 based on parameters including innovative programs, research and infrastructure facilities. The University is a member of Association of Indian Universities [AIU] which has ranked BVDU among top 10 universities of India for International students' enrollment. BVDU is also a member of International Association of Universities.

Rajiv Gandhi Institute of IT and Biotechnology is a constituent unit of BVDU established in 2003. The Institute is approved by UGC to conduct graduate and post graduate courses in Biotechnology. The Institute has excellent infrastructure, state-of-the-art laboratories and competent faculty facilitating appropriate learning environment. The Institute offers one undergraduate and four postgraduate programmes in Biotechnology.



## INTRODUCTION

The Master of Science (M.Sc.) in Bioinformatics is a full time post graduate program offered by **Bharati Vidyapeeth (Deemed to be University (BVDU))** in its constituent unit, Rajiv Gandhi Institute of IT and Biotechnology (RGITBT). The course was initiated in the year 2010 and was designed to facilitate empowerment of students to face cutting edge technological applications in bioinformatics sector. 21<sup>st</sup> century biology has been transformed into integrative biology due to paradigm shift from reductionist to holistic approach. The data explosion is one of the obvious causes of the transformation to holistic or systems biology mode. In order to have deeper insights in to biological systems, integration of the data from genome to phenome levels to generate dynamic models has surfaced as key area of bioinformatics. On its implementation for 8 years, the curriculum is being revised two times to embrace newer emerging disciplines and value added courses. The revised **M.Sc. Bioinformatics is a full time 108 credits** Program to be implemented in Rajiv Gandhi Institute of IT and Biotechnology from the academic year 2019-20. The feedback of students, alumni, faculty, employers and parents has a substantial contribution in designing of this curriculum.

## OBJECTIVES

1. To impart deep knowledge of the discipline
2. Develop skills in relevant areas to enhance employment opportunities
3. Introduce emerging areas of NGS, Drug designing and data mining
4. Build interdisciplinary approach
5. Foster global competence among students
6. Inculcate social and moral values and sense of scientific responsibilities in students

## ELIGIBILITY FOR ADMISSION TO THE COURSE

Candidates satisfying following criteria are eligible to apply for M.Sc. Bioinformatics Course

1. A student who has obtained Bachelor's degree with minimum **50%** in (i) B.Sc. (Biotechnology / Microbiology / Biochemistry / Zoology / Botany / Chemistry /Agriculture/ Mathematics /Statistics / Computer Science). (ii)B. Pharm (iii). MBBS (iv) BDS (v) BAMS (vi) BHMS (vii) B.E. in Computer Science or Information technology or Biomedical Engineering will be considered eligible for admission to M.Sc. Bioinformatics course or **45%** aggregate marks for **SC / ST** category respectively at graduate level university examination.
2. Subject to above conditions, the admission will be based on the merit at Entrance Examination conducted by Bharati Vidyapeeth (Deemed to be University).

### **DURATION OF THE COURSE**

The course will be executed in four semesters. The medium of instruction and examination will be only English.

### **RULES FOR THE COURSE**

1. The entire course is of 108 credits.
2. One credit for theory course is equivalent to 15 lectures/tutorials; while one credit for practical course is equivalent to 25 – 30 hrs. of lab /field work or demonstration.
3. The curriculum comprises of core, advanced and value added courses. The Core and Advanced Courses are compulsory where as Value Added are elective.
4. The Core Courses are aimed at providing fundamental knowledge of the discipline. The advanced courses are designed to develop manpower for bioinformatics industries as per current need. The Value Added Courses are intended to inculcate the thrust of new domains of bioinformatics within students.
5. The teaching schedule for the 3 credits and 2 credits theory courses will be 3 and 2 lectures per week respectively. All courses will have one tutorial fortnightly.
6. The respective elective course will be implemented only if more than 10 students enroll for that course.
7. All core courses will be evaluated by University Examination. The elective courses will be evaluated by University Examination and Continuous Assessment.

8. Two extra credits will be awarded to students if there is any significant outcome of their dissertation study. The research outcome in terms of publication in indexed national/International journal; filing of patent; or commercialization of technology will be considered for the award of credits.

## RULES FOR EXAMINATION

### A: Nature of Examination:

1. Each course will have 40% marks for internal assessment and 60% marks for semester-end examination.
2. The assessment for 1, 2 and 3 Credits courses will be as given in following table:

**Table 1: Evaluation pattern for one to three Credit Courses**

Course Credits	Marks for UE (60% Weightage)	Marks for IE (40% weightage)	Total Marks for evaluation
1	15	10	25
2	30	20	50
3	45	30	75
4	60	40	100

3. The duration of **60 Marks UE theory paper will be 2.00 Hrs; for 30 Marks 1.30 Hrs.** respectively.
4. The Internal Assessments (IA) will be conducted by the Institute and an end-of-the term University Examination (UE) conducted by the university. The UE will be based on the entire syllabus.
5. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course.

**STANDARD OF PASSING**

**A: Grading System:** A **10-point absolute grading system** will be adapted for grading in each head of passing. The system will have seven grade points, the highest being 10. The grading system shall be as shown in Table-2 below. The performance indicators O, A+, A, B+, B, C, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, Satisfactory, and Poor.

**Table-2: The grading system under CBCS**

Range of Marks (out of 100)	Grade Point	Grade
$80 \geq \text{Marks} \leq 100$	10	O
$70 \geq \text{Marks} \leq 80$	9	A+
$60 \geq \text{Marks} \leq 70$	8	A
$55 \geq \text{Marks} \leq 60$	7	B+
$50 \geq \text{Marks} \leq 55$	6	B
$40 \geq \text{Marks} \leq 50$	5	C
$\text{Marks} < 40$	0	D

1. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table-2) shall be the GPA for the course.**
2. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses up to and including the current semester. The CGPA of a student when he/she completes the program is his/her final result.
3. The SGPA is calculated by the formula ,  $\text{SGPA} = \frac{\sum C_k \times \text{GPA}_k}{\sum C_k}$  where  $C_k$  is the Credit-value assigned to a course and  $\text{GPA}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which

he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

4. The CGPA is calculated by the formula ,  $CGPA = \frac{\sum Ck \times GPAk}{\sum Ck}$  where  $Ck$  is the

Credit-value assigned to a course and  $GPAk$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

5. The CGPA, calculated after the minimum credits specified for the program are 'earned', will be the final result grace marks of 1, 2 or 3 may be awarded to a candidate at UE as per the university rules.

**B: Standards of Passing and ATKT rules:**

1. For all Core Courses, both UE and IA

Constitute separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits

- (a) the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA;

**OR**

- (b) If he/she fails in IA, then also the learner passes in the course, **provided that a minimum of 25% is obtained in IA and GPA for the course is at least 6.0 (50%marks ) in aggregate.** The GPA for a course will be calculated only if the learner passes in that course.

2. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP. **A student who passes in aggregate in a course need not reappear even if he failed at IA if he/she obtains 25% at IA.**

3. The students of Semester I and II & III will be admitted to next Semester even if he/she gets backlog in any of the course. They can reappear in the next semester examination as a backlog candidate.

#### C: AWARD OF HONOURS:

1. A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms of letter grade and CGPA only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given in Table 3.

**Table 3: Criteria for the award of honors at the end of the program**

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \geq CGPA \leq 10.00$	O	Outstanding	$80 \geq Marks \leq 100$
$9.00 \geq CGPA \leq 9.49$	A+	Excellent	$70 \geq Marks \leq 80$
$8.00 \geq CGPA \leq 8.99$	A	Very Good	$60 \geq Marks \leq 70$
$7.00 \geq CGPA \leq 7.99$	B+	Good	$55 \geq Marks \leq 60$
$6.00 \geq CGPA \leq 6.99$	B	Average	$50 \geq Marks \leq 55$
$5.00 \geq CGPA \leq 5.99$	C	Satisfactory	$40 \geq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks below 40

#### THE FORMAT OF THE TRANSCRIPTS

The transcripts may be acquired by the students indicating his/her performance in every semester examination. The transcript shall show the performance indicators given in the following table, in addition to any other information.

Course Number	Course Description	Number of Credits	University Examination		IA/CA		Grade Point Average (GPA)	Result
			Grade	Grade Point	Grade	Grade Point		
Total Cumulative Credits Completed		SGPA	CGPA	Equivalent Marks (%)	<b>Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be GPA</b>			

**PATTERN FOR ASSESSMENT**

**A: Pattern of Evaluation for Internal Assessment of Theory Courses:**

The weightage for Internal Assessment is 40%. Students for IA of every theory course will be assessed for total of 40 marks for 3 credit course and for 20 marks for 2 credit course which will be cumulative marks obtained in two separate assessments specified below.

1. Two internal written examinations of 20 marks each for 3 credit course and 10 marks each for 2 credit course. A total of the two tests will be considered.
2. An optional assignment/ oral/ open book examination may be undertaken if desired.

**B. Pattern of Evaluation for Internal Assessment of Practical Courses:**

The Internal Assessment for every practical course will be of 20 Marks for 2 credits and 40 marks for 4 credits practical courses. The students for IA will be assessed on the basis of;

1. Performance for every practical: 10 Marks/20 Marks for 2/4 Credits practical courses respectively. (Marks to be distributed depending on total number of practical)
2. Assignment/ Oral examination/Tour Report: 10/20 Marks for 2/4 Credits courses

### **C: Pattern of question paper at University Examination**

University Examination for 3 credit and 2 credit theory course will be of 60 marks and 30 marks respectively. **For 3 credit course**, the question paper will comprise of 6 questions, 3 questions each in section I and section II. Each question will be of 10 marks. All questions will be compulsory. The pattern of question paper will be as given on next page.

### **PATTERN OF QUESTION PAPER FOR 3 CREDIT COURSE OF UNIVERSITY THEORY EXAMINATION OF M.Sc. BIOINFORMATICS 2019 CBCS COURSE (TOTAL MARKS: 60, TME: 3.00 HRS.)**

#### **Instructions to Paper Setter:**

1. Question paper of each course will comprise of total 6 questions,
2. Section I will have 3 questions and Section II 3 questions.
3. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
4. Q. no 1 will be objective, comprising of 7 questions of 2 mark each. They will be based on entire portion of Section I. Students will have to attempt any 5 out of these.
5. Q no 4 will be objective, comprising of 7 questions of 2 mark each. They will be based on entire portion of Section II. Students will have to attempt any 5 out of these.
6. Questions 2 & 3 of **Section I** and 5 & 6 of **Section II** will be descriptive and contain 3 sub-questions of 5 marks each out of which students will attempt any two.



7. Q 2 and 3 will be based solely on Unit I and II whereas Q 5 and 6 will be based on Unit III and IV of the syllabus respectively.
8. Students will attempt answers to Section I and Section II in separate answer books

### SECTION I

- Q.1** Attempt **Any FIVE** of the following:(Define, Explain why, Fill in the blanks, Give examples, Answer in brief) (10)
- a
  - b
  - c
  - d
  - e
  - f
  - g
- Q.2** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of) (10)
- a
  - b
  - c
- Q.3** Write short notes on **Any Two** of the following (10)
- a
  - b
  - c

### SECTION II

- Q.4** Attempt **Any five** of the following: :(Define, explain why, Fill in the blanks, Give examples, Answer in brief) (10)
- a
  - b
  - c
  - d
  - e
  - f
  - g

**Q.5** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of) (10)

a

b

c

**Q.6** Write short notes on **Any Two** of the following (10)

a

b

c

**QUESTION PAPER PATTERN FOR 2 CREDITS THEORY COURSE AT UNIVERSITY**  
**EXAMINATION**

**For 2 credit course**, the question paper will comprise of 4 questions, 2 questions each in section I and section II. Q1 of section I and Q3 of section II will be of 7 marks each while Q2 and Q4 will be of 8 marks each. All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 2 credit course of university theory examination of M.Sc. BIOINFORMATICS 2019 CBCS COURSE (Total Marks: 30, Tme: 1.50 Hrs.)**

**Instructions to Paper Setter:**

1. Question paper of each course will comprise of total 4 questions,
2. Section I will have 2 questions and Section II 2 questions.
3. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
4. Questions 1 of section I and 3 of section II will be objective, and contain 7 questions of 1 mark each out of which students will attempt any 5. They will be based on entire portion of Section I and section II respectively.
5. Questions 2 of **Section I** and 4 of **Section II** will be descriptive and contain 3 sub-questions of 5 marks each out of which students will attempt any two.
6. Q 2 and 4 will be based solely on Unit I and II of the syllabus respectively.
7. Students will attempt answers to Section I and Section II in separate answer books

## SECTION I

**Q.1** Attempt **Any Five** of the following: :(Define, Explain why, Fill in the blanks, Give examples, Answer in brief) (05)

- a
- b
- c
- d
- e
- f
- g

**Q.2** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of, Write short notes on) (10)

- a
- b
- c

## SECTION II

**Q.3** Attempt **Any Five** of the following: :(Define, Explain why, Fill in the blanks, Give examples, Answer in brief) (05)

- a
- b
- c
- d
- e
- f
- g
- h

**Q.4** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of, Write short notes on) (10)

- a
- b
- c

**D: PATTERN FOR QUESTION PAPER OF UNIVERSITY PRACTICAL EXAMINATION OF M.Sc. BIOINFORMATICS 2019 CBCS COURSE**

**(Total Marks: 30/60 for 2/4 credit courses, Time: 3 .00/6.00 Hrs.)**

<b>Q. 1</b>	Major Practical	(10/20)
<b>Q. 2</b>	Spotting/Minor Experiment	(10/20)
<b>Q. 3</b>	Viva	(05/10)
<b>Q. 4</b>	Journal	(05/10)

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**Course structure of M.Sc. Degree Course in Bioinformatics**  
**Under Choice Based Credit System 2019-20**

**SEMESTER I**

<b>Course No. &amp; Description</b>	<b>Title</b>	<b>Credits</b>	<b>IA</b>	<b>Univ. Exam</b>	<b>Total Credits</b>
<b>MBI 101</b> Basic Course-Theory	Cell Biology (C)	2	20	30	<b>28</b>
<b>MBI 102</b> Basic Course -Theory	Biochemistry (C)	2	20	30	
<b>MBI 103</b> Basic Course -Theory	Biomathematics (C)	2	20	30	
<b>MBI 104</b> Basic Course -Theory	Biostatistics (C)	2	20	30	
<b>MBI 105</b> Basic Course -Theory	C Programming and Data structure (C)	3	40	60	
<b>MBI 106</b> Basic Course - Theory	Biological Informatics (C)	2	20	30	
<b>MBI 107</b> Basic Course - Theory	DBMS & MongoDB (C)	3	40	60	
<b>MBI 108</b> Elective Course - Theory	PERL Programming / HTML Programming	2	20	30	
<b>MBI 109</b> Basic Course -Practical	Cell Biology and Biochemistry Lab (C)	2	20	30	
<b>MBI 110</b> Basic Course -Practical	C Programming and Data Structure Lab (C)	2	20	30	
<b>MBI 111</b> Basic Course -Practical	Biological Informatics Lab (C)	2	20	30	
<b>MBI 112</b> Basic Course -Practical	DBMS & MongoDB lab (C)	2	20	30	
<b>MBI 113</b> Elective Course - Practical	PERL Programming Lab /HTML Programming Lab	2	20	30	

## SEMESTER II

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBI 201</b> Core Course –Theory	Statistical Analysis System (SAS) (C)	2	20	30	30
<b>MBI 202</b> Core Course –Theory	R and Data Analytics (C)	3	40	60	
<b>MBI 203</b> Core Course –Theory	JAVA and BioJAVA Programming (C)	3	40	60	
<b>MBI 204</b> Core Course –Theory	Science of Omics (C)	3	40	60	
<b>MBI 205</b> Core Course - Theory	Proteomics (C)	2	20	30	
<b>MBI 206</b> Core Course -Theory	Molecular Biology	2	20	30	
<b>MBI 207</b> Core Course -Theory	Recombinant DNA Technology	2	20	30	
<b>MBI 208</b> Core Course-Theory	Structural Biology and Molecular Modeling	3	40	60	
<b>MBI 209</b> Core Course - Practical	SAS and Data Analytics lab (C)	2	20	30	
<b>MBI 210</b> Core Course - Practical	JAVA and BioJAVA Programming lab (C)	2	20	30	
<b>MBI 211</b> Core Course - Practical	Omics Analysis Lab (C)	2	20	30	
<b>MBI 212</b> Core Course - Practical	Molecular Biology and Recombinant DNA Technology lab	2	20	30	
<b>MBI 213</b> Core Course- Practical	Structural Biology and Molecular Modeling Lab	2	20	30	

## SEMESTER III

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>MBI 301</b> Core Course –Theory	Scientific Writing Skills	2	20	30	<b>30</b>
<b>MBI 302</b> Advance Course –Theory	Chemoinformatics and Drug Designing	3	40	60	
<b>MBI 303</b> Advance Course- Theory	Machine Learning Techniques	3	40	60	
<b>MBI 304</b> Advance Course- Theory	Current Bioinformatics	2	20	30	
<b>MBI 305</b> Advance Course –Theory	Python Programming	2	20	30	
<b>MBI 306</b> Elective Course- Theory	Introduction to Clinical Trials and Pharmacovigilance / Selenium	2	20	30	
<b>MBI 307</b> Elective Course- Theory	Cancer Genomics/ Biodiversity Informatics & Molecular Phylogenetics	2	20	30	
<b>MBI 308</b> Elective Course- Theory	System Biology/Artificial Intelligence	2	Continuous Assessment		
<b>MBI 309</b> Advance Course- Practical	Chemoinformatics and Drug Designing Lab	2	20	30	
<b>MBI 310</b> Advance Course- Practical	Machine Learning Techniques Lab	2	20	30	
<b>MBI 311</b> Advance Course- Practical	Current Bioinformatics Lab	2	20	30	
<b>MBI 312</b> Advance Course -Practical	Python Programming Lab	2	20	30	
<b>MBI 313</b> Elective Course- Practical	Introduction to Clinical Trials and Pharmacovigilance Lab / Selenium lab	2	20	30	
<b>MBI 314</b> Elective Course -Practical	Cancer Genomics Lab/ Biodiversity Informatics & Molecular Phylogenetics Lab	2	20	30	

**SEMESTER IV**

<b>Course No. &amp; Description</b>	<b>Title</b>	<b>Credits</b>	<b>IA</b>	<b>Univ. Exam</b>	<b>Total Credits</b>
<b>MBI 401</b> Core Course	Research Project	20	40	60	20

**Total Credits Offered: 28 C, Sem I+ 30 C, Sem II +30 C, Sem III+ 20C, Sem IV = 108**



# **SEMESTER I**

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<b>MBI 101: Cell Biology (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

- |   |          |
|---|----------|
| <b>1. Cell as a basic unit of life.</b><br>Basic structure, organization and composition of prokaryotic and eukaryotic cell. Plasma membrane structure and functions, Membrane models. Components of blood & their functions (Plasma, RBC, WBC, Platelets). | <b>4</b> |
| <b>2. Cytoskeleton:</b> Organization and functions cytoskeleton, Actin filaments, actin binding proteins, Intermediate filaments, Microtubules  | <b>3</b> |
| <b>3. Cell Junctions:</b><br>Gap junctions, Tight junctions, Cell adhesion-integrins, selectins, cadherins. desmosomes and hemidesmosomes, plasmodesmata  | <b>2</b> |
| <b>4. Membrane Transport:</b><br>Transport across membrane- passive diffusion, osmosis, active transport, Ion Channels, Na <sup>+</sup> and K <sup>+</sup> pump, Ca <sup>2+</sup> ATPase pump, co-transport, symport, antiport, endocytosis and exocytosis. | <b>6</b> |

**UNIT II**

- |  |          |
|--|----------|
| <b>6. Cell Cycle:</b> Molecular events of cell division and cell cycle, regulation of cell cycle events- Cyclins, Cyclin dependent kinases, inhibitors.    | <b>5</b> |
| <b>7. Cell Signaling:</b> General principles of cell signaling, signaling via G-protein coupled receptors, kinase receptors, role of secondary messengers. | <b>6</b> |
| <b>8. Ageing and apoptosis, abnormal development and teratogenesis in animals</b>  | <b>4</b> |

**References:**

1. Alberts, B., Bray, D., Lewis, J., Raf, M., Roberts, K., Watson, J.D. (1994). Molecular Biology of the Cell
2. Cooper, G.M. (1997). The Cell: A molecular approach, ASM Press, USA.
3. Darnell, J., Lodish, H., Baltimore, D. (1990). Molecular Cell Biology. Scientific American Books Inc. NY.
4. Hallwell, B., Gutteridge, J.M.C. (2002). Free Radicals Biology and Medicine. Oxford Press.UK.
5. Karp, G. (1996). Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.
6. Lodish, H., Baltimore, D., Berk, A., Zipursky, B.L., Mastysdaira, P., Darnell, J. (2004). Molecular Cell Biology, Scientific American Books Inc. NY.

<b>MBI 102: Biochemistry (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to Biomolecules: Carbohydrates, Lipids and Proteins – their biological roles and functions</b>	<b>1</b>
<b>2. Carbohydrates:</b> Classification-on basis of carbon no & functional grs.; Structure with molecular formulae; Stereochemistry (structural and conformational isomers); isomers with one and more chiral centres, properties of stereoisomers; cyclization of sugars; conformations of cyclic forms (chair & boat forms).	<b>3</b>
<b>3. Important monosaccharides:</b> 6 C sugars- glucose, fructose, mannose, galactose, 5 C sugars- ribose, deoxyribose, important modified monosaccharides (2-keto-3-deoxy-D-manno-octulosonic acid (KDO), <u>2-keto-3-deoxy-D-glycero-D-galacto-nonulosonic acid (KDN)</u> , sialic acids, aminosugars, sugar acids (their biological role/ occurrence)	<b>1</b>
<b>4. Linkages in Sugars:</b> Structure and functions of important di-saccharides (sucrose, lactose, maltose, cellobiose) and poly-saccharides (homo and heteropolymers, storage and structural polymers – starch, glycogen, cellulose, chitin, peptidoglycan)	<b>1</b>
<b>5. Physico-chemical properties of carbohydrates:</b> Reducing-non-reducing properties; Exploitation for detection and separation –Benedict’s test; Introduction to conjugate sugars (Glycoproteins and glycolipids and their importance)	<b>2</b>
<b>6. Significance of carbohydrates in microbial, plant and animal system:</b> ABO blood groups, heparin, lectins, carbohydrate vaccines	<b>2</b>
<b>7. Lipids:</b> Occurrence/sources: plant derived oils, ghee	<b>1</b>
<b>8. Structure :</b> Structure of fatty acids, triglycerides; Classification viz., simple and compound, structural and storage with examples; unsaturated-saturated, Oils (refined/unrefined significance); fats, waxes, rancidity/spoilage of fats (microbial, oxidative)	<b>2</b>
<b>9. Functions:</b> Functions in a living system: significance of hydrophobicity and water immiscibility for compartmentalisation, in vitamins, cofactors, for signalling, pigments	<b>2</b>
<b>10. Lipid conjugates:</b> Important conjugates and their functions: phospholipids, glycerophospholipids, sphingolipids; structure of membranes, micellar structures, Cholesterol- Structure, function and significance	<b>3</b>

11. **Liposomes:**Liposomes in drug delivery, soaps, bio-surfactants 1
- Physico-chemical properties of carbohydrates and lipids:** Compare and contrast of properties arising due to differences in C:O ratio

## UNIT II

12. **Amino acids, peptides and proteins:** Occurrence/sources, Naturally occurring amino acids; structures; abbreviated names; stereoisomerism; amphoteric nature of amino acids, Classification of amino acids (on basis of functional groups, essential/non-essential); Chemical reactivity due to functional group (amide, acid, amine); peptides & proteins peptide bond, bond properties, N-Terminal, C-Terminal, Complex proteins– Proteoglycans, Lipoproteins, metalloproteins, phosphoproteins, chromoproteins and their significance 3
13. **Protein structure:** Primary, secondary ( $\alpha$  helix and  $\beta$  conformation), tertiary and quaternary structure. Forces stabilizing molecular structure (covalent bond, ionic bond, hydrogen bond, salt linkage, van der Waal's forces) a brief over view of Ramchandran plot, Structure-Function relationship in proteins with examples of Fibrous proteins, Collagen, Hemoglobin; importance of sequence of amino acids for structure and function of protein (eg. Sickle cell anaemia), 4
14. **Introduction to enzymes as biocatalysts:** Enzyme-substrate interaction, Rates of enzyme reaction, Concept of  $K_m$ ,  $V_{max}$  4

### References:

1. Biochemistry, Berg, J.M., Tymoczko, J. L. and Stryer, L. W.H. Freeman and Co., New York, USA (2003).
2. Principles of Biochemistry by Lehninger, A., Nelson, D. L. and Cox, M.M. W.H. Freeman and Co., New York, USA (2008).
3. Biochemistry, Satyanarayan, U. Books and Allied (P) Ltd., Kolkata, India (2008).

<b>MBI 103: Mathematics (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

### UNIT I

1.	Calculus: Limits, Continuity, Differentiation (1D & Partial), Definite Integrals.	8
2.	Numerical Techniques: Vector algebra, Matrices, Finding Eigen values & Eigen vectors	3
3	2Dimensional & 3Dimensional Geometry: Cartesians and Polar Coordinates, Locus, Equation of a straight line, Pair of straight lines, Circle, Ellipse, Parabola, Hyperbola. 3D Coordinate System, Spherical and Cylindrical Coordinates.	4

### UNIT II

4.	Ordinary & Partial Differential Equation: 1'st Order & 2'nd Order Ordinary Differential Equations. Nature of Partial Differential Equations, Method of Separation of Variables, Methods for Solving Equations, Solving ODE & PDE.	5
5.	Integral transform: Fourier Series, Fourier Transform, Laplace Transform	7
6.	Applications To Mathematical Biology: Enzyme kinetics, Immunology, Population genetics, Tumor modeling, Applications of ordinary & partial differential equations to Biology.	3

### References:

1. Introduction to mathematical methods in bioinformatics by Isaev, Alexander Berlin Springer, 2004.
2. Mathematics in chemistry by K. V. Raman & Pal, Sourav, New Delhi, Vikas publishing house Pvt. ltd., 2005
3. Calculations in molecular biology and biotechnology: a guide to mathematics in the laboratory by Stephenson, F.H. Amserdam, Academic Press, 2003.
4. Advanced mathematical methods for engineering & science students by Stephenson, G. & Radmore, P. M., 1990.
5. Mathematics and computer science in medical imaging by Viergever, Max A.& Todd-Pokropek, Andrew.,1988.
6. Mathematical Methods for Physicists by G. Arfken, Academic Press, New York,1970.
7. Some Modern Mathematics for Physicists and Other Outsiders by P. Roman, Pergamon, New York, 1975, Vol. 2, p. 660.
8. Mathematical Biology, by J. D. Murray Springer Verlag, 1989.
9. Mathematical Models in Molecular and Cellular Biology by Segal, L., ed. 1980. Cambridge: Cambridge University Press.
10. Numerical Methods by Balaguruswamy, TMH.

**MBI 104: Biostatistics (C)** **Total**  
**Basic Course – Theory; 2 Credits** **30L**

**UNIT I**

- |  |          |
|--|----------|
| 1. Probabilities, Random Variables, Multiple Random Variables, Distributions, Random Sampling, Maximum Likelihood Estimators, Bayes Estimators, Mean Squared Error. Hypothesis Testing., t-tests, Likelihood Ratio Tests , Interval Estimation | <b>7</b> |
| 2. Analysis of Variance ,One-Way Analysis of Variance , Two-Way Analysis of Variance , Regression Models, Simple Linear Regression, Logistic Regression  | <b>8</b> |

**UNIT II**

- |   |          |
|---|----------|
| 3. Bayesian Method with Examples, basics of Markov chains, Dynamic Programming and Hidden Markov Model, Metropolis–Hastings Algorithm and Gibbs Sampling.<br>Gene Expression and Microarray Analysis ,Unsupervised Learning , Supervised Learning Sequence Alignment, Pair-Wise Sequence Analysis, Multiple Sequence Alignment , Sequence Pattern Discovery | <b>7</b> |
| 4. Some Common Tools and Techniques : (Brief introduction and case studies only)<br>Classification and clustering ( Use WEKA)<br>Artificial Neural Networks.<br>Fuzzy Sets and Fuzzy Logic<br>Genetic Algorithms  | <b>8</b> |

**Note:** Practice on XLminer analysis tool-pack or R (no hand computations). Theory to focus on basic concepts, applications and interpretations/inferencing with secondary data, no mathematical derivations

**References:**

1. Basics of Bioinformatics, Rui Jiang Xuegong Zhang Michael Q. Zhang Editors
2. “Basic Statistics for Bioinformatics,”(free open-source package called R. /XL Miner for solving problems / No hand computation, Use of XL-miner in practicals - 10 exercises, focus should be on estimating and interpreting outputs)
3. Probability statistics, and reliability for engineers by Boca Raton, Ayyub B. M. & McCuen, R H, CRC Press, 1997.
4. Statistics: concepts and applications by Frank, Harry & Althoen, S. C., Cambridge University Press, 1995.
5. Statistical methods in bioinformatics: an introduction by Ewens, W. J. & Grant, G. R., New York. Springer, 2001.

<b>MBI 105: C Programming and Data Structure (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |  |          |
|--|----------|
| <b>1. Introduction and First Program</b> | <b>3</b> |
| ➤ Why Programming                        |          |
| ➤ Types of Programming                   |          |
| ➤ Introduction to C                      |          |
| ➤ C programming features                 |          |
| ➤ Benefits of C                          |          |
| ➤ Some Facts about C                     |          |
| ➤ Understanding First C Program          |          |
| <b>2. Variables and Data Types</b>       | <b>3</b> |
| ➤ Identifiers                            |          |
| ➤ Keywords                               |          |
| ➤ Data Types                             |          |
| ➤ Variables                              |          |
| ➤ Constants                              |          |
| <b>3. Console IO Operations</b>          | <b>2</b> |
| ➤ printf function                        |          |
| ➤ scanf function                         |          |
| ➤ Unformatted Functions                  |          |
| <b>4. Operators and Expressions</b>      | <b>2</b> |
| ➤ Expressions                            |          |
| ➤ Types of Operators                     |          |
| ➤ Type Casting                           |          |
| <b>5. Control Flow Statements</b>        | <b>2</b> |
| ➤ Decision Making in C                   |          |
| ➤ If Statement                           |          |
| ➤ Switch Statement                       |          |
| ➤ Unconditional Branching                |          |
| ➤ While Loop                             |          |
| ➤ Do...While Loop                        |          |
| ➤ For Loop                               |          |
| ➤ Break and continue statements          |          |

**UNIT II**

- |   |          |
|---|----------|
| <b>6. Working with Functions</b>              | <b>5</b> |
| ➤ What is a Function                          |          |
| ➤ Benefits of a Function                      |          |
| ➤ Function Terminology                        |          |
| ➤ Array of Structures                         |          |
| ➤ How does Function Works                     |          |
| ➤ Scope and Lifetime of Variables in function |          |

- Storage Classes of Variables
- Call by value and call by reference
- Recursion
- 7. Working with Arrays and Strings 5
  - Understanding Arrays
  - Arrays Declaration and Initialization
  - Sample Programs
  - Multidimensional Arrays.
  - Arrays and Functions
  - String operation

### UNIT III

- 8. Pointers 4
  - Understanding Pointers
  - Declaring and Initializing Pointers
  - Function and Pointer Parameters
  - Pointer Arithmetic
  - Pointer and Arrays
  - Two Dimensional Arrays and Pointers
  - void Pointer
  - Dynamic allocation of memory
  - Difference between malloc and calloc
- 9. Structure and Unions 4
  - Overview of Structures
  - Defining and Using a Structure
  - Structures within a Structure
  - typedef keyword
  - Passing Structures to Functions
  - Structure and Pointers
  - Unions
- 10. File Handling 4
  - What is a Stream
  - Opening and Closing of Files
  - Writing and Reading in Text Format
  - Writing and Reading in Binary Format

### UNIT IV

- 11. Introduction to Data Structures 2

Data Structures- Data structure, Abstract Data Types (ADT), Concept of linear and Non-linear, static and dynamic data structures, and relationship among data, data structure
- 10. Linked Lists 3

Concept, Comparison of sequential and linked organizations, Primitive operations, Realization of Linked Lists, Linked list operations, Head



pointer and header node, Types of linked list- Linear and circular linked lists, Doubly Linked List and operations, Circular Linked List, Singly circular linked list, Doubly circular linked list.

- |            |   |          |
|------------|---|----------|
| <b>11.</b> | Stacks  | <b>2</b> |
|            | Stacks- concept, Primitive operations, stack operations, Applications of Stack- Expression, Evaluation and Conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Recursion- concept, Backtracking algorithmic strategy, use of stack in backtracking. |          |
| <b>12.</b> | Queues  | <b>2</b> |
|            | Concept, Realization of Queues Using Arrays , Circular Queue, Advantages of using circular queues, operations on queue  |          |
| <b>13.</b> | Sorting and Searching   | <b>2</b> |
|            | Searching- Search Techniques, Sequential search, Binary search. Sorting methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Heap sort, Shell sort, Comparison of All Sorting Methods.   |          |

#### References:

1. C& Data structures - P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education.
3. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
4. Programming in C - Stephen G. Kochan, III Edition, Pearson Eductaion.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.
6. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
7. DataStructures Using C - A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
8. Let us C – Yashwant Kanetkar

<b>MBI 106: Biological Informatics (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to Bioinformatics</b>	<b>5</b>
<ul style="list-style-type: none"> <li>➤ Nature of biological data types</li> <li>➤ Overview of available Bioinformatics resources on the web</li> <li>➤ Primary Resource Institutes: NCBI, EMBL &amp; DDBJ</li> <li>➤ Hierarchy of Biological databases: Primary, Secondary &amp; Derived</li> </ul>	
<b>2. Biological Databases &amp; Tools</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Database search engines: Entrez, SRS</li> <li>➤ Nucleic acid databases: GenBank, ENA, Gentry</li> <li>➤ Protein sequence databases: NCBI Protein, EMBL Protein, PIR-PSD, SwissProt/ UniProtKB/ TrEMBL, ExPasy</li> <li>➤ Structural Databases: PDB, SCOP, CATH, NDB, CCSD, CSD</li> <li>➤ Molecular visualization tools: RasMol, Cn3D, SPDBV, Chime, Mol4D, etc</li> <li>➤ Databases and search methods for chemical compounds: PubChem Compound, PubChem Substance, ChEBI, ChEMBL, PDBeChem, RESID, EuroCarbDB</li> <li>➤ Sequence Submission Tools: Sequin, BankIt, ENA, IMGT/HLA, DGVa, SPIN, Metagenomics</li> </ul>	

**UNIT II**

<b>3. Overview/concepts in Sequence Analysis</b>	<b>7</b>
<ul style="list-style-type: none"> <li>➤ Local &amp; Global alignment, DotPlot, Gap Penalties</li> <li>➤ Dynamic Programming, Heuristic Methods</li> <li>➤ Pairwise Sequence Alignment algorithms: Needleman &amp; Wunsch, Smith &amp; Waterman</li> <li>➤ Scoring matrices for Nucleic acids and proteins: PAM/MDM, BLOSUM, CSW</li> </ul>	
<b>4. Database Similarity Searches</b>	<b>8</b>
<ul style="list-style-type: none"> <li>➤ BLAST &amp; FASTA</li> </ul>	

Other Tools: LALIGN, Dotlet

- Multiple Sequence Alignment: ClustalW, ClustalX, PRAS  
Other Tools: DbClustal, Kalign, MAFFT, MUSCLE, MView, T-Coffee
- Motifs, Pattern & Profiles
- Derived Databases: PROSITE, BLOCK, ProDom, Pfam, PRINTS, SBASE

### References:

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J., Delhi, Pearson Education (Singapore) Pte.Ltd., 2001.
2. Bioinformatics: Sequence and Genome Analysis by Mount, David, New York, Cold Spring Harbor Laboratory Press, 2004.
3. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., New York, John Wiley & Sons Inc., 2004.
4. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
5. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
6. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press.
7. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
8. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.
9. Rastogi, S.C., Mendiratta, N. and Rastogi, P. 2004 Bioinformatics: Concepts, Skills & Applications. CBS Publishers & Distributors, New Delhi.
10. Vyas, S.P. and Kohli, D.V., Methods in Biotechnology and Bioengineering.
11. Genetic Library Construction and Screening: Advanced Techniques and Applications: Lab Manual
12. Mont, D.W., Bioinformatics: Sequence and Genome Analysis.
13. Pierre Baldi and Soren Brunak, Bioinformatics: The Machine Learning Approach.

<b>MBI 107: DBMS &amp; MongoDB (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1. DBMS</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Database designing, data capturing</li> <li>➤ Data Abstraction</li> <li>➤ Data Models</li> <li>➤ Instances &amp; Schemes</li> <li>➤ E-R Model - Entity and entity sets</li> <li>➤ Relations and relationship sets</li> <li>➤ E-R diagrams</li> </ul> <p>Reducing E-R Diagrams to tables</p>	

**UNIT II**

<b>2. Basic concepts in Indexing and hashing</b>	<b>15</b>
<ul style="list-style-type: none"> <li>➤ Types of Indexing</li> <li>➤ Data warehousing</li> <li>➤ Data mining</li> <li>➤ Oracle Architecture</li> <li>➤ Basic concepts in Oracle: <ul style="list-style-type: none"> <li>○ Table space</li> <li>○ Data files</li> <li>○ Blocks</li> <li>○ Extents</li> <li>○ Segments</li> <li>○ Oracle Background Processes</li> <li>○ Control files</li> <li>○ Oracle Memory Management</li> <li>○ Rollback</li> <li>○ Redo logs etc.</li> </ul> </li> <li>➤ Oracle Report generation, Grants, Roles, Privileges</li> <li>➤ Introduction to SQL</li> </ul>	

**UNIT III**

<b>3. MongoDB</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Introduction of mongoDB</li> <li>➤ Uses and Advantages</li> <li>➤ RDBMS/SQL vs. MongoDB</li> <li>➤ Structure of MongoDB</li> <li>➤ Database, Collection – operation</li> <li>➤ Data type</li> </ul>	

**UNIT IV**

- |           |  |           |
|-----------|--|-----------|
| <b>4.</b> | <ul style="list-style-type: none"> <li>➤ CRVD commands</li> <li>➤ Limit Records, Sorting Record</li> <li>➤ Indexing, Aggregation</li> <li>➤ Covered queries</li> <li>➤ ObjectID</li> <li>➤ Regular Expression</li> </ul> | <b>10</b> |
|-----------|--|-----------|

**References:**

1. Database System Concepts by Hanery Korth and Abraham Silberschatz, McGraw Hill publication.
2. An Introduction to Database Systems by C.J. Date, Addison-Wesley.
3. Database systems by Nilkamal Surve, Tech Max publications.
4. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers.
5. Oracle PL/SQL Programming by Steven Feuerstein, Bill Pribyl, O'Reilly Media.
6. The Relational Database Dictionary by C.J. Date, O'Reilly Media
7. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education.
8. Database Design and Relational Theory by C.J. Date, O'Reilly Media.
9. Oracle Database 11g A Beginners Guide by Ian Abramson, Michael Abbey, Michael J. Corey and Michelle Malcher, McGraw Hill publication.
10. Developing Bioinformatics Computer Skills by Gibas, & Jambeck, O-Reilly.
11. Linux : The Complete Reference 6th Edition by Richard Petersen, Tata McGraw-Hill Education (2007)

<b>MBI 108: PERL Programming</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to Perl</b>	<b>3</b>
Perl Data types, Operators, Input/Output in Perl	
<b>2. String Functions, Array Functions, Hash Functions</b>	<b>3</b>
<b>3. Control Statements and loops</b>	<b>4</b>

**UNIT II**

<b>4. Subroutine</b>	<b>3</b>
Defining subroutine, Calling subroutine, Passing Arguments to a Subroutine	
Returning Value from a Subroutine	
<b>5. Regular Expression, Pattern Matching, Referencing and Dereferencing</b>	<b>3</b>
<b>6. File handling</b>	<b>4</b>
File I/O, Opening and Closing Files, Reading and Writing Files	

**UNIT III**

<b>7. Object Oriented Programming in Perl</b>	<b>3</b>
Objects, Methods, and Classes in Perl	
<b>8. Packages in Perl</b>	<b>3</b>
<b>9. Perl and Web</b>	<b>4</b>
CGI programming, Web browsing	

**References:**

1. Beginning Perl for Bioinformatics by James Tisdall, O-Reilly publication.
2. Perl: Complete Reference Perl by Martin C. Brown, McGraw-Hill publication.
3. Mastering Perl for Bioinformatics by James D. Tisdall, O-Reilly

Publication.

4. Teach Yourself Perl 5 in 21 days by David Till, Sams publishing.
5. Mastering Algorithms with Perl by Jon Orwant, Jarkko Hietaniemi and John Macdonald, O-Reilly Publication.
6. Professional Perl Programming by Peter Wainwrig, Published by Wrox Press Ltd.
7. Beginning Web Development with Perl by Steve Suehring, Apress publication.

<b>MBI 108: HTML Programming</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to HTML</b>	<b>5</b>
HTML basic tags, Formatting Tags, Colour codings	
<b>2. Lists, Tables, Headers</b>	<b>5</b>
<b>3. Images, Frames</b>	<b>5</b>

**UNIT II**

<b>4. CSS, Basis Syntax, Single style sheet, Multiple style sheets</b>	<b>5</b>
<b>5. CSS text fonts, CSS backgrounds</b>	<b>5</b>
<b>6. CSS lists, CSS links</b>	<b>5</b>

**References:**

1. Learning Web Design- a beginner's guide to HTML, graphics, and beyond by Jennifer Niederst, Publisher: O'reilly digital studio.
2. HTML Black Book by Steven Holzner, Publisher: Dreamtech Press.
3. Head First HTML with CSS & XHTML, by Elisabeth Robson and Eric Freeman, Publisher: O'reilly Media.
4. XML Pocket Reference by Robert Eckstein and Michel Casabianca, Publisher: O'reilly.
5. XML Schema by Eric van der Vlist, Publisher: O'reilly.
6. Learning XML by Erik T. Ray, Publisher: O'reilly.



<b>MBI 109:Cell Biology and Biochemistry Lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>20 P</b>

**Cell Biology Lab**

- |  |   |
|--|---|
| 1. Chloroplast isolation from spinach leaves   | 1 |
| 2. Staining of prokaryotic cell organelles:<br>Staining of capsule, spore, cell wall and metachromatic granule | 2 |
| 3. Study of mitosis with onion root tip chromosomes  | 2 |
| 4. Observation of permanent slides of meiosis  | 1 |
| 5. Isolation of nuclei from rat liver  | 2 |
| 6. To determine Erythrocyte ( <i>RBC</i> ) count of a blood sample   | 1 |
| 7. To determine Leucocytes ( <i>WBC</i> ) count of a blood sample  | 1 |
| 8. Temporary mounting of mitochondria by Janus green B   | 1 |

**Biochemistry Lab**

- |  |   |
|--|---|
| 9. Preparation of buffers-acetate buffer & Preparation of biochemical reagents<br>(Benedict's reagent) | 2 |
| 10. Isolation of biomolecules  | 2 |
| a. Isolation of starch from corn (separation on the basis of density)                                  |   |
| b. Isolation of protein from a suitable source   |   |
| c. Extraction of triglycerides from oilseeds (separation on the basis of<br>differential solubility)   |   |
| 11. Quantitative estimation of Glucose by DNSA method  | 1 |
| 12. Quantitative estimation of Protein by Biuret method and absorption at 280 nm                       | 2 |
| 13. Acid value or saponification value. Determination with reference to fatty acids.                   | 2 |

**References:**

1. An Introduction to Practical Biochemistry, Plummer, D.T., Tata-McGraw-Hill Publishing Co., New Delhi (2005).
2. Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J., Cambridge University Press, New York (2005).

3. Laboratory Manual in Biochemistry, Jayraman J., New Age International (P) Ltd., New Delhi (2007).
4. Alberts B. and Jhonson A. 4<sup>th</sup> edition (2002) Molecular Biology of the cell, Garland science.
5. Berg J., Tymoczko J, and Stryer L, 5<sup>th</sup> edition (2002) Biochemistry, W. H. Freeman and company, New York.
6. Cooper G.M., Hausman R. E. The cell: A molecular approach. 5<sup>th</sup> edition. ASM Press and Cinauer Associates Inc. 2009
7. Practical Microbiology: Principles and Techniques, (2005), 1<sup>st</sup> Edn., Kale, V and Bhusari, K. Himalaya Publishing House, New Delhi.

<b>MBI 110: C Programming and Data Structure Lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>15 P</b>

**1. Laboratory assignments based on the following topics in ‘C’ programming: 5**

- Data types, operators and expressions, Hierarchy of operators,
- control statements including decision (if, if-else), loops (while, do-while, for), branching statements (switch, break, continue),
- Functions,
- Arrays (1D, 2D- all matrix operations including inverse of a matrix),
- Strings,
- File handling etc.

**2. Writing C programs for Bioinformatics applications: 10**

- Extract a protein or nucleic acid sequence from any of the databank files (GenBank entry, Swiss-Prot, EMBL entry etc.)
- Interconverting the sequence from one databank format to the other eg. GenBank format to FASTA format, FASTA to PIR format etc.
- Determining the base composition in a nucleic acid sequence and amino acid composition in a protein sequence.
- Generating the complimentary sequence of a DNA sequence o Pattern search algorithms o Search for a specific oligonucleotide pattern (eg. GAACATCC) in a given DNA sequence.
- Find the position where a specific sequence say “GGTCCCGAC” will hybridize a given DNA sequence.
- Find the restriction enzyme cleavage sites eg. where PVUZ, ECORI etc. will cut the DNA.
- Locate palindromic sequence stretches in a DNA sequence. Count the number of Open Reading frames (ORF’s) in a DNA sequence.
- Calculate the codon usage in a nucleic acid sequence.
- Translate a DNA sequence into protein sequence in the forward and reverse frames.
- Implementation of the Needleman-Wunsch algorithm for pair wise

alignment and testing alignment score with randomized pairs of sequences also.

- Numerical Techniques (4 assignments)
- Basic Formalism, Methods for Solving Equations, Finding Eigen values & Eigenvectors (5 assignments)

**References:**

1. Let Us C by Yashavant Kanetkar, BPB Publications.
2. The C programming language by Kerighan and Richie, PHI Publication.
3. Programming in ANSI C by Balaguruswamy, Tata McGraw-Hill Education.
4. Sams Teach Yourself C in 21 Days Peter Aitken and Bradley L. Jones, Macmillan Computer publishing.
5. Schaum's outline of programming with C by Byron Gottorfried.

<b>MBI 111: Biological Informatics lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>15 P</b>
1. Exploring the integrated database system at NCBI server and querying the PUBMED and GenBank databases using the ENTREZ search engine.	1
2. Exploring the integrated database system at EBI server and searching the EMBL Nucleotide database using the SRS search engine.	1
3. Exploring & querying SWISSPROT & UniProtKB.	1
4. Exploring and querying the PIR database.	1
5. Exploring tools on ExPASy.	1
6. Exploring utilities in EMBOSS packages.	1
7. Explore Pair-wise global alignments.	1
8. Explore Pair-wise local alignments.	1
9. Database (homology) searches using different versions of BLAST and FASTA interpretation of the results to derive the biologically significant relationships of the query sequences (proteins/DNA) with the database sequences. Exploring other databases: LALIGN, Dotlet	2
10. Multiple sequence alignments: CLUSTALW, Clustal Omega, DbClustal, Kalign, MAFFT, MUSCLE, MView, T-Coffee.	2
11. Exploring Alignment Analysis tools: AMAS, CINEMA, MaxAlign, PhyloGibbs, SVA, PVS.	1
12. Exploring and using the derived databases: PROSITE, PRINTS, BLOCKS, Pfam and Prodom for pattern searching, domain searches etc.	1
13. Studying the format & content of structural databases & visualization of structure using Rasmol, Cn3D and other utilities.	1

**References:**

1. Bioinformatics: A Practical Guide to the analysis of Genes and Proteins (3<sup>rd</sup> Ed.) by Baxevanis, A.D. & Ouellette, B., F. F., New York, John Wiley & Sons, Inc. Publications, 2004.
2. Practical Bioinformatics, Michael Agostino, 1st Edition,

ISBN:9780815344568 , September 26, 2012

3. Bioinformatics: A Practical Approach, Shui Qing Ye, CRC Press, 20-Aug-2007
4. Bioinformatics: Methods Express, Paul Dear (Editor) , Publication Date: September 18, 2007 | ISBN-10: 190484216X | ISBN-13: 978-1904842163 | Edition: 1st Edition
5. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., New York, John Wiley & Sons Inc., 2004.
6. Bioinformatics: Sequence, Structure and Databanks: A Practical Approach [Paperback]

<b>MBI 112: DBMS &amp; MongoDB lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>20 P</b>
<b>1. Part I: ORACLE</b>	<b>2</b>
Assignment based on “Data Definition Language”.	
➤ A set of SQL commands used to create table, modify table structure, drop table, rename table.	
<b>2. Assignment based on “Data Manipulation Language”</b>	<b>2</b>
➤ A set of SQL commands used to change the data within the database.	
➤ Insertion of records in the tables, updating of all or specific set of records in tables.	
➤ Viewing the attributes of table’s column.	
<b>3. Assignment based on “Data Query Language”</b>	<b>2</b>
➤ Different forms of Select statement	
➤ Arithmetic and logical operators.	
➤ Range searching and pattern matching.	
<b>4. Assignment based on defining Constraints.</b>	<b>2</b>
➤ Types: I/O constraints like Primary Key, Foreign key, Null and Unique	
➤ Constraints. Business constraints like check constraints.	
<b>5. Assignment based on using joins.</b>	<b>2</b>
➤ Joining multiple tables, joining a table to it.	
<b>6.</b>	<b>2</b>
➤ Granting rights on user objects such as Tables, Views, and Sequences.	
➤ Revoking rights on user objects such as Tables, Views, and Sequences.	
➤ XAMPP for MySQL	
<b>7. Part II: MongoDB based practical</b>	<b>8</b>

#### References:

1. Database System Concepts by Hanery Korth and Abraham Silberschatz, McGraw Hill publication.

2. An Introduction to Database Systems by C.J. Date, Addison-Wesley.
3. Database systems by Nilkamal Surve, Tech Max publications.
4. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Morgan Kaufmann publishers.
5. Oracle PL/SQL Programming by Steven Feuerstein, Bill Pribyl, O'Reilly Media.
6. The Relational Database Dictionary by C.J. Date, O'Reilly Media
7. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education.
8. Oracle Database 11g A Beginners Guide by Ian Abramson, Michael Abbey, Michael J. Corey and Michelle Malcher, McGraw Hill publication.



**MBI 113: PERL Programming Lab** **Total**  
**(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)** **20P**

**1 Writing programs in Perl based on following assignment topics:** **10**

- Arithmetic and Logical operators
- Control statements and Loops
- Functions of Strings, Arrays, Hashes
- Input/output in Perl
- Subroutine
- Regular Expression
- Pattern Matching
- Working with files
- OOPs programming
- CGI programming

**2 Writing programs for following:** **10**

- Programs for Transcription. (DNA to RNA sequence)
- Programs for Translation. (RNA to Protein Sequences)
- Programs for finding Open Reading Frame.
- Programs for count bases in Sequence.
- Programs for finding Triplet Codon.
- Programs for multi FASTA files.

**References:**

1. Beginning Perl for Bioinformatics by James Tisdall, O-Reilly publication.
2. Perl: Complete Reference Perl by Martin C. Brown, McGraw-Hill publication.
3. Mastering Perl for Bioinformatics by James D. Tisdall, O-Reilly Publication.
4. Teach Yourself Perl 5 in 21 days by David Till, Sams publishing.
5. Mastering Algorithms with Perl by Jon Orwant, Jarkko Hietaniemi and John Macdonald, O-Reilly Publication.
6. Professional Perl Programming by Peter Wainwrigth, Published by Wrox Press Ltd.
7. Beginning Web Development with Perl by Steve Suehring, Apress publication.

<b>MBI 113: HTML Programming lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>20P</b>

**1. Writing programs in HTML based on following assignment topics: 10**

- HTML basic tags
- Formatting Tags
- Colour coding
- Lists
- Tables
- Headers
- Images
- Frames

**2. Writing programs in CSS based on following assignment topics: 10**

- CSS tags
- Single style sheet
- Multiple style sheets
- CSS text fonts
- CSS backgrounds
- CSS lists
- CSS links

**References:**

1. Learning Web Design- a beginner's guide to HTML, graphics, and beyond by Jennifer Niederst, Publisher: O'reilly digital studio.
2. HTML Black Book by Steven Holzner, Publisher: Dreamtech Press.
3. Head First HTML with CSS & XHTML, by Elisabeth Robson and Eric Freeman, Publisher: O'reilly Media.
4. XML Pocket Reference by Robert Eckstein and Michel Casabianca, Publisher: O'reilly.
5. XML Schema by Eric van der Vlist, Publisher: O'reilly.
6. Learning XML by Erik T. Ray, Publisher: O'reilly.

# **SEMESTER II**

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<b>MBI 201: Statistical Analysis System (SAS) (C)</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to SAS</b>	<b>1</b>
➤ An overview of SAS foundation	
➤ Introduction to SAS programs submitting a SAS program	
➤ Working with SAS program syntax	
<b>2. Accessing Data</b>	<b>1</b>
➤ Examining SAS data sets	
➤ Accessing SAS libraries- Proc contents	
<b>3. Reading and Creating SAS Data sets</b>	<b>2</b>
➤ Introduction to SAS Data sets	
➤ Reading from existing SAS Data Sets	
➤ Reading Spreadsheet and Database Data	
➤ Reading Raw Data Files	
○ Reading standard delimited data	
○ Reading nonstandard delimited data	
○ Handling missing data	
○ Reading raw data files with formatted input	
○ Controlling when a record loads	
<b>4. Formatting Data Values</b>	<b>1</b>
➤ Using SAS formats	
➤ Creating user-defined formats	
<b>5. Manipulating Data</b>	<b>2</b>
➤ using SAS functions	
➤ conditional processing	
<b>6. Combining SAS Data Sets</b>	<b>2</b>
➤ Concatening	
➤ Merging - one-one, one-many, merging with non-matches	
<b>7. Processing Data in groups</b>	<b>1</b>

- |   |          |
|---|----------|
| <b>8. Processing Data Iteratively</b>         | <b>2</b> |
| ➤ DO loop processing                          |          |
| ➤ conditional DO loop processing              |          |
| ➤ SAS array processing                        |          |
| ➤ using SAS arrays                            |          |
| <b>9. Restruction / Rotating SAS Data Set</b> | <b>1</b> |
| <b>10. Creating Summary Reports</b>           | <b>2</b> |
| ➤ Proc Print                                  |          |
| ➤ Proc Freq                                   |          |
| ➤ Proc Report                                 |          |
| ➤ Proc Tabulate                               |          |
| ➤ Report Enhancement                          |          |

## UNIT II

- |  |          |
|--|----------|
| <b>11. SAS Macros Language</b>   | <b>1</b> |
| ➤ Purpose of Macro Facility  |          |
| ➤ Program Flow   |          |
| <b>12. Macro Variables introduction to macro variables</b>               | <b>2</b> |
| ➤ Automatic macro variables  |          |
| ➤ Macro variable references  |          |
| ➤ User-defined macro variables   |          |
| ➤ Delimiting macro variable references                                   |          |
| <b>13. Macro Definitions defining and calling a macro</b>                | <b>2</b> |
| ➤ Macro parameters   |          |
| ➤ DATA Step and SQL Interfaces creating macro variables in the DATA step |          |
| <b>14. DATA Step and SQL Interfaces creating macro variables in the</b>  | <b>2</b> |

<b>DATA step</b>	
➤ Indirect references to macro variables	
➤ Creating macro variables in SQL	
<b>15. Macro Programs conditional processing</b>	<b>2</b>
➤ Parameter validation	
➤ Iterative processing	
➤ Global and local symbol tables	
<b>16. SAS SQL – Language</b>	<b>1</b>
➤ Introduction to SAS- SQL	
➤ Basic Queries	
➤ Overview of the SQL procedure	
➤ Specifying columns	
➤ Specifying rows	
<b>17. Types of Joins</b>	<b>1</b>
<b>18. Introduction to Subqueries</b>	<b>2</b>
<b>19. Set Operators</b>	<b>2</b>

**References:**

1. Berger, J. O. (1985), Statistical Decision Theory and Bayesian Analysis, 2nd Edition, New York: Springer-Verlag.
2. Cameron, A. C. and Trivedi, P. K. (1998), Regression Analysis of Count Data, Cambridge: Cambridge University Press.
3. Gallant, A. R. (1987), Nonlinear Statistical Models, New York: John Wiley & Sons.
4. Gelman, A., Carlin, J. B., Stern, H. S., and Rubin, D. B. (2004) , Bayesian Data Analysis, 2nd Edition, London: Chapman & Hall.
5. Powers, D. A. and Xie, Y. (2000), Statistical Methods for Categorical Data Analysis, San Diego: Academic Press.
6. Schervish, M. J. (1995), Theory of Statistics, New York: Springer-Verlag.

<b>MBI 202: R and Data Analytics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45 L</b>

**UNIT I**

<b>1.</b>	<b>An Introduction to R and Basic Programming</b>	<b>5</b>
	➤ Overview	
	➤ Environment set up (Note: Only for Lab Demonstration)	
	➤ Data Types	
	➤ Variables	
	➤ Operator	
	➤ Decision making	
<b>2.</b>	<b>R Core Programming</b>	<b>5</b>
	➤ Loops	
	➤ Functions	
	➤ Strings	
	➤ Vector	
	➤ List	
	➤ Matrix	

**UNIT II**

<b>3.</b>	<b>R Core Programming</b>	<b>5</b>
	➤ Arrays	
	➤ Factors	
	➤ Data Frames	
	➤ Packages	
	➤ Data Shaping	
	➤ Library	
<b>4.</b>	<b>R Charts and Graphs</b>	<b>5</b>
	➤ R-Pie Chart	

- R – Bar Chart
- R- Box Plots
- R - Histogram
- R- Line Graph
- R- Scatter Plots

### UNIT III

- |           |  |          |
|-----------|--|----------|
| <b>5.</b> | R Data Interfaces 1  | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ R-CSV</li> <li>➤ R-Excel</li> <li>➤ R-Binary files</li> <li>➤ R-XML files</li> </ul>    |          |
| <b>6.</b> | R Data Interfaces 1  | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ R-JSON files</li> <li>➤ R-Web Data</li> <li>➤ R-Database</li> <li>➤ R- NoSQL</li> </ul> |          |

### UNIT IV

- |           |  |          |
|-----------|--|----------|
| <b>7.</b> | Analytics with R Statistics  | <b>6</b> |
|           | <ul style="list-style-type: none"> <li>➤ Mean, Median, Mode</li> <li>➤ Normal Distribution</li> <li>➤ Multiple regression</li> <li>➤ Supervised Model</li> <li>➤ Unsupervised Model</li> </ul> |          |
| <b>8.</b> | Algorithm  | <b>9</b> |
|           | <ul style="list-style-type: none"> <li>➤ Logistic regression</li> <li>➤ Linear Regression</li> <li>➤ Decision tree</li> <li>➤ Random Forest</li> </ul>   |          |



- SVM model

**References:**

1. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2nd Edition Paperback – Import, 28 Mar 2018
2. Python Machine Learning, Uxi (Hayden) Liu By Example Paperback,– Import, 31 May 2017
3. Data Analytics for Beginners: Basic Guide to Master Data Analytics Paperback – November 3, 2016, by Paul Kinley
4. Data Analytics Made Accessible: 2019 edition Kindle Edition by Anil Maheshwari
5. Learn R in a Day, 2013, Kindle Edition, by Steven Murray
6. Beginning R: The Statistical Programming Language, 2013 by Mark Gardener, Paperback
7. Statistical Programming in R, 5 June 2017 by K.G. Srinivasa and G.M. Siddesh Paperback

<b>MBI 203: JAVA and BioJAVA Programming (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1. An Introduction to Java</b>	<b>2</b>
A Short History of Java	
➤ Features or buzzwords of Java	
➤ Comparison of Java and C++	
➤ Java Environment	
➤ Simple java program	
➤ Java Tools – jdb, javap, javadoc	
➤ Java IDE – Eclipse/NetBeans (Note: Only for Lab Demonstration)	
<b>2. An Overview of Java</b>	<b>4</b>
➤ Types of Comments	
➤ Data Types	
➤ Final Variable	
➤ Declaring 1D, 2D array	
➤ Accepting input using Command line argument	
➤ Accepting input from console (Using Buffered Reader class)	
<b>3. Objects and Classes</b>	<b>6</b>
➤ Defining Your Own Classes	
➤ Access Specifiers (public, protected, private, default)	
➤ Array of Objects	
➤ Constructor, Overloading Constructors and use of ‘this’ Keyword	
➤ Static block, static Fields and methods	
➤ Predefined class – Object class methods (equals(), toString(), hashCode(), getClass())	
➤ Creating, Accessing and using Packages	
➤ Creating jar file and manifest file	

- Wrapper Classes
- Garbage Collection (finalize() Method)

## UNIT II

- 4. Inheritance and Interface** **7**
- Inheritance Basics (extends Keyword) and Types of Inheritance
  - Superclass, Subclass and use of Super Keyword
  - Method Overriding and runtime polymorphism
  - Use of final keyword related to method and class
  - Use of abstract class and abstract methods
  - Defining and Implementing Interfaces
  - Runtime polymorphism using interface
  - Object Cloning
- 5. Exception Handling** **4**
- Dealing Errors
- Exception class, Checked and Unchecked exception
  - Catching exception and exception handling
  - Creating user defined exception
  - Assertions

## UNIT III

- 6. Strings, Streams and Files** **5**
- String class and StringBuffer Class
  - Formatting string data using format() method
  - Using the File class
  - Stream classes
  - Byte Stream classes
  - Character Stream Classes
  - Creation of files

- Reading/Writing characters and bytes
- Handling primitive data types
- Random Access files

**7. Collection 6**

Introduction to the Collection framework

- List – ArrayList, LinkedList and Vector, Stack, Queue
- Set - HashSet, TreeSet, and LinkedHashMap
- Map – HashMap, LinkedHashMap, Hashtable and TreeMap
- Interfaces such as Comparator, Iterator, ListIterator, Enumeration

**UNIT IV**

**8. Database Programming 6**

- The design of jdbc, jdbc configuration
- Types of drivers
- Create and Execute sql statements, query execution
- The Result Set Object

**9. Multithreading 3**

- What are threads?
- Life cycle of thread
- Running and starting thread using Thread class
- Thread priorities
- Running multiple threads
- The Runnable interface
- Synchronization and interthread communication

**10. Networking 2**

Networking basics – Protocol, Addressing, DNS, URL, Socket, Port

- The java.net package – InetAddress, URL, URLConnection class
- SocketServer and Socket class
- Creating a Socket to a remote host on a port (creating TCP

client and server)

- Simple Socket Program Example

### References:

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J.,  
Delhi, Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann,  
Gary Cornell,  
Prentice Hall, Sun Microsystems Press
5. Core Java Volume-II-Advanced Features, Eighth Edition, Cay S.  
Horstmann, Gary
6. Cornell, Prentice Hall, Sun Microsystems Press

<b>MBI 204: Science of Omics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | ➤ <b>Introduction to Genomics:</b>   | <b>5</b> |
|           | ➤ Genome sequencing: <ul style="list-style-type: none"> <li>○ Strategies &amp; Approaches</li> <li>○ Conventional DNA sequencing methodologies</li> <li>○ NGS(Next generation sequencing)           <ul style="list-style-type: none"> <li>✓ Introduction, Next-generation sequencing methods,</li> <li>✓ NGS File formats (Recognizing different file formats related to genome sequencing data),</li> <li>✓ NGS data quality check &amp; cleaning,</li> </ul> </li> <li>○ Third generation sequencing</li> </ul> |          |
| <b>2.</b> | ➤ <b>Genome Assemblies:</b>  | <b>6</b> |
|           | <ul style="list-style-type: none"> <li>○ Reference assembly, Assembly statistics &amp; visualization,</li> <li>○ De-novo assemblies &amp; assemblers for genome makeup(MIRA, RAYMETA etc)</li> </ul> ➤ Basic Aspects of Genome Annotation<br>➤ Genome mapping techniques: Genetic Mapping and Physical mapping<br>➤ Structural Genomics and Functional Genomics  |          |

**UNIT II**

- |           |  |          |
|-----------|--|----------|
| <b>3.</b> | <b>Genomics and Comparative genomics Databases:</b>  | <b>6</b> |
|           | <ul style="list-style-type: none"> <li>➤ Genome Databases: Genome Sequence DataBase (GSDB), Genome Database (GDB), 1000 Genomes Project , AceDB, FlyBase, UCSC Genome Browser, Wormbase, MaizeGDB, MGI</li> <li>➤ Comparative Genomics Databases: COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb, Gramene</li> <li>➤ Genetic Disorders Databases: OMIM, OMIA, Genetic Association</li> </ul> |          |

Database, Genetic Disorder Guide, IGDD, DisGenet, Genetic Disorder UK

- 4. Genomics and Comparative genomics Tools: 6**
- Genome Alignments tools:BLAST2, MUMmer, PipMaker, VISTA
  - Comparison of Gene Order :GeneOrder, Gene Synteny
  - Prediction of genes: ORFs, Prediction of Signal sequences (Promoters, Primers, splice sites, UTRs etc.), Operons
  - Primer Designing Tools: Primer, Primer3, NetPrimer, Primerfinder
  - DNA/RNA Sequence Analysis: CENSOR, Gene Finder, GENEID, GenHunt, GENIE, GRAIL, ORD ID, ORF Finder, ORFGene, Pol3Scan, tRNAscan
  - Translation Tools: Translation Tool, The Protein Machine, 6 Frame Translation Tool, Reverse Translation Tools
  - Restriction Analysis Tools: WEB Cutter, ENZFINDER, TACG

### UNIT III

- 5. Transcriptomics: 6**
- Biology of Transcription
  - Search for transcription factor binding sites
  - RNA Sequencing & Techniques of RNA analysis RNA-Seq, Microarrays, Regulatory RNAs: small or large, Computational prediction of miRNA target genes, RNA Darkmatter
  - Generating Transcriptome expression Data
- 6. Metagenomics: 6**
- Introduction & Study of metagenomics
  - Metagenomics Samples
  - Qualitative and quantitative analysis of metagenome: DGGE, T-RFLP, RT-PCR, NGS
  - Sequence to identification of biodiversity
  - Metagenomics Algorithms (metagenomics data analysis): RAST, IMG/M,

MEGAN

**UNIT IV**

- |   |          |
|---|----------|
| <b>7. Metabolomics:</b>   | <b>5</b> |
| ➤ Fundamental concept,  |          |
| ➤ Tools of metabolomics- Capillary electrophoresis, Gas chromatography, Electrochemical detectors |          |
| ➤ Case studies.   |          |
| <b>8. Lipidomics:</b>   | <b>2</b> |
| Basic concepts and tools Case studies   |          |
| <b>9. Degradomics:</b>  | <b>3</b> |
| ➤ Techniques and concepts   |          |
| ➤ Approaches to identify the protease and protease-substrate repertoires, or                      |          |
| ➤ 'degradomes', on an organism-wide scale   |          |
| ➤ Uncover new roles for proteases in vivo.  |          |
| ➤ Identification of new pharmaceutical targets to treat disease (Emerging degradomic )            |          |

**References:**

1. She Has Her Mother's Laugh: The Powers, Perversions, and Potential of Heredity Hardcover – May 29, 2018, Dutton; 1st Edition by Carl Zimmer
2. The Gene: An Intimate History Paperback – May 2, 2017, by Siddhartha Mukherjee
3. Introduction to genomics by Arthur M. Lesk, 2007, Published by OUP Oxford
4. Bioinformatics and Functional Genomics, Textbook by Jonathan Pevsner, 2003, Wiley publication
5. Metabolomics- Methods and Protocols by Wolfram Weckwerth, Humana Press.
6. Lipidomics- Technologies and Applications by Kim Ekroos, Wiley-VCH.
7. Web/Journal Resources.
8. Transcriptomics: Expression Pattern Analysis, Virendra Gomase, Somnath Tagore; VDM Publishing, 2009 – Science



<b>MBI 205: Proteomics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1.</b>	<b>Overview of Proteomics:</b>	<b>7</b>
	<ul style="list-style-type: none"> <li>➤ Introduction and scope of proteomics</li> <li>➤ Protein separation techniques: <ul style="list-style-type: none"> <li>○ ion-exchange</li> <li>○ size-exclusion and</li> <li>○ affinity chromatography techniques</li> <li>○ Polyacrylamide gel electrophoresis</li> <li>○ Two dimensional PAGE for proteome analysis; Image analysis of 2D gels</li> </ul> </li> </ul>	
<b>2.</b>	<ul style="list-style-type: none"> <li>➤ Determination of Amino acid composition <ul style="list-style-type: none"> <li>○ Hydrolysis</li> <li>○ Separation</li> <li>○ Quantitative analysis</li> </ul> </li> </ul>	<b>1</b>
<b>3.</b>	<ul style="list-style-type: none"> <li>➤ Protein sequencing Methods <ul style="list-style-type: none"> <li>○ Sanger's method</li> <li>○ Edman's method</li> </ul> </li> </ul>	<b>1</b>
<b>4.</b>	<ul style="list-style-type: none"> <li>➤ Protein structure determination methods: <ul style="list-style-type: none"> <li>○ X ray crystallography,</li> <li>○ Mass spectrometry</li> <li>○ NMR</li> </ul> </li> </ul>	<b>3</b>
<b>5.</b>	<b>Proteomics tools:</b>	<b>3</b>
	<ul style="list-style-type: none"> <li>➤ <u>Protein Databases</u></li> <li>➤ <u>Structural databases: PDB, MMDB, SCOP, CATH.</u></li> <li>➤ <u>3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</u> (already covered in MBI 106)</li> <li>➤ Secondary structure prediction algorithms: Chou-Fasman, Jpred, Psipred, GOR methods; PHD</li> <li>➤ 3D structure validation databases: PROSA, Ramchandran Plot,</li> </ul>	

Procheck

- Proteomics tools on Expasy

## UNIT II

- |           |   |          |
|-----------|---|----------|
| <b>6.</b> | <ul style="list-style-type: none"> <li>➤ Protein modifications: Post transcriptional and post translational</li> <li>➤ Applications of proteome analysis to drug; Protein-protein interaction (Two hybrid interaction screening)</li> <li>➤ Protein engineering, Protein chips and functional proteomics</li> <li>➤ Clinical and biomedical application of proteomics</li> <li>➤ Proteome databases</li> <li>➤ Proteomics industries</li> </ul>   | <b>9</b> |
| <b>7.</b> | <p><b>Protein-protein interaction Databases :</b></p> <ul style="list-style-type: none"> <li>➤ BIND - Biomolecular Interaction Network Database,</li> <li>➤ STRING</li> <li>➤ DIP (Database of Interacting Proteins)</li> <li>➤ PPI Server</li> <li>➤ BIND - Biomolecular Interaction Network Database</li> <li>➤ PIM -Hybrigenics</li> <li>➤ PathCalling Yeast Interaction Database</li> <li>➤ MINT - a Molecular Interactions Database</li> <li>➤ GRID - The General Repository for Interaction Datasets</li> <li>➤ InterPreTS - protein interaction prediction through tertiary structure</li> </ul> | <b>4</b> |

### References:

1. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Business Media, LLC.
2. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003, Marcel Dekker.
3. Proteomics: Methods Express (Methods Express Series) Paperback – Import,

2007, by C. David O'Connor (Editor), B. David Hames (Editor)

4. Proteomics: A Comprehensive Study of Proteins Hardcover – Import, 30 Jun 2017 by Tanner Perry (Editor)
5. Principles of Proteomics, English, Paperback, Twyman, 2004
6. Introduction to Proteomics -Tools for the New Biology by Daniel C. Liebler, Humana Press
7. Mass Spectrometry for Biotechnology by Gary Siuzdak, Academic Press.
8. Proteomics for Biological Discovery by Timothy Veenstra and John Yates, Wiley.

<b>MBI 206: Molecular Biology</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>

### UNIT I

- |    |  |   |
|----|--|---|
| 1. | Organization of prokaryotic genome, Structure of nucleosome and organization of chromatin, structure of chromosome, chromatin remodeling, Repetitive sequences, clusters and repeats, Concept of gene, Interrupted and uninterrupted genes, intron, exon and their relationships centromere and telomere, Genome sizes of different organisms, C Value | 2 |
| 2. | Types of mutations, effect of mutations, mutation related inherited human disorders, Physical and chemical mutagenic agents, frequency of mutations, measuring mutation rate, somatic & germline mutations, role of mutations in evolution   | 4 |
| 3. | Salient features of genetic code, codon – anticodon recognition, Wobble hypothesis, exceptions to the universal genetic code   | 3 |
| 4. | DNA replication & repair<br>DNA polymerases, mechanism of replication in prokaryotes and eukaryotes, DNA damage, Mechanisms of DNA repair in prokaryotes and eukaryotes, Excision repair, mismatch repair, recombination repair, error prone repair, SOS response, repair system in eukaryotic cells.  | 6 |

### UNIT II

- |    |  |   |
|----|--|---|
| 5. | Transcription and posttranscriptional mechanisms<br>RNA polymerase and mechanism of prokaryotic transcription, Eukaryotic RNA polymerases and their promoters, activating transcription, role of enhancers, gene silencers, CpG Islands, post transcriptional modifications, RNA splicing reactions, catalytic RNA | 7 |
| 6. | Regulatory RNA, Micro RNAs & RNA Interference  | 4 |
| 7. | Translation<br>Mechanism of translation in prokaryotes and eukaryotes, post translational  | 4 |

modifications, transport of proteins, role of chaperons

**References:**

1. Watson J. and Stephen (2004) Molecular Biology of the Gene, Dorling Kindersley(India) pvt ltd,New delhi. Taylor and Francis group, NewYork.
2. Cooper G.M. and Hausman R.E. (2004) The Cell: A molecular approach, Sinauer Associates, Inc., ASM Press, Washington DC.
3. Lewin (2007) Genes IX: Pearson Prentice Hall, Pearson Education, Inc. Upper Saddle River, NJ 07458
4. Strickberger 1985, Genetics. Macmillan.
5. Russell 2002, Genetics. Benjamin.
6. Cornell, Prentice Hall, Sun Microsystems Press

<b>MBI 207: Recombinant DNA Technology</b>	<b>Total</b>
<b>Core Course –Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

1. Scope of Genetic engineering	1
2. Tools and techniques: DNA Purification, Hybridization, PCR and Types of PCR, Electrophoresis	7
3. Enzymes used in gene manipulation: Restriction endonucleases, Methylases, DNA polymerases, Ligases, Kinases, Phosphatases, Topoisomerase, DNA labelling methods	7

**UNIT II**

4. Cloning vectors of plasmids (pBR, pUC18) and $\lambda$ phages, Cosmids, BACs, PACs.	6
5. Introduction of DNA into living cells, Identification of recombinants,	2
6. DNA libraries: construction and of Genomic library and cDNA library. Library screening	3
7. Mapping and Sequencing genome: RFLP, SNP, AFLP, Physical mapping, Radiation Hybrid mapping	4

**References:**

1. Brown T. A., 7th edition (2016), Gene cloning and DNA analysis, Blackwell publishing, UK
2. Primrose S., Twyman R. M. , 8th edition (2016), Principles of Gene Manipulation and Genomics, Blackwell Publishing, UK

<b>MBI 208: Structural Biology &amp; Molecular Modeling</b>	<b>Total</b>
<b>Core Course –Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

- |  |   |
|--|---|
| 1. Secondary and tertiary structures of macromolecules: protein, DNA and RNA   | 3 |
| 2. Secondary structure prediction using Chou Fasman, GOR methods; analysis of results and measuring the accuracy of predictions using Q3, Segment overlap, Mathew's correlation coefficient. | 2 |
| 3. Fundamentals of the methods for 3D structure prediction (sequence similarity/identity of target proteins of known structure, fundamental principles of protein folding etc.)              | 5 |

**UNIT II**

- |  |   |
|--|---|
| 4. Homology Modeling, fold recognition, and ab-initio structure prediction methods - protocols/algorithms. | 5 |
| 5. 3-D structure comparison and concepts: FSSP, CE, VAST and DALI, Fold Classes.                           | 6 |
| 6. Databases of structure-based classification: CATH and SCOP.   | 2 |

**UNIT III**

- |   |   |
|---|---|
| 7. General features- bond stretching, angle bending, improper torsions, cross terms, non-bonded interactions, point charges, calculation of atomic charges, polarization, Van Der Waals interactions, hydrogen bond interactions, Water models. | 3 |
| 8. Types of force field - all atoms force field, united atom force field, etc.  | 4 |
| 9. Molecular Energy minimization methods: steepest descent, conjugate gradient– derivatives, First order steepest decent and conjugate gradients.   | 3 |
| 10. Second order derivatives Newton-Raphson, Minima, maxima saddle points and convergence criteria.-non derivatives minimization methods, the simplex.  | 3 |

## UNIT IV

- |            |   |          |
|------------|---|----------|
| <b>11.</b> | Molecular Dynamics Simulation: Newtonian dynamics, Periodic boundary conditions and minimum image convention, Potential truncation and shifted-force potentials, Neighbor list, Force calculations. | <b>3</b> |
| <b>12.</b> | Classical Monte Carlo: Random numbers, Evaluating integrals using random numbers, Importance sampling, Metropolis algorithm.  | <b>3</b> |
| <b>13.</b> | Analysis of simulated trajectories: Radial distribution functions, Self diffusion coefficient, Time correlation functions.  | <b>3</b> |

**References:**

1. Molecular Modeling Principles and Applications (2nd Ed.) by Andrew R. Leach, 2001, Prentice Hall, USA.
2. Principles of Protein Structure by G. E. Schulz, 2009, Springer
3. Textbook of Structural Biology by Anders Liljas, Lars Liljas, Jure Piskur and GÅran Lindblom, World Scientific Publishic Co. Pvt. Ltd.
4. Structural Bioinformatics, Edited by Jenny Gu, Philip E. Bourne, Wiely Blackwell
5. Computational Structural Biology: Methods and Applications by orsten Schwede, Torsten Schwede, Manuel C. Peitsch, 2008, World Scientific Publishing Company.
6. Molecular Modeling Of Nucleic Acids, Leontis N.B. and SantaLucia J. Jr. (eds), 1998, American Chemical Society.
7. Molecular Modeling of Proteins by Andreas Kukol, 2008, Humana Press.
8. Molecular Modeling and Simulation: An Interdisciplinary Guide by Schlick T., 2012, Springer.
9. Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology) by Russell Schwartz, The MIT Press, Cambridge, Massachusetts, London, England



<b>MBI 209: SAS and Data Analytics lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>15P</b>

<b>1. SAS based practical</b>	<b>05</b>
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<b>2. Data Analysis lab</b>	<b>15</b>
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- Install R from CRAN and setup R studio
- Write a Program to print list of Student, Marks and Percentage considering
  - Different data types variables in R using logical, numeric
  - integer, complex, character and raw
  - Valid/invalid variables declaration
  - Variable assignment
  - Getting variables in environment
  - Class of variables
  - Deleting variables
  - Vectors declaration
  - Different operators demonstration using Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Miscellaneous Operators
  - if-else demonstration for negative, positive and zero number test
  - Switch case for different operations
- Write program to classify odd and even number to demonstrate For, While and Repeat loops with break and next keywords
- Create a function to calculate Area and circumference of circle/rectangle
  - calling a function with/without arguments
  - calling by argument position and names
- Write R program to demonstrate string functions in R , String manipulations in R
  - Vector declaration
  - Accessing vector elements
  - Vector manipulations

- Create a list and modify
  - Name elements
  - Access elements
  - Manipulate the list
  - Merging list
  - convert list to vector
- Create a numeric matrix
  - Access elements
  - Matrix computation
  - Demonstration
- Create array name columns, rows, matrix, Access array elements  
matrix computations
- Create a categorical vector and convert it to
  - Factor
  - Factor validations
  - Generating levels
  - Order change
- Create a data frame
  - Get structure and summary
  - Extract data from DF
  - Expand the data frame add column and rows
  - Check packages
  - Install packages
  - Load package
  - Join cols/rows in DF
  - Merge DF
  - Melting and casting
- Read/write files and access from
  - CSV files
  - Binary file
  - Xls file
- Read access and manipulate JSON data

- Download and load data from website
- Connect to mysql/oracle DB and access data from table
- Working with MongoDB/Redis
- Create data records and create
  - Plot Pie chart for Profit sharing among individuals. Percentage plotting , pie chart
  - Plot a bar graph for monthly revenue. Group bar graph/stacked chart
  - Plot a boxplot for match data mpg vs cylinder
  - Create a vector and plot a histogram , Ranged histogram
  - Create a vector and plot line, point both graph
  - Plot scatterplot for mtcars\$wt and mtcars\$mpg
- Create data from Hospital, Patient, and disease use case
  - Calculate mean, median, mode of a distribution for data
  - Demonstration of dnorm, pnorm, qnorm and rnorm
  - Demonstration of multiple regression with mtcars dataset
- Get records and perform below
  - Use case of admission into university
  - Use case for weight calculation
  - Use case for Titanic survival prediction
  - Use case for Car acceptability
  - Use case for Heart disease recognition with caret package

### References:

1. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2nd Edition Paperback – Import, 28 Mar 2018
2. Python Machine Learning, Uxi (Hayden) Liu By Example Paperback,– Import, 31 May 2017
3. Data Analytics for Beginners: Basic Guide to Master Data Analytics Paperback – November 3, 2016, by Paul Kinley
4. Data Analytics Made Accessible: 2019 edition Kindle Edition by Anil Maheshwari
5. Learn R in a Day, 2013, Kindle Edition, by Steven Murray
6. Beginning R: The Statistical Programming Language, 2013 by Mark Gardener, Paperback
7. Statistical Programming in R, 5 June 2017 by K.G. Srinivasa and G.M. Siddesh Paperback

**MBI 210: JAVA and BioJAVA programming Lab (C)** **Total**  
**(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)** **20 P**

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | ➤ Class and Method Implementation by – <ul style="list-style-type: none"> <li>○ Method overloading</li> <li>○ Constructor Overloading</li> <li>○ Static members and methods</li> </ul>   | <b>2</b> |
| <b>2.</b> | ➤ Implementation of Multiple Inheritance using Interface.  | <b>1</b> |
| <b>3.</b> | ➤ Implementation of Inheritance by <ul style="list-style-type: none"> <li>○ Method overriding</li> <li>○ super constructor and super keyword</li> <li>○ abstract class</li> </ul>  | <b>2</b> |
| <b>4.</b> | ➤ Implementation of Package  | <b>1</b> |
| <b>5.</b> | ➤ Program to read basic data types from keyboard using Scanner/BufferedReader and check the entered values' data type for its appropriateness.   | <b>1</b> |
| <b>6.</b> | ➤ Exception Handling for – <ul style="list-style-type: none"> <li>○ Divide by zero error</li> <li>○ Null values</li> </ul>   | <b>2</b> |
| <b>7.</b> | ➤ Program to read the data from user and save it to two different files, display the contents and exchange the contents of those two files using IO package.   | <b>2</b> |
| <b>8.</b> | ➤ Synchronization of threads. <ul style="list-style-type: none"> <li>➤ Develop an animation program using Multithreading viz. Bouncing Ball.</li> <li>➤ Implementation of Client / Server mechanism using Socket classes.</li> <li>➤ Design Database program for Employee details and implement INSERT, SELECT, DELETE, UPDATE queries.</li> <li>➤ Design concurrent server that will handle multiple clients using Multithreading.</li> </ul> | <b>9</b> |

- Develop a simple client-server application using RMI.
- Programs using IO streams.
- Programs using files.

**References:**

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J.,  
Delhi, Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann,  
Gary Cornell,  
Prentice Hall, Sun Microsystems Press
5. Core Java Volume-II-Advanced Features, Eighth Edition, Cay S.  
Horstmann, Gary
6. Cornell, Prentice Hall, Sun Microsystems Press

<b>MBI 211: Omics Analysis Lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>20P</b>
1. Browsing & viewing genome data	<b>1</b>
Ensembl@EBI	
➤ MapViewer@NCBI	
2. Explore comparative genomics resources and NCBI and EBI	<b>1</b>
3. Viewing regions exhibiting Synteny	<b>1</b>
➤ Genome assembly	
➤ Genome Annotation:	
Using integrated genome annotation servers such as the	
server developed at IMTech, Chandigarh	
( <a href="http://imtech.res.in/raghava/gp.html">http://imtech.res.in/raghava/gp.html</a> )	
4. Gene Prediction and Gene Modeling	<b>2</b>
➤ Prediction of genes and gene structures (gene modeling)	
using online (web) servers of different methods tailored for	
prokaryotic and eukaryotic organisms such as GLIMMER,	
GeneMark, Grail, GENSCAN etc. Interpretation of results	
and comparison with known gene models (where available).	
Evaluation of accuracy of the methods.	
➤ Prediction of promoters using methods such as Neural	
Network Promoter Prediction (NNPP) at Berkeley	
Drosophila Genome Project server, Genome inspector for	
combined analysis of multiple signals in genomes etc. Using	
Promoter databases.	
➤ Prediction of alternate splice sites using methods such as	
Splice Site Prediction by Neural Network (at Berkeley	
Drosophila Genome Project server), GenScan, NetGene2	
GeneSplicer etc. Prediction of PCR primers using Primer 3,	
ePCR etc.	

- |     |   |   |
|-----|---|---|
| 5.  | Comparison of full / partial genomic sequences using following methods to identify conserved genes and map/compare the annotations of the two sequences   | 2 |
|     | <ul style="list-style-type: none"> <li>➤ BLAST2</li> <li>➤ MegaBLAST and Discontiguous MegaBLAST</li> <li>➤ MUMmer</li> <li>➤ PipMaker</li> <li>➤ VISTA</li> <li>➤ Artemis</li> </ul>   |   |
| 6.  | Compare gene order of given genomic sequences using the GeneOrder tool  | 1 |
| 7.  | Explore and query the comparative genomics databases: COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb, Gramene etc.  | 1 |
| 8.  | Explore and query SNP and SNP-related databases   | 1 |
| 9.  | RNA seq data Analysis   | 1 |
| 10. | Transcriptomics data analysis   | 1 |
| 11. | Metagenomics Data Analysis  | 1 |
| 12. | Explore and query the protein-protein interaction databases: DIP, PPI Server, BIND, PIM, PathCalling, MINT, GRID, InterPreTS  | 2 |
| 13. | Gene annotation of unknown sequence   | 1 |
| 14. | <p>Functional Genomics</p> <p style="padding-left: 40px;">Using primary databases (such as UniProt) and derived databases such as InterPro, PRINTS, BLOCKS, PRODOM, Pfam etc. along with advanced sequence analysis tools such as profiles searches, pattern searches for function annotation of genomic sequences.</p> <p>Validation and verification of results for known case studies</p> <ul style="list-style-type: none"> <li>➤ Using sequence-based and structure-based Function Annotation Servers such as: ProKnow (<a href="http://www.doe-mpi.ucla.edu/Services/ProKnow/">http://www.doe-mpi.ucla.edu/Services/ProKnow/</a>)</li> <li>➤ Joined Assembly of Function Annotations (JAFA) at <a href="http://jafa.burnham.org/learnMore.html">http://jafa.burnham.org/learnMore.html</a> etc. which are integrated</li> </ul> | 4 |

services for function annotation

- ProFunc (<http://www.ebi.ac.uk/thornton-srv/databases/ProFunc>)

### References:

1. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Bussiness Media, LLC.
2. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003, Marcel Dekker.
3. Proteomics: Methods Express (Methods Express Series) Paperback – Import, 2007, by C. David O'Connor (Editor), B. David Hames (Editor)
4. Principles of Proteomics, English, Paperback, Twyman, 2004.
5. Dale Jeremy, Schantz Malcolm Von. From genes to genomes: concepts and applications of DNA technology. Publisher: John Wiley & Sons Ltd., 2007. ISBN:9780470017340.
9. Brown, T.A., Genomes, 3rd edition Garland Science publishers, 2006. ISBN: 1859960294.
10. Primrose Sandy B., Twyman Richard. Principles of Gene Manipulation and Genomics. Publisher: Wiley-Blackwell. 7th edition 2006. ISBN: 1405135441.



<b>MBI 212: Molecular Biology and Recombinant DNA Technology lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Core Course Practical)</b>	<b>15P</b>

**Molecular Biology Lab:**

- |   |   |
|---|---|
| 1. Isolation of genomic DNA from bacterial cells/cell lines/blood /plant                        | 3 |
| 2. Analysis of DNA and RNA preparations by agarose gel electrophoresis                          | 2 |
| 3. Quantitation of DNA and RNA preparations and determination of purity by UV spectrophotometry | 1 |

**Recombinant DNA Technology lab:**

- |  |   |
|--|---|
| 4. Competent cells preparation and GFP cloning in E.Coli | 2 |
| 5. Plasmid isolation from <i>E. coli</i>                 | 3 |
| 6. Restriction digestion                                 | 2 |
| 7. Restriction mapping                                   | 2 |

**References:**

1. Molecular cloning: A laboratory Manual, Sambrook and Russell, Wiley New York, Volume I – III.
2. Watson J. and Stephen (2004) Molecular Biology of the Gene, Dorling Kindersley(India) pvt ltd,New delhi. Taylor and Francis group, NewYork.
3. Cooper G.M. and Hausman R.E. (2004) The Cell: A molecular approach, Sinauer Associates, Inc., ASM Press, Washington DC.
4. Lewin (2007) Genes IX: Pearson Prentice Hall, Pearson Education, Inc. Upper Saddle River, NJ 07458
5. Strickberger 1985, Genetics. Macmillan.
6. Russell 2002, Genetics. Benjamin.

<b>MBI 213: Structural Biology and Molecular Modeling Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>15P</b>

**Structural Biology:**

- |  |          |
|--|----------|
| 1. <b>Visualization Tools:</b> RasMol, Cn3D, SPDBV, Chime, PyMOL   | <b>3</b> |
| 2. <b>Secondary Structure Prediction Tools:</b> PHYRE, PSI-PRED, PREDIC PROTEIN, APSSP2, YASPIN SECONDARY STRUCTURE PREDICTION TOOLS, JPRED3 | <b>4</b> |
| 3. <b>Structural Databases:</b> FSSP, VAST, DALI, CATH, SCOP   | <b>3</b> |

**Molecular Modeling:**

- |                                    |          |
|------------------------------------|----------|
| 4. ➤ Conformational Analysis       | <b>5</b> |
| ➤ BABEL, MOPAC                     |          |
| ➤ Molecular dynamics simulations   |          |
| ➤ Molecular Dynamics Visualization |          |
| ➤ Homology Modeling                |          |

**References:**

1. Molecular Modeling Principles and Applications (2nd Ed.) by Andrew R. Leach, 2001, Prentice Hall, USA.
2. Principles of Protein Structure by G. E. Schulz, 2009, Springer
3. Textbook of Structural Biology by Anders Liljas, Lars Liljas, Jure Piskur and GÅran Lindblom, World Scientific Publishic Co. Pvt. Ltd.
4. Structural Bioinformatics, Edited by Jenny Gu, Philip E. Bourne, Wiely Blackwell
5. Computational Structural Biology: Methods and Applications by orsten Schwede, Torsten Schwede, Manuel C. Peitsch, 2008, World Scientific Publishing Company.
6. Molecular Modeling Of Nucleic Acids, Leontis N.B. and SantaLucia J.

Jr. (eds), 1998, American Chemical Society.

7. Molecular Modeling of Proteins by Andreas Kukol, 2008, Humana Press.
8. Molecular Modeling and Simulation: An Interdisciplinary Guide by Schlick T., 2012, Springer.
9. Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology) by Russell Schwartz, The MIT Press, Cambridge, Massachusetts, London, England.

# **SEMESTER III**

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**MBI 301: Scientific Writing Skills****Total****Core Course – Theory; 2 Credits****30L****Course Statement/Objectives:**

This course aims to demystify the writing process and teach the fundamentals of effective scientific writing. Instruction will focus primarily on the process of writing and publishing scientific manuscripts but grant writing will also be addressed. The course will be presented in two segments:

Part (1) teaches students how to write effectively, concisely, and clearly.

part (2) takes them through the preparation of an actual scientific manuscript or grant.

The course may be taken for 2 units or 3 units. Students taking the class for 2 units will be asked to attend a weekly lecture and to complete short writing and editing exercises, including writing a real “Letter to the Editor” piece. Students taking the class for 3 units will additionally develop a manuscript of their choice and will meet periodically with the instructor for individual editing sessions.

**1. Demystifying the Writing Process****15**

- What makes good writing? Are there “good writers” and “bad writers”?
- Words, word choice, the basic elements of sentences and sentence structure. Writing in the active voice. Introduction to Bioinformatics
- Dissecting the news article: News-writing is the art of maximizing information and minimizing words; it’s the barest-bones form of writing. The fundamentals of good writing can be learned by dissecting news articles.
- In-Class Exercise: Sorting through news articles.
- Writing Basics I: Punctuation and Parallelism. Tricks for clarity, brevity, and finesse.
- In-Class Exercise: Peer interviews and write-up mini-profiles
- Writing Basics II: Paragraphs, logic, and organization. Organizational strategies.
- In-Class Exercise: Peer interviews and write-up mini-profiles (swap)
- Writing Basics III: Putting it all together...
- In Class exercise: group rewrites of hard-to-read scientific

snippets

**2. Good Writing Applied: The Scientific Manuscript 10**

- Methods and Results Sections: How to present data effectively. How to write prose that complements a table or figure.
- In-Class Exercise: Discuss a variety of journal articles that present data in different ways; rewrite a results paragraph.
- The Abstract, Introduction, and Discussion: Getting to the main point and summarizing effectively. How to conduct literature reviews. Writing an effective discussion.
- Wrap-up scientific manuscripts plus Overview of grant writing:
  - Submission and authorship for scientific manuscripts.
  - Overview of the NIH grants writing process.
  -

**3. Communicating effectively with the media and lay public and peer review 5**

- How to write articles for the lay public. How to deal with the media. Ethics. Also: how to write a peer review.
- In-Class Exercise: Practice writing a peer review
- SUBMIT completed (or near-completed) manuscript

**References:**

1. Sin and Syntax, Constance Hale
2. Successful Scientific Writing: A step-by-step guide for biomedical scientists, Matthews and Bowen

**MBI 302: Chemoinformatics and Drug Designing** **Total**  
**Advance Course – Theory; 3 Credits** **45L**

### UNIT I

- 1. Introduction to Cheminformatics** **12**
- Introduction to cheminformatics: aims, scope, role of cheminformatics in pharmaceutical/chemical research.
  - Chemical Structure representation file format: 1D, 2D and 3D structures, molecular file formats (SMILES, PDB, SDF, MOL).
  - Molecular Descriptors: 1D, 2D, 3D, topological (Molecular connectivity, electrotopological and refractotopological) and shape indices descriptors.
  - Introduction to graph theory, vertex partitioning algorithms, Molecular Similarity and Molecular Diversity Analysis.

### UNIT II

- 2. Introduction to Molecular Properties** **11**
- Similarity metrics: Tanimoto Coefficient, Euclidean distance and Tversky Index.
  - Chemical Databases: Design, storage and retrieval methods, molecular database screening, Lipinski rule, Drug/Lead like molecules, chemical structure based search techniques
  - Introduction to molecular properties: Hydrophobicity, molecular refractivity, electronic charges (Huckel charge, Wang-ford charge), principal moment of inertia.
  - Pharmacokinetics study: *In-silico* ADMET Studies

### UNIT III

- 3. Drug discovery and QSAR** **11**
- Drug discovery process, role of Bioinformatics in drug design.
  - Target identification and validation, lead optimization and validation.
  - Structure-based drug design and ligand based drug design.

- Concept of *de novo* design for lead identification.
- Structure Activity Relationship: QSARs and QSPRs, QSAR Methodology, Training data, test data and external validation data, applicability domain in QSAR
- 3D QSAR techniques: CoMFA and CoMSIA.

## UNIT IV

### 4. Pharmacophore Modeling 11

- Pharmacophore features, Pharmacophore model, Receptor-based and ligand-based pharmacophore modeling.
- Virtual screening based on pharmacophore model.
- Receptor site, molecular docking study, flexible docking, rigid docking, molecular interactions.
- Scoring functions, correlation between ligand-based and receptor-based studies.

#### References:

1. Chemoinformatics -A Textbook by Johann Gasteiger and Thomas Engel, Wiley-VCH 2003.
2. Handbook of Chemoinformatics by Johann Gasteiger, Wiley-VCH 2003.
3. An Introduction to Chemoinformatics by Andrew R. Leach, Valerie J. Gillet, Springer 2007.
4. Burger's Medicinal Chemistry edited by Donald J. Abraham, Volume – I.
5. Computer-Aided Molecular Design: Theory and Applications by Jean-Pierre Doucet, J. P. Doucet, Jacques Weber, Elsevier Science & Technology Books.
6. Receptor-based Drug Design edited by Paul Leff, Marcel Dekker Inc., New York.
7. Advanced Drug Design and Development: A Medicinal Chemistry Approach by P. N. Kourounakis, 1994, Taylor & Francis.
8. Biopharmaceutical Drug Design and Development by Susanna Wu-Pong, Yon Rojanasakul, 2008, Humana Press.
9. Combinatorial Library Design and Evaluation: Principles, Software, Tools, and Applications in Drug Discovery by Arup Ghose, Vellerkad Viswanadhan, 2001.
10. Computer-Aided Drug Design and Delivery Systems by Ahindra Nag, Baishakhi De, 2010, McGraw-Hill Professional.



<b>MBI 303: Machine Learning Techniques</b>	<b>Total</b>
<b>Advance Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1.</b>	<b>Introduction to Machine Learning (ML)</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>➤ .Introduction to Artificial Intelligence &amp; Machine Learning,</li> <li>➤ Elements of ML,</li> <li>➤ Life Cycle of ML,</li> <li>➤ Applications of Machine Learning.</li> </ul>	
<b>2.</b>	<b>Introduction to Data Mining</b>	<b>3</b>
	<ul style="list-style-type: none"> <li>➤ Data Science and Visualization</li> <li>➤ Important Python Libraries</li> <li>➤ pandas</li> <li>➤ numpy</li> <li>➤ scikit-learn</li> <li>➤ matplotlib</li> <li>➤ seaborn.</li> </ul>	
<b>3.</b>	<b>Biological Data and its Application in Machine Learning</b>	<b>1</b>
<b>4.</b>	<b>Genetic Algorithm</b>	<b>1</b>
	<ul style="list-style-type: none"> <li>➤ What is genetic algorithm?</li> <li>➤ Types of genetic algorithm</li> <li>➤ Introduction to feature selection</li> </ul>	
<b>5.</b>	<b>Introduction to Linear Regression</b>	<b>3</b>
	<ul style="list-style-type: none"> <li>➤ loss functions</li> <li>➤ over fitting</li> <li>➤ gradient descent</li> </ul>	

**UNIT II**

<b>6.</b>	<b>Classification Algorithm</b>	<b>6</b>
	➤ Logistic Regression,	
	➤ Support Vector Machine	
	➤ Naïve Bayes Classifier.	
<b>7.</b>	<b>Non Parametric Learning:</b>	<b>4</b>
	➤ K- Nearest Neighbors	
	➤ Decision Trees	
	➤ Random Forest Classifier	
<b>8.</b>	<b>Introduction to Cross-Validation, Hyper parameter tuning and ensemble Models</b>	<b>2</b>

### UNIT III

<b>7.</b>	<b>Introduction &amp; Types of Unsupervised Learning</b>	<b>1</b>
<b>8.</b>	<b>Association Rule Mining : (Market Basket Analysis)</b>	<b>2</b>
<b>9.</b>	<b>Clustering :</b>	<b>3</b>
	➤ K-means Clustering	
	➤ Hierarchical Clustering	
<b>10.</b>	➤ Principal Component Analysis (PCA)	<b>3</b>
	➤ Singular Value Decomposition (SVD)	
	➤ SOM(self-organizing maps)	

### UNIT IV

<b>8.</b>	<b>Neural Computation</b>	<b>2</b>
	➤ Introduction to Neural computation	
	➤ Neural network model	
<b>9.</b>	<b>Evolutionary computation</b>	<b>4</b>
	➤ Introduction to evolutionary Processes	

- Genetic Operators
  - Evolutionary Optimization Algorithms
- 10. Fuzzy Computation 3**
- Introduction
  - Fuzzy sets & systems
  - Ant colony Optimization (ACO)
- 11. Introduction to Human Language Technology & Machine Learning 3**
- Stochastic Grammar & linguistics, Language models
  - Statistical language Model,
  - Markov model
  - Hidden Markov Model
- 12. Optimization Techniques 2**
- Conjugate Gradient,
  - Newton Raphson,
  - Steepest descent,
  - Simulated annealing

### References:

1. Data Mining: Concepts and Techniques by Han and Kamber, Morgan Kaufmann.
2. Machine Learning by Tom Mitchell, McGraw Hill.
3. Data Mining: Practical Machine Learning Tools and Techniques by Witten and Frank, Elsevier.
4. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G. Cambridge Univ. Press, 1998.
5. Optimization Theory and Application by Rao, S.S., 1984.
6. Discrete optimization by Parker, R. G. & Rardin, R. L., 1988.
7. Stochastic simulation by Repley, Brian D, Wiley series, 1987.
8. Methods of microarray data analysis III by Johnson, K.F. & Lin, S.M. Boston.

Kluwer academic publishers, 2003.

9. Exploration and analysis of DNA microarray and protein array data by Amaratunga, D. & Cabrera, J. New Jersey. John Wiley & Sons Inc., 90 BVDU-RGITBT-M.Sc. BIOINFORMATICS- SEM III 2004.
10. Ant colony optimization by Dorigo, Marco & Stutzle, Thomas New Delhi, Prentice-Hall of India Pvt Ltd, 2004.
11. Data mining: introductory and advanced topics by Dunham, M.H.: New Delhi, Pearson Education, 2003.
12. An introduction to bioinformatics algorithms by Jones, Neil.C. & Pevzner, Pavel A. New Delhi, Anne Books, 2005.
13. Fuzzy sets and fuzzy logic: theory and applications by Klir, G.J. & Yuan Bo, New Delhi. Printice Hall of India, 2002. 81-203-1136-1.
14. Fuzzy and neuro-fuzzy systems in medicine by Teodorrescu, Horia Nicolai, Kandel, Abraham. & Jain, Lakhmi, C New York, CRS Press

<b>MBI 304: Current Bioinformatics</b>	<b>Total</b>
<b>Advance Course – Theory; 2 Credits</b>	<b>30L</b>

### UNIT I

<b>1. Linux:</b> Linux Essentials, Hands-on Exercises	<b>3</b>
Querying Biological Databases with SQL	
<b>2.</b> Statistics and graphing software: GraphPad Prism	<b>3</b>
Creating Phylogenetic Trees with MEGA	
<b>3. NGS:</b>	<b>4</b>
➤ QC'ing Reads	
➤ Mapping Next Generation Sequence Reads	
➤ Analysis of ChIP-seq data in Galaxy	
➤ Analysis of RNA-seq data in Galaxy	
➤ Analysis of differential gene expression	
➤ Finding and annotating indels in Human genome	
➤ Bedtool: Toolset for genome arithmetic	
<b>5. Structural Variant Analysis</b>	<b>5</b>
➤ Variant detection: VarScan and SVDetect	
➤ Variant annotation: TASSEL, GATK	

### UNIT II

<b>6. Advanced Genomics</b>	<b>5</b>
Visualizing Genomes: Browsers	
Introduction to ENSEMBL	
Integrative Genomics Viewer (IGV)	
Juggling Genome Coordinates	
Gene list enrichment analysis	
Visualizing Genomes: Circos Plots	
<b>7. Introduction to Microarray</b>	<b>6</b>
DNA and Protein Array	
Microarray data Analysis pipeline	

- Microarray Techniques
- Data analysis with R/Bioconductor
- Clustering and Displaying Microarray Data
- Expression Atlas
- Cool BaRC Web Tools
- 8. Sequence analysis using DotPlot 4
- GeneGo: Bioinformatics Technology for Systems Biology
- Visualizing Networks: Cytoscape

**References:**

1. Next-Generation DNA Sequencing Informatics, Stuart M. Brown, New York University School of Medicine 2013 ISBN 978-1-936113-87-3
2. Chip Technology, Volume 77, Jörg D. Hoheisel, Alvis Brazma, illustrated Publisher Springer, 2002, ISBN 3540432159, 9783540432159
3. Microarray biochip technology, Mark Schena, illustrated Publisher Eaton Pub., 2000, Original from the University of California, ISBN 1881299376, 9781881299370
4. Discovering Statistics Using R, Andy Field, Jeremy Miles, Zoë Field, SAGE, 2012, ISBN 1446258467, 9781446258460
5. The R Book, Michael J. Crawley, John Wiley & Sons, 2012 ISBN 1118448944, 9781118448946
6. A Guide to MATLAB: For Beginners And Experienced Users, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Edition 2, illustrated Publisher Cambridge University Press, 2006, ISBN 1139452533, 9781139452533
7. MATLAB Guide, Desmond J. Higham, Nicholas J. Higham, Edition 2, illustrated Publisher SIAM, 2005 ISBN 0898715784, 9780898715781
8. MATLAB Primer, , Kermit Sigmon, Timothy A. Davis, Edition 7, CRC Press, 2004 ISBN 1420034952, 9781420034950
9. Foundations of Comparative Genomics, Arcady R. Mushegian, Academic Press, 2010 ISBN 0080546099, 9780080546094
10. Essentials of Genomic and Personalized Medicine, Geoffrey S. Ginsburg, Huntington F Willard, Academic Press, 2009 ISBN 0080958117

<b>MBI 305: Python Programming</b>	<b>Total</b>
<b>Advance Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I****1. Introduction and Overview of Python** **4**

- Installation and understanding Python Environment
- Introduction to Python variables
- basic Operators, keywords, python blocks

**2. Data types and Program Flow Structures** **6**

- Numeric data types: int, float, complex, string data type and string operations,
- Control Structure: if, else and elif , nested control structures
- Python Loop : for loops in python using ranges, string, list and dictionaries, while loops in python, Controlling loop using pass, continue, break and else

**3. String , Lists, Tuples & Dictionaries** **5**

- String: String operators, String manipulation using in built methods
- Lists: list operations, slicing, list methods, - list comprehension.
- Tuples: definition, assignment, tuple operations.
- Dictionaries: definition, operations and methods

**UNIT II****4. Functions , Modules & Packages** **4**

- Function: Definition, Function calling, lambda function
- Modules: Introduction to inbuilt Modules, User defined Modules

- Package: Understanding in built package, building own package, importing package

## 5. File Handling & Exceptional Handling 6

- File Handling: Opening a file, Read and Write operations, File and Directory related methods
- Exceptional Handling: try-except-else, Assert, try-finally, Raise, Exception Names & descriptions, User defined exceptions.

## 6. Python Database Interaction 5

- Python Database interaction, Insertion and retrieval information in database.
- Reading and storing information on database.

### References:

1. Python: The Complete Reference Paperback – 20 Mar 2018, Martin C. Brown
2. Python Programming: A modular approach by Pearson Paperback – 26 Sep 2017, by Taneja Sheetal , Kumar Naveen
3. Python Machine Learning By Example Paperback – Import, 31 May 2017
4. by Yuxi (Hayden) Liu
5. Artificial Intelligence with Python Paperback – Import, 27 Jan 2017, by Prateek Joshi
6. Python Deep Learning Paperback – Import, 28 Apr 2017, by Valentino Zocca , Gianmario Spacagna , Daniel Slater, Peter Roelants



<b>MBI 306: Introduction to Clinical Trials and Pharmacovigilance</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Clinical Research:</b>	<b>3</b>
Introduction to clinical Pharmacology, basic components and scope. The concept of safety: measuring risk, safety in practice, risk–benefit balance, lack of benefit causation: causality assessment in individual cases, assessing causality from clinical trial data, using the Bradford hill criteria to assess causality.	
<b>2.</b> Introduction to basic terms: tolerance, addiction, idiosyncrasy, allergy, hypersensitivity, antagonism, synergism, potentiation, tachyphylaxis, adverse drug reactions and its monitoring.	<b>2</b>
<b>3.</b> Clinical evaluation of new drugs, organizations, types of clinical research	<b>2</b>
<b>4.</b> Phases of clinical research: pre-clinical studies, human volunteer studies (Phase I), clinical trials (Phase II and III studies), post-marketing surveillance (Phase IV studies), prescription-event monitoring and registries.	<b>2</b>
<b>5. Introduction to clinical trials:</b>	<b>2</b>
History, terminologies, type of clinical trials, role of clinical trials in new drug developments.	
<b>6.</b> Regulatory affairs in clinical trials:	<b>2</b>
IND, NDA, ANDA-parts and contents, safety monitoring boards, FDA in various countries including India.	
<b>7.</b> Clinical trial designs:	<b>2</b>
Designs used in clinical trials, inclusion and exclusion criteria, randomization blinding and controls.	

**UNIT II**

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|------------|---|----------|
| <b>8.</b>  | <b>Concept of Pharmacovigilance</b><br>Standard terms and terminologies in Pharmacovigilance.   | <b>2</b> |
| <b>9.</b>  | Adverse Drug Reactions: nature and mechanisms of ADRs, predisposing factors for ADRs.   | <b>2</b> |
| <b>10.</b> | The process of Pharmacovigilance: signal detection, evaluation and investigation and communication.   | <b>2</b> |
| <b>11.</b> | Regulatory aspects of Pharmacovigilance: legislation and guidelines, key elements of European legislation, regulatory Pharmacovigilance systems, obligations of pharmaceutical companies. | <b>2</b> |
| <b>12.</b> | International collaboration: international regulatory collaboration, World Health Organization, Council for International Organizations of Medical Sciences.                              | <b>2</b> |
| <b>13.</b> | Clinical aspects of adverse drug reactions: clinical burden of ADRs, important ADRs and minimizing risk, improving patient safety in clinical practice.                                   | <b>2</b> |
| <b>14.</b> | Ethical and societal considerations: ethical principles, informed consent, privacy and confidentiality, ethical issues for the pharmaceutical industry, conflicts of interest.            | <b>2</b> |
| <b>15.</b> | Reporting Database, managements and Risk assessment: PSUR (periodic safety update reports), risk assessments and managements. Regulatory guidelines and laws n PV.                        | <b>1</b> |

**References:**

1. An Introduction to Pharmacovigilance (2nd edition) by Patrick Waller, Mira Harrison-Woolrych, Wiley-Blackwell, 2017
2. Pharmacovigilance- An Industry Perspective by By Deepa Arora, Pharmapublisher, 2012.
3. Pharmacovigilance: A Practical Approach edited by Thao Doan, Fabio Lievano, Mondira Bhattacharya, Linda Scarazzini, Cheryl Renz, Elsevier, 2018.

4. Dictionary of Pharmacovigilance by Amer Alghabban, Pharmaceutical Press, 2004.
5. Textbook of Pharmacovigilance by Gupta Sk, Jaypee Brothers, Medical Publishers, 2011.
6. Fundamentals of Clinical Trials, Textbook by David L. DeMets and Lawrence M. Friedman, 1981, Springer.
7. Design and analysis of clinical trials, Book by Shein-Chung Chow, Wiley, 1995.
8. Clinical Trials: A Practical Approach, Book by Stuart J. Pocock, 1983, Wiley.
9. The Sourcebook for Clinical Research: A Practical Guide for Study Conduct  
Book by Jeff Nelligan and Natasha Martien, 2018, Academic Press.

<b>MBI 306: Selenium</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Selenium Overview:</b>	<b>6</b>
<ul style="list-style-type: none"> <li>➤ Selenium Overview &amp; Selenium IDE basics</li> <li>➤ Introduction to Selenium</li> <li>➤ Overview of Selenium tool suite-IDE, Selenium RC, Web Driver, grid.</li> </ul>	
<b>2. Selenium IDE basics: Selenium IDE basics</b>	<b>4</b>
<ul style="list-style-type: none"> <li>➤ Installation</li> <li>➤ IDE Features</li> <li>➤ Recording, running, Pausing and Debugging script</li> <li>➤ Verifying Page Elements</li> <li>➤ Assertion and Verification</li> <li>➤ Locating Elements- use of firebug, Firepath <ul style="list-style-type: none"> <li>○ What is firebug?</li> <li>○ Installing Firebug</li> <li>○ Firepath</li> </ul> </li> </ul>	
<b>3. Selenium Web Driver I:</b>	<b>5</b>
<ul style="list-style-type: none"> <li>➤ Architecture of selenium web driver</li> <li>➤ web driver basis – Installation</li> <li>➤ web driver basis – Download/Setup/Configuration</li> <li>➤ web driver basis – writing the first test case</li> <li>➤ working with multiple browser- IE, Chrome, Firefox</li> <li>➤ working with Firefox profile – create Firefox profile and use in Web Driver script</li> </ul>	
<b>4. Introduction to TestNG :</b>	<b>5</b>
<ul style="list-style-type: none"> <li>➤ Introduction to TestNG’s role in testing</li> <li>➤ Why TestNG?</li> <li>➤ Testing with TestNG – Advantages</li> </ul>	

- Testing with TestNG – Disadvantages
- Features of TestNG
- Downloading TestNG
- Installing TestNG onto Eclipse
- Different basic types of annotations in TestNG
  - @Test
  - @Before method
  - @After method
  - @ Before class
  - @After class
- Generation of test execution report using TestNG.

## UNIT II

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|-----------|--|----------|
| <b>5.</b> | <b>Managing UI Objects :</b>   | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ Locating the element use of firebug, Firepath</li> <li>➤ Inspect HTML with Firebug</li> <li>➤ How to use Firepath?</li> <li>➤ Different types of web elements.</li> <li>➤ Identifying Web-elements using id, name, linkText, class xpath, tagname, cssselector</li> <li>➤ Handling input box/buttons, list/selection boxes, radio buttons, check boxes, Grids/Web Tables</li> <li>➤ Handling dynamic objects using regular expressions</li> <li>➤ Extracting links and other Web-Elements.</li> </ul> |          |
| <b>6.</b> | <ul style="list-style-type: none"> <li>➤ Understanding XPath and CSS</li> <li>➤ Locating objects using regular expression</li> <li>➤ Extracting data from web-Elements</li> </ul>  | <b>2</b> |
| <b>7.</b> | <b>Selenium Web Driver II :</b>  | <b>3</b> |
|           | <ul style="list-style-type: none"> <li>➤ Switching between the frames, window</li> <li>➤ Tabbed browsing with Selenium</li> <li>➤ Managing Alerts/pop-ups</li> </ul>   |          |

- Capturing screenshots

**References:**

1. Selenium Testing Tools Cookbook, Book by Unmesh Gundecha, November 2012, Unmesh Gundecha, Packt Publishing Ltd.
2. Instant Selenium Testing Tools Starter Book by Unmesh Gundecha, 2013, Unmesh Gundecha, Packt Publishing Ltd.
3. Front End Testing and Continuous Integration, Book by Daniel Ellis, Daniel Ellis, O'Reilly publishing
4. Selenium 1.0 Testing Tools Beginner's Guide Book by David Burns, 2010, Packt Publishing Ltd.

<b>MBI 307: Cancer Genomics</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | <ul style="list-style-type: none"> <li>➤ HUMAN TUMORS -- epidemiology, classification, conventional treatment</li> <li>➤ Clonal selection in human tumors. Metastasis as a product of cell evolution.</li> <li>➤ Tumor initiation. Chemical, Viral and other cancerogenic routes</li> </ul>  | <b>7</b> |
| <b>2.</b> | <ul style="list-style-type: none"> <li>➤ Tumor suppressor genes and oncogenes.</li> <li>➤ Mutational process in tumors. Instability of tumor genome</li> <li>➤ A review of the cancer gene cloning strategies in pre-genomic and post-genomic eras</li> <li>➤ Genomic analysis of familial cancers</li> <li>➤ Review of cancer and genomics</li> </ul> | <b>8</b> |

**UNIT II**

- |           |  |           |
|-----------|--|-----------|
| <b>3.</b> | <ul style="list-style-type: none"> <li>➤ Signaling pathways damaged or short-circuited in human tumors: RB genes network, cyclines, CDKs, CDKIs</li> <li>➤ Signaling pathways damaged or short-circuited in human tumors: Receptors and RTKs, SMADs, RAS-cascade, PTEN, NF1 etc</li> <li>➤ Extracellular matrix signaling, hypoxia, angiogenesis-related pathways and VHL</li> <li>➤ Differentiation-related pathways in leukemia and lymphomas</li> <li>➤ Cancer checkpoints</li> <li>➤ P53 as guardian of genome</li> <li>➤ Programmed cell death.</li> <li>➤ Cancer- associated polymorphisms, Epigenetics</li> <li>➤ Breakthrough Research and Therapeutics</li> </ul> | <b>15</b> |
|-----------|--|-----------|

**References:**

1. Stewart, B. W. K. P., and Christopher P. Wild. "World cancer report 2014." (2014).
2. Neidle, Stephen, ed. *Cancer drug design and discovery*. Elsevier, 2011.
3. Dellaire, Graham, Jason N. Berman, and Robert J. Arceci, eds. *Cancer genomics: from bench to personalized medicine*. Academic Press, 2013.
4. *Cancer Genomics and Proteomics: Methods and Protocols (Methods in Molecular Biology)* **by** Paul B. Fisher , Humana Press; 2007 edition
5. *Cancer Genomics, Molecular Classification, Prognosis and Response Prediction*, Pfeffer, Ulrich, Springer 2013
6. *The Biology of Cancer*, Robert Weinberg, WW Norton & Co, 2014



<b>MBI 307: Biodiversity Informatics &amp; Molecular Phylogenetics</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Molecular Evolution</b>	<b>6</b>
<ul style="list-style-type: none"> <li>➤ Overview &amp; protocols</li> <li>➤ Nature of data used</li> <li>➤ Basic Principles of Taxonomy &amp; Phylogeny</li> <li>➤ Modern Taxonomical Methods</li> <li>➤ Molecular Systematics: Molecular data types, generation and analysis</li> <li>➤ Diversity of Life: Genetic, Species, Community and Landscape Diversity</li> <li>➤ Species Diversity: Measurement methodologies, Indices</li> <li>➤ Trends of Species Diversity: Gradients, Biodiversity Hot Spots</li> </ul>	
<b>2. Ecological / Ecosystem diversity</b>	<b>2</b>
<ul style="list-style-type: none"> <li>➤ Urban Biodiversity</li> <li>➤ National, Regional and Global Diversity Information Systems and Networks</li> </ul>	
<b>3. Biodiversity Informatics Databases</b>	<b>7</b>
<ul style="list-style-type: none"> <li>➤ Species 2000</li> <li>➤ Tree of Life</li> <li>➤ ATCC</li> <li>➤ GBIF</li> <li>➤ ICTV</li> <li>➤ Species Analyst Collaboration</li> <li>➤ Animal Virus information System</li> <li>➤ Online Biodiversity and Ecosystem based Databases</li> </ul>	

**UNIT II**

- |           |   |          |
|-----------|---|----------|
| <b>4.</b> | Probabilistic models and associated algorithms  | <b>4</b> |
|           | <ul style="list-style-type: none"> <li>➤ Probabilistic models of evolution</li> <li>➤ Maximum likelihood algorithm</li> </ul>   |          |
| <b>5.</b> | Phylogenetic analysis algorithms  | <b>6</b> |
|           | <ul style="list-style-type: none"> <li>➤ Distance-based: UPGMA, Transformed Distance, Neighbors-Relation, Neighbor-Joining Character optimization; delayed and accelerated transformation</li> <li>➤ Maximum Parsimony Reliability of trees: Bootstrap, jackknife, decay, randomization tests.</li> </ul> |          |
| <b>6.</b> | Phylogenetic trees and their comparison   | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ Definition and description, various types of trees;</li> <li>➤ Consensus (strict, semi-strict, Adams, majority rule, Nelson).</li> <li>➤ Data partitioning and combination.</li> <li>➤ Tree to tree distances, similarity</li> </ul>                             |          |

**References:**

1. Recknagel, F. 2002 Ecological Informatics: Understanding Ecology by Biologically- Inspired Computation. Springer, New York.
2. Phillipson, J. 1972 Ecological Energetics, Edward Arnold.
3. Odum, E.P. 1983 Basic Ecology. Saunders International Edition, Japan.
4. Atkinson, P.M. and Tate, N.J.(Eds.) 1999 Advances in remote sensing and GIS analysis., Wiley, New York.
5. Gunther,O. 1998 Environmental Information Systems. Berlin, New York, Springer.
6. Pankhurst, R.J. 1981 Practical taxonomic computing. Cambridge University Press, Cambridge, U.K.
7. Judd, W.S., Campbell, C.S., Kellogg, E.A.,Stevens, P.F. and Donoghue, M.J.(2002) Plant Systematics: A Phylogenetic Approach, 2<sup>nd</sup> Ed., Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, U.S.A.

8. Nordenstam, B., El Gazaly, G. and Kassas, M. 2000 Plant Systematics for 21<sup>st</sup> Century. Portland Press Ltd., London.
9. Bromham Lindell. Reading the Story in DNA: A Beginner's Guide to Molecular Evolution. Publisher: USA, Oxford University Press. 2008. ISBN: 9780199290918.
10. Bernardi Giorgio. Structural and Evolutionary Genomics, Volume 37: Natural Selection in Genome Evolution (New Comprehensive Biochemistry). Publisher: Netherlands, Elsevier Science. 2005. ISBN: 9780444521361.
11. Marco Salemi, Anne-Mieke Vandamme. The phylogenetic handbook: a practical approach to DNA and protein phylogeny. Publisher: Cambridge University Press, 2003. ISBN: 052180390X.
12. Patthy Laszlo. Protein Evolution. Publisher: London, Blackwell Science Ltd. 1999. ISBN: 0632047747.
13. Takahata Naoyuki, Clark Andrew G.(Editor). Mechanisms of Molecular Evolution: Introduction to Molecular Paleopopulation Biology. Publisher: Japan, Japan Scientific Societies Press and Sinauer Associates, Inc. 1993. ISBN: 476226718X.

**MBI 308: System Biology** **Total**  
**Elective Course – Theory; 2 Credits** **30L**

### UNIT I

- |           |   |          |
|-----------|---|----------|
| <b>1.</b> | <b>Biological Systems – their analysis and modeling</b>   | <b>8</b> |
|           | <ul style="list-style-type: none"> <li>➤ Systems and modeling, modeling types, model constraints, process of modeling, constraints and analysis categories</li> <li>➤ Qualitative modeling, principles, types, Forrester diagrams, formulations, simplification, Qualitative modeling using dynamic editors</li> <li>➤ Quantitative modeling, categories, formulation, physical process modeling</li> </ul> |          |
| <b>2.</b> | <b>Models of mathematics in Systems Biology</b>   | <b>7</b> |
|           | <ul style="list-style-type: none"> <li>➤ Difference equation based modeling, linear models, non-linear models, discrete models, continuous models, logistic models</li> <li>➤ Interaction modeling, predator-prey models, stability, linearization, equilibria</li> </ul>   |          |

### UNIT II

- |           |   |           |
|-----------|---|-----------|
| <b>3.</b> | <b>Numerical techniques in analyzing bio-models</b>   | <b>10</b> |
|           | <ul style="list-style-type: none"> <li>➤ Numerical integration</li> <li>➤ Numerical differentiation, ODEs, PDEs</li> <li>➤ Adaptive modeling using ODE tools</li> <li>➤ Numerical methods implementation</li> </ul> |           |
| <b>4.</b> | <b>Validation techniques</b>  | <b>5</b>  |
|           | <ul style="list-style-type: none"> <li>➤ Model validation, techniques, and discrimination models</li> <li>➤ Dynamic validations</li> <li>➤ System-level validation</li> </ul>                                       |           |

#### References:

1. Elizabeth S. Allman, John A. Rhodes, *Mathematical models in Biology: An Introduction*, Cambridge University Press.
2. Bernhard O. Palsson, *Systems Biology: Properties of Reconstructed Networks*, Cambridge University Press.
3. James W. Haefner, *Modeling Biological Systems: Principles and Applications* Springer.
4. Zoltan Szallasi, Jörg Stelling, Vipul Periwal, *System Modeling in Cell Biology: From Concepts to Nuts and Bolts*, MIT Press.

<b>MBI 308: Artificial Intelligence</b>	<b>Total</b>
<b>Elective Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Intelligent Agents:</b>	<b>4</b>
➤ PEAS Representation for an Agent,	
➤ Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Types of Agents	
<b>2. Problem Solving:</b>	<b>4</b>
➤ Solving problems by searching, - DFS, BFS, A* searches, Performance Evaluation.	
➤ Use of graphs in bioinformatics	
<b>3. Knowledge and Reasoning:</b>	<b>4</b>
➤ A knowledge Based Agent,	
➤ Introduction To Logic,	
➤ First Order Logic: Syntax and Semantics,	
➤ Inference in First Order Logic, Unification, Forward and backward chaining, Resolution	
<b>4. Planning:</b>	<b>3</b>
➤ Planning problem,	
➤ Planning with State Space Search	
➤ Partial Order Planning	
➤ Hierarchical Planning	
➤ Conditional Planning	

**UNIT II**

<b>5. Genetic Algorithms:</b>	<b>2</b>
➤ Single-objective genetic algorithms,	
➤ Multi-objective genetic algorithms,	

- GA – bioinformatics applications genetic programming
- 6. Learning: 3**
- Introduction to neural networks
  - Perceptrons
  - Multilayer feed forward network
  - Application of ANN
  - Reinforcement learning: Passive & Active Reinforcement learning
- 7. Introduction to Robotics: 2**
- Robot Classification, Robot Specification.
- 8. Direct and Inverse Kinematics: 4**
- Coordinate Frames, Rotations, Homogeneous Coordinates,
  - Arm Equation of four axis SCARA Robot,
  - TCV
  - Direct Kinematics of Four Axis SCARA Robot
  - Inverse Kinematics of Four Axis SCARA Robot
- 9. Application: 4**
- DNA sequencing, hybridization
  - RNA folding prediction using GA
  - Genomics and proteomics
  - MAGE (MicroArray *and* Gene Expression)
  - Advances in tele surgery and surgical robotics
  -

### References:

1. Stuart Russell and Peter Norvig Artificial Intelligence A Modern Approach Edition, Pearson Publication.
2. Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Publication.
3. Intelligent Bioinformatics: The Application of Artificial Intelligence

Techniques to Bioinformatics Problems Edward Keedwell, Ajit Narayanan, John Wiley & Sons Ltd,

4. A Beginner's Guide to Microarrays: Eric M. Blalock, Springer
5. Artificial Intelligence and Bioinformatics group(AIBIG), Afnizanfaizal Abdullah Springer
6. Surgical Robotics Systems Applications and Visions : Rosen, Jacob; Hannaford, Blake; Satava, Richard M. (Eds.) Springer
7. Robotic Surgery: Farid Gharagozloo, Farzad Najam, McGraw-Hill Professional Publishing
8. Robin R Murphy Introduction to AI Robotics ISBN-81-203-2458-7 PHI Publication.

<b>MBI 309: Chemoinformatics and Drug Designing Lab</b> <b>(2 Credits, 1 P, 4.00 Hr., Advance Course Practical)</b>	<b>Total</b> <b>20 labs</b> <b>10</b>
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**1. Cheminformatics:**

- Practical session for chemical structure representation and storage in special file formats.
- Importance of 3D structures and method of generation from 1D & 2D representations.
- A brief introduction to building molecular databases with special emphasis on retrieval using structure input.
- Substructure/Exact/similar structure based searching.
- Development of descriptors (2D descriptors, Refracto-topological and Electro-topological state indices, 3D descriptors).

**2. Drug Design:**

**10**

- Development of 2D QSAR models.
  - Classical QSAR
  - kNN QSAR
  - GFA QSAR
- Development of 3D QSAR models.
  - CoMFA
  - CoMSIA
  - Topomar CoMFA
  - HQSAR
- Web-based pharmacophore modeling.
  - HypoGen
  - HipHop
  - DiscoTech
- Molecular docking study.
  - Rigid Docking
  - Flexible Docking



- Self Docking
- Virtual Screening.
- Combinatorial library design.

**References:**

1. Chemoinformatics -A Textbook by Johann Gasteiger and Thomas Engel, Wiley-VCH 2003.
2. Handbook of Chemoinformatics by Johann Gasteiger, Wiley-VCH 2003.
3. An Introduction to Chemoinformatics by Andrew R. Leach, Valerie J. Gillet, Springer 2007.
4. Burger's Medicinal Chemistry edited by Donald J. Abraham, Volume – I.
5. Computer-Aided Molecular Design: Theory and Applications by Jean-Pierre Doucet, J. P. Doucet, Jacques Weber, Elsevier Science & Technology Books.
6. Receptor-based Drug Design edited by Paul Leff, Marcel Dekker Inc., New York.
7. Advanced Drug Design and Development: A Medicinal Chemistry Approach by P. N. Kourounakis, 1994, Taylor & Francis.
8. Biopharmaceutical Drug Design and Development by Susanna Wu-Pong, Yon Rojanasakul, 2008, Humana Press.
9. Combinatorial Library Design and Evaluation: Principles, Software, Tools, and Applications in Drug Discovery by Arup Ghose, Vellerkad Viswanadhan, 2001.
10. Computer-Aided Drug Design and Delivery Systems by Ahindra Nag, Baishakhi De, 2010, McGraw-Hill Professional.

<b>MBI 310: Machine Learning Technique Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Advance Course Practical)</b>	<b>20P</b>

Implementation of following Algorithms using Python Programming

**20**

1. Logistic Regression,
2. Support Vector Machine,
3. Naïve Bayes Classifier. :
4. K- Nearest Neighbors,
5. Random Forest Classifier.
6. K-means Clustering
7. Association Rule Mining
8. Ant colony optimization
9. Simulated annealing algorithm for energy minimization
10. Estimator of transition probabilities for markov models based→  
on various sample sizes

#### References:

1. Data Mining: Concepts and Techniques by Han and Kamber, Morgan Kaufmann.
2. Machine Learning by Tom Mitchell, McGraw Hill.
3. Data Mining: Practical Machine Learning Tools and Techniques by Witten and Frank, Elsevier.
4. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G. Cambridge Univ. Press, 1998.
5. Optimization Theory and Application by Rao, S.S., 1984.
6. Discrete optimization by Parker, R. G. & Rardin, R. L., 1988.
7. Stochastic simulation by Repley, Brian D, Wiley series, 1987.
8. Methods of microarray data analysis III by Johnson, K.F. & Lin, S.M. Boston. Kluwer academic publishers, 2003.
9. Exploration and analysis of DNA microarray and protein array data by Amaratunga, D. & Cabrera, J. New Jersey. John Wiley & Sons Inc., 90 BVDU-RGITBT-M.Sc. BIOINFORMATICS- SEM III 2004.
10. Ant colony optimization by Dorigo, Marco & Stutzle, Thomas New Delhi, Prentice-Hall of India Pvt Ltd, 2004.
11. Data mining: introductory and advanced topics by Dunham, M.H.: New Delhi, Pearson Education, 2003.
12. An introduction to bioinformatics algorithms by Jones, Neil.C. & Pevzner, Pavel A. New Delhi, Anne Books, 2005.
13. Fuzzy sets and fuzzy logic: theory and applications by Klir, G.J. & Yuan Bo, New Delhi. Printice Hall of India, 2002. 81-203-1136-1.

<b>MBI 311: Current Bioinformatics Lab</b> (2 Credits, 1 P, 4.00 Hr., Advance Course Practical)	<b>Total 20P</b>
<b>1. Linux:</b> Linux Essentials, Hands-on Exercises Querying Biological Databases with SQL	<b>2</b>
<b>2.</b> Statistics and graphing software: GraphPad Prism Creating Phylogenetic Trees with MEGA	<b>2</b>
<b>3. NGS:</b>	<b>4</b>
➤ QC'ing Reads	
➤ Mapping Next Generation Sequence Reads	
➤ Analysis of ChIP-seq data in Galaxy	
➤ Analysis of RNA-seq data in Galaxy	
➤ Analysis of differential gene expression	
➤ Finding and annotating indels in Human genome	
➤ Bedtool: Toolset for genome arithmetic	
<b>5. Structural Variant Analysis</b>	<b>2</b>
➤ Variant detection: VarScan and SVDetect	
➤ Variant annotation: TASSEL, GATK	
<b>6. Advanced Genomics</b>	<b>4</b>
Visualizing Genomes: Browsers	
Introduction to ENSEMBL	
Integrative Genomics Viewer (IGV)	
Juggling Genome Coordinates	
Gene list enrichment analysis	
Visualizing Genomes: Circos Plots	
<b>7. Introduction to Microarray</b>	<b>4</b>
DNA and Protein Array	
Microarray data Analysis pipeline	
Microarray Techniques	
Data analysis with R/Bioconductor	
Clustering and Displaying Microarray Data	

- Expression Atlas  
Cool BaRC Web Tools
8. Sequence analysis using DotPlot 2  
GeneGo: Bioinformatics Technology for Systems Biology  
Visualizing Networks: Cytoscape

### References:

1. Next-Generation DNA Sequencing Informatics, Stuart M. Brown, New York University School of Medicine 2013 ISBN 978-1-936113-87-3
2. Chip Technology, Volume 77, Jörg D. Hoheisel, Alvis Brazma, illustrated Publisher Springer, 2002, ISBN 3540432159, 9783540432159
3. Microarray biochip technology, Mark Schena, illustrated Publisher Eaton Pub., 2000, Original from the University of California, ISBN 1881299376, 9781881299370
4. Discovering Statistics Using R, Andy Field, Jeremy Miles, Zoë Field, SAGE, 2012, ISBN 1446258467, 9781446258460
5. The R Book, Michael J. Crawley, John Wiley & Sons, 2012 ISBN 1118448944, 9781118448946
6. A Guide to MATLAB: For Beginners And Experienced Users, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Edition 2, illustrated Publisher Cambridge University Press, 2006, ISBN 1139452533, 9781139452533
7. MATLAB Guide, Desmond J. Higham, Nicholas J. Higham, Edition 2, illustrated Publisher SIAM, 2005 ISBN 0898715784, 9780898715781
8. MATLAB Primer, , Kermit Sigmon, Timothy A. Davis, Edition 7, CRC Press, 2004 ISBN 1420034952, 9781420034950
9. Foundations of Comparative Genomics, Arcady R. Mushegian, Academic Press, 2010 ISBN 0080546099, 9780080546094
10. Essentials of Genomic and Personalized Medicine, Geoffrey S. Ginsburg, Huntington F Willard, Academic Press, 2009 ISBN 0080958117, 9780080958118

**MBI 312: Python Programming lab** **Total**  
**(2 Credits, 1 P, 4.00 Hr., Core Course Practical)** **20 labs**

- |           |   |           |
|-----------|---|-----------|
| <b>1.</b> | Basic Python Programming  | <b>10</b> |
|           | <ul style="list-style-type: none"> <li>➤ Python Basic</li> <li>➤ Python Basic (Part -II)</li> <li>➤ Python Data Types - String</li> <li>➤ Python Data Types - List</li> <li>➤ Python Data Types - Dictionary</li> <li>➤ Python Data Types - Tuple</li> <li>➤ Python Data Types - Sets</li> <li>➤ Python Array</li> <li>➤ Python Conditional statements and loops</li> <li>➤ Python functions</li> </ul> |           |
| <b>2.</b> | Python Data Structures and Algorithms   | <b>3</b>  |
|           | <ul style="list-style-type: none"> <li>➤ Data Structure</li> <li>➤ Search and Sorting</li> <li>➤ Recursion</li> </ul>   |           |
| <b>3.</b> | <ul style="list-style-type: none"> <li>➤ Python Date Time</li> <li>➤ Python Class</li> <li>➤ Python Math</li> <li>➤ Python File Input Output</li> <li>➤ Python Regular Expression</li> </ul>  | <b>7</b>  |

### References:

1. <https://www.w3resource.com/python-exercises/>
2. Python: The Complete Reference Paperback – 20 Mar 2018, Martin C. Brown
3. Python Programming: A modular approach by Pearson Paperback – 26 Sep 2017, by Taneja Sheetal , Kumar Naveen
4. Python Machine Learning By Example Paperback – Import, 31 May 2017
5. by Yuxi (Hayden) Liu
6. Artificial Intelligence with Python Paperback – Import, 27 Jan 2017, by Prateek Joshi
7. Python Deep Learning Paperback – Import, 28 Apr 2017, by Valentino Zocca , Gianmario Spacagna , Daniel Slater, Peter Roelants

<b>MBI 313: Introduction to Clinical Trials and Pharmacovigilance Lab</b> <b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>Total</b> <b>20</b> <b>labs</b>
<ol style="list-style-type: none"> <li>1.     ➤ Study of case papers to study drug interactions.</li> <li>       ➤ Studying various Bioinformatics tools to study drug interactions.</li> <li>       ➤ Reporting Database</li> </ol>	<b>10</b>
<ol style="list-style-type: none"> <li>2.     ➤ Clinical trial phase reports</li> </ol>	<b>10</b>

**References:**

1. An Introduction to Pharmacovigilance (2nd edition) by Patrick Waller, Mira Harrison-Woolrych, Wiley-Blackwell, 2017
2. Pharmacovigilance- An Industry Perspective by By Deepa Arora, Pharmapublisher, 2012.
3. Pharmacovigilance: A Practical Approach edited by Thao Doan, Fabio Lievano, Mondira Bhattacharya, Linda Scarazzini, Cheryl Renz, Elsevier, 2018.
4. Dictionary of Pharmacovigilance by Amer Alghabban, Pharmaceutical Press, 2004.
5. Textbook of Pharmacovigilance by Gupta Sk, Jaypee Brothers, Medical Publishers, 2011.
6. Fundamentals of Clinical Trials, Textbook by David L. DeMets and Lawrence M. Friedman, 1981, Springer.
7. Design and analysis of clinical trials, Book by Shein-Chung Chow, Wiley, 1995.
8. Clinical Trials: A Practical Approach, Book by Stuart J. Pocock, 1983, Wiley.
9. The Source book for Clinical Research: A Practical Guide for Study Conduct Book by Jeff Nelligan and Natasha Martien, 2018, Academic Press.

<b>MBI 313: Selenium Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>17 labs</b>
1. Selenium Overview	2
2. Selenium IDE basics	3
3. Selenium Web Driver I	3
4. Introduction to Test NG	3
5. Managing UI Objects	3
6. Selenium Web Driver II	3

#### **References:**

1. An Introduction to Pharmacovigilance (2nd edition) by Patrick Waller, Mira Harrison-Woolrych, Wiley-Blackwell, 2017
2. Pharmacovigilance- An Industry Perspective by By Deepa Arora, Pharmapublisher, 2012.
3. Pharmacovigilance: A Practical Approach edited by Thao Doan, Fabio Lievano, Mondira Bhattacharya, Linda Scarazzini, Cheryl Renz, Elsevier, 2018.
4. Dictionary of Pharmacovigilance by Amer Alghabban, Pharmaceutical Press, 2004.
5. Textbook of Pharmacovigilance by Gupta Sk, Jaypee Brothers, Medical Publishers, 2011.
6. Fundamentals of Clinical Trials, Textbook by David L. DeMets and Lawrence M. Friedman, 1981, Springer.
7. Design and analysis of clinical trials, Book by Shein-Chung Chow, Wiley, 1995.
8. Clinical Trials: A Practical Approach, Book by Stuart J. Pocock, 1983, Wiley.
9. The Source book for Clinical Research: A Practical Guide for Study Conduct Book by Jeff Nelligan and Natasha Martien, 2018, Academic Press.

<b>MBI 314: Cancer Genomics Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>20 labs</b>
1. TCGA data portal --> cBioPortal (use this as a database)	3
2. Data mining using SRA or GEO databases for rna seq data	3
3. Data clustering and analysis	2
4. Single cell transcriptomics	3
5. Data visualization using the following plots: tSNE, MDS, heatmap	3
6. Single sample gene set enrichment analysis to find gene panels	3
7. Survival analysis using kaplan meier plots	3

#### **References:**

1. Stewart, B. W. K. P., and Christopher P. Wild. "World cancer report 2014." (2014).
2. Neidle, Stephen, ed. Cancer drug design and discovery. Elsevier, 2011.
3. Dellaire, Graham, Jason N. Berman, and Robert J. Arceci, eds. Cancer genomics: from bench to personalized medicine. Academic Press, 2013.
4. Cancer Genomics and Proteomics: Methods and Protocols (Methods in Molecular Biology) **by** Paul B. Fisher , Humana Press; 2007 edition
5. Cancer Genomics, Molecular Classification, Prognosis and Response Prediction, Pfeffer, Ulrich, Springer 2013
6. The Biology of Cancer, Robert Weinberg, WW Norton & Co, 2014



<b>MBI 314: Biodiversity Informatics &amp; Molecular Phylogenetics Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Elective Course Practical)</b>	<b>20 labs</b>
<b>1. Biodiversity Informatics Lab</b>	<b>3</b>
Biodiversity Informatics Databases:	
➤ Species 2000	
➤ Tree of Life	
➤ ATCC	
➤ GBIF	
➤ ICTV	
<b>2.</b>	<b>4</b>
➤ Online Biodiversity and Ecosystem based Databases	
➤ Software for identification	
➤ Accessing existing databases on the WWW	
➤ Software for identification of species	
➤ Probabilistic and deterministic identification	
➤ Delta MicroIS, AVIS, ICTV	
<b>3. Molecular Phylogenetics Lab</b>	<b>1</b>
Compilation & curation of dataset, format conversion	
<b>4.</b>	<b>1</b>
Survey of software programs available for phylogenetic analysis	
➤ Installation of at least 2 public domain packages for both Windows & Unix environment: Phylip, PAUP, MEGA	
<b>5.</b>	<b>2</b>
MSA using ClustalW: writing files for phylogenetic analysis	
➤ Informative and variable sites; Singleton sites etc.	
➤ Difference between dendogram & phylogenetic tree	
➤ Converting sequence data into distance data	
<b>6.</b>	<b>2</b>
Reconstruction of phylogenetic trees using molecular data	
➤ Distance-based methods: UPGMA, Neighbor-joining, Neighbor-relations & Transformed distance	
➤ Maximum Parsimony	

- Maximum likelihood
7. Using bootstrapping tool to generate multiple datasets from the original input data & generation of consensus tree 1
  8. Plotting, visualizing & printing phylogenetic trees: TreeView and other tools 2
    - Various rendering
    - Formatting & labeling
    - Interpretation of trees
  9. Comparison of trees drawn using 1
    - RNA, Nucleotide & protein data
    - Gene trees & species tree
  10. Un-rooted & rooted tree 1
    - Rooting un-rooted tree using an out group
  11. Reconstruction of phylogenetic trees using whole genome data of viruses 1
  12. Numerical taxonomy & Bacterial identification using matrices 1

### References:

1. Recknagel, F. 2002 Ecological Informatics: Understanding Ecology by Biologically- Inspired Computation. Springer, New York.
2. Phillipson, J. 1972 Ecological Energetics, Edward Arnold.
3. Odum, E.P. 1983 Basic Ecology. Saunders International Edition, Japan.
4. Atkinson, P.M. and Tate, N.J.(Eds.) 1999 Advances in remote sensing and GIS analysis., Wiley, New York.
5. Gunther,O. 1998 Environmental Information Systems. Berlin, New York, Springer.
6. Pankhurst, R.J. 1981 Practical taxonomic computing. Cambridge University Press, Cambridge, U.K.
7. Judd, W.S., Campbell, C.S., Kellogg, E.A.,Stevens, P.F. and

- Donoghue, M.J.(2002) Plant Systematics: A Phylogenetic Approach, 2<sup>nd</sup> Ed., Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, U.S.A.
8. Nordenstam, B., El Gazaly, G. and Kassas, M. 2000 Plant Systematics for 21<sup>st</sup> Century. Portland Press Ltd., London.
  9. Bromham Lindell. Reading the Story in DNA: A Beginner's Guide to Molecular Evolution. Publisher: USA, Oxford University Press. 2008. ISBN: 9780199290918.
  10. Bernardi Giorgio. Structural and Evolutionary Genomics, Volume 37: Natural Selection in Genome Evolution (New Comprehensive Biochemistry). Publisher: Netherlands, Elsevier Science.2005. ISBN: 9780444521361.
  11. Marco Salemi, Anne-Mieke Vandamme. The phylogenetic handbook: a practical approach to DNA and protein phylogeny. Publisher: Cambridge University Press, 2003. ISBN: 052180390X.
  12. Patthy Laszlo. Protein Evolution. Publisher: London, Blackwell Science Ltd. 1999. ISBN: 0632047747.
  13. Takahata Naoyuki, Clark Andrew G.(Editor). Mechanisms of Molecular Evolution: Introduction to Molecular Paleopopulation Biology. Publisher: Japan, Japan Scientific Societies Press and Sinauer Associates, Inc. 1993. ISBN: 476226718X.

# **SEMESTER IV**

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**MBI 401: RESEARCH PROJECT****Core Course – 20 Credits**

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**Guidelines for Research Project Submission during Sem IV for Master of Science  
(M. Sc.) in Bioinformatics****Eligibility:**

- If student fails to pay any of the pending dues before the beginning of the project date, he/ she will not be considered to be eligible to undertake research project.

**Project Duration, Dissertation writing and Submission:**

- The project duration will be from beginning till the end of Semester IV
- Students shall submit dissertation title, name of research guide, name of co-guide (for off-campus only), name & place of research work within 10 days after the start date of semester IV. (As per the format enclosed).
- Student must have to submit Two hard copies (copy of Library/ Co-Guide & Student's copy) and one soft copy (Guide) of Dissertation only in the prescribed format (read below), duly approved by Research Guide(s) on or before April 15th of every year. The dissertation will not be accepted for evaluation for those who submit after March 15th, their presentation will be taken along with the next year batch.
- Students must acknowledge all the figures, maps, tables, methods, texts, etc., that are used, taken from other sources for writing the dissertation, except for original work that they have carried out. Dissertation having more than 10 % of plagiarism found will not be considered for evaluation.
- Dissertation must be written in specified format only as mentioned below:
  - a. The paper used for printing shall be of A4 size;

- b. Printing shall be in a standardized form (word size of 12, font in Times New Roman) on one side of the paper and in 1.5 line spacing;
  - c. A margin of 1.5 inches shall be on the left hand side, top, bottom and right hand margin shall be of 1 inch.
  - d. The card for cover shall not be more than 330 GSM.
  - e. The title of the dissertation, name of the candidate, degree, name of the guide, co-guide, place of research and the date, month and year of submission shall be printed on the title page and on the front cover.
  - f. The hard- bound thesis cover shall be of black color. Spine of the binding [side cover] should mention ‘M Sc. Bioinformatics dissertation on the top, name of the candidate and date, month and year.
- Student must follow following chapter scheme for Dissertation submission:

#### **Chapter Scheme of Dissertation :**

- ✓ Introduction
- ✓ Review of Literature
- ✓ Aims and Objectives
- ✓ Materials & Methods
- ✓ Observations and Results
- ✓ Discussion
- ✓ Summary
- ✓ Conclusions
- ✓ Bibliography –Reference etc.

#### **Place of Research Project:**

- Student may prefer to undertake his/ her research project in-house or off-campus. Students those preferring to pursue research at off-campus will have to undertake research work only in any of the Department of Scientific and Industrial research (DSIR), Government of India recognized laboratory (Government, State-Government, Private).

#### **Research Guide(s):**

- Students who are opting for off-campus will have one Major Research Guide from the host organization (Preferably a Ph D. qualified scientist), however, a Co-Guide from RGITBT will be appointed.

#### **Dissertation Evaluation:**

- Students will have to submit **Two progress reports (45 days of Intervals) (Format Enclosed) and One evaluation report from Research Guide having 40 % weight age (Format Enclosed)** at the time of dissertation submission on the execution of research project duly signed by Guide / Co-Guide. The progress report will include, attendance percentage, review collection, research progress, sincerity, topic understanding, and systematic execution of research project, data collection and management. The evaluation report will include attendance, review work, project execution, critical thinking, originality of work, presentation of result, understanding of research, dissertation write-up, presentation of tables, figures, maps, references, etc.
- Student will have to give 20 min presentation on the work done in the presence of expert committee (between **April 21 to May 5 of every year**). (Note only working dates will be considered). The power point presentation format shall contain project title, name of candidate, place of research work, name of Guide/ Co-Guide, introduction, review, objectives, significance of the work, methodology, results & discussion, conclusion, references and acknowledgement. The presentation shall be of 12-15 min with 5-8 minutes of discussion.
- The presentation will carry **60 % of weight age** based on the following consideration. The overall understanding of the research project, objectives, methodology. The outcome of research work, data analysis and statistics, clarity in presentation and question – answer session (**Format Enclosed**).
- Student will be assigned a grade as per the Rules mentioned.



**RAJIV GANDHI INSTITUTE OF IT AND BIOTECHNOLOGY**

“Write here **approved title** of the Dissertation in all upper-case (capital letters) with a 'centre' alignment. Place this title on the upper central part of the cover with sufficient margin from top and both sides. Use font size suitable to length of the title”

A DISSERTATION SUBMITTED TO

**RAJIV GANDHI INSTITUTE OF I.T. AND BIOTECHNOLOGY,  
BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE**

FOR AWARD OF DEGREE OF  
**MASTER OF SCIENCE in BIOTECHNOLOGY**

SUBMITTED BY

.....

UNDER THE GUIDANCE OF

.....  
.....

Name of Co-Guide

Name of Guide

RESEARCH CENTRE

.....  
.....  
.....

WRITE HERE DATE, MONTH & YEAR OF SUBMISSION



**CERTIFICATE**

This is to certify that the work incorporated in the dissertation entitled “.....” for the degree of ‘Master of Science’ in the subject of Biotechnology under the faculty of Interdisciplinary Science has been carried out by Mr/ Mrs..... Rajiv Gandhi Institute of I.T and Biotechnology, BharatiVidyapeeth Deemed University, Dhankawadi, Pune (OR NAME OF THE LABORATORY, PLACE OF THE WORK) during the period from ..... to.....under the guidance of Dr.....

Place: Pune  
Date :

(Signature of Head of the Institute with seal)  
Principal / Director  
Seal

**CERTIFICATION OF GUIDE**

This is to certify that the work incorporated in the dissertation entitled  
 “.....  
 .....”

Submitted by..... for the degree of ‘Master of Science’ in the subject of  
 ‘Biotechnology’ under the faculty of Interdisciplinary Science has been carried  
 out in the Department (laboratory) of....., RGIITBT, BVDU (**Institute/  
 Private Lab, Govt Lab etc**) ....., Pune (**OR Place**) during the period  
 from .....to....., under my direct supervision/ guidance.

Place :  
 Guide)

( Signature of Research

Date :

(Name & Designation)

Place : Pune

( Signature of Research Co-Guide)

Date :

(Name & Designation)

**DECLARATION BY THE CANDIDATE**

I hereby declare that the dissertation entitled “  
\_\_\_\_\_” submitted by me to the  
Bharati Vidyapeeth (Deemed to be University), Pune for the degree of Master of Science  
(M.Sc.) in Bioinformatics under the Faculty of Interdisciplinary Sciences  
has been carried out by me under the supervision of **(Name of Guide)** and **(Name of  
Co-guide (if any))**.

I further declare that it has not been submitted to this or any other university or Institution  
for the award of any Degree or Diploma.

I also confirm that all the material which I have borrowed from other sources and  
incorporated in this dissertation is duly acknowledged. If any material is not duly  
acknowledged and found incorporated in this dissertation, it is entirely my responsibility.  
I am fully aware of the implications of any such act which might have been committed  
by me advertently or inadvertently.

Place :  
Date : / /

Name & signature of  
Research Student

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A<sup>+</sup> Grade** by NAAC in 2017)**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Road, Katraj, Pune – 411 046****Proforma of Progress Report – I**

(To be submitted to Principal, RGIITBT, BVDU, Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Dec 1 – Jan 15

Name & Place of Research Work :  
 Objectives of Research Work : 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:****Place & Date:**

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**

(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A+ Grade** by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Progress Report – II**

(To be submitted to Principal, RGITBT, BVDU, Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)  
 Period under report : Jan 16 – Feb 28

Name & Place of Research Work :  
 Objectives of Research Work: 1)  
 2)  
 3)

**(Tick mark, wherever applicable)**

	<b>Very Good</b>	<b>Good</b>	<b>Poor</b>	<b>Special Remark, if any</b>
Percent Attendance				
Getting well acquainted with colleague and laboratory procedures, sincerity				
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management				
Overall Performance				

**Name of Research Guide with signature and seal:**

**Place & Date:**

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**(Re-accredited with **A grade** by NAAC in 2011, Accredited with **A<sup>+</sup> Grade** by NAAC in 2017)**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046****Proforma of Internal Evaluation Report**

(To be submitted to Principal, RGITBT, BVDU, Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

**(of 40 % weight age )**

	<b>Out of</b>	<b>Marks obtained</b>
Percent Attendance	10	
Getting well acquainted with colleague and laboratory procedures, sincerity	5	
Technical Aspects: Understanding research topic, review collection, systematic execution of research project, research progress, data collection and management	20	
Overall Performance	5	
Total		

1. Name of Research Guide with signature and seal:
2. Name of Research Guide:

Place &amp; Date:

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**

(Re-accredited with A grade by NAAC in 2011, Accredited with A<sup>+</sup> Grade by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology**  
**Pune-Satara Rd, Katraj, Pune – 411 046**

**Proforma of Evaluation Report on Presentation**

(To be submitted to Principal, RGITBT, BVDU, Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Completion of Research Objectives : (Yes / No)

(of 60 % weight age )

	<b>Out of</b>	<b>Marks obtained</b>
Overall understanding of the research project - Research Objectives	10	
Significance of Research / Review	10	
Results – Data presentation, statistical analysis, Softwares used, Result Interpretation	15	
Presentation – Clarity, power point slides, communication skills, question – answer session.	15	
Significant outcome – Technical abstract, Seminar, etc.	10	
<b>Total</b>		

Name & Signature of Expert Pane - 1. (External):  
 2. (Internal):  
 3. (Internal):

Signature of Principal (RGITBT):

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**

(Re-accredited with A grade by NAAC in 2011, Accredited with A<sup>+</sup> Grade by NAAC in 2017)

**Rajiv Gandhi Institute of Information Technology and Biotechnology  
Pune-Satara Rd, Katraj, Pune – 411 046**

**Plan of Research Outline**

(To be submitted to Principal, RGIITBT, BVDU, Pune)

Name of the Student :  
 Registration Number of the Student :  
 Degree Program :  
 Proposed Project Title :  
 Name of the Research Guide :  
 Name of Internal Guide (Co-Guide) :  
 (Only in case of off-campus student)

Name & Place of Research Work :  
 Proposed Research Objectives :

Start Date of Research project :

Likely Date of Project Completion :

Significance of Research Project :


Name & Sign of Student

**Approved by**

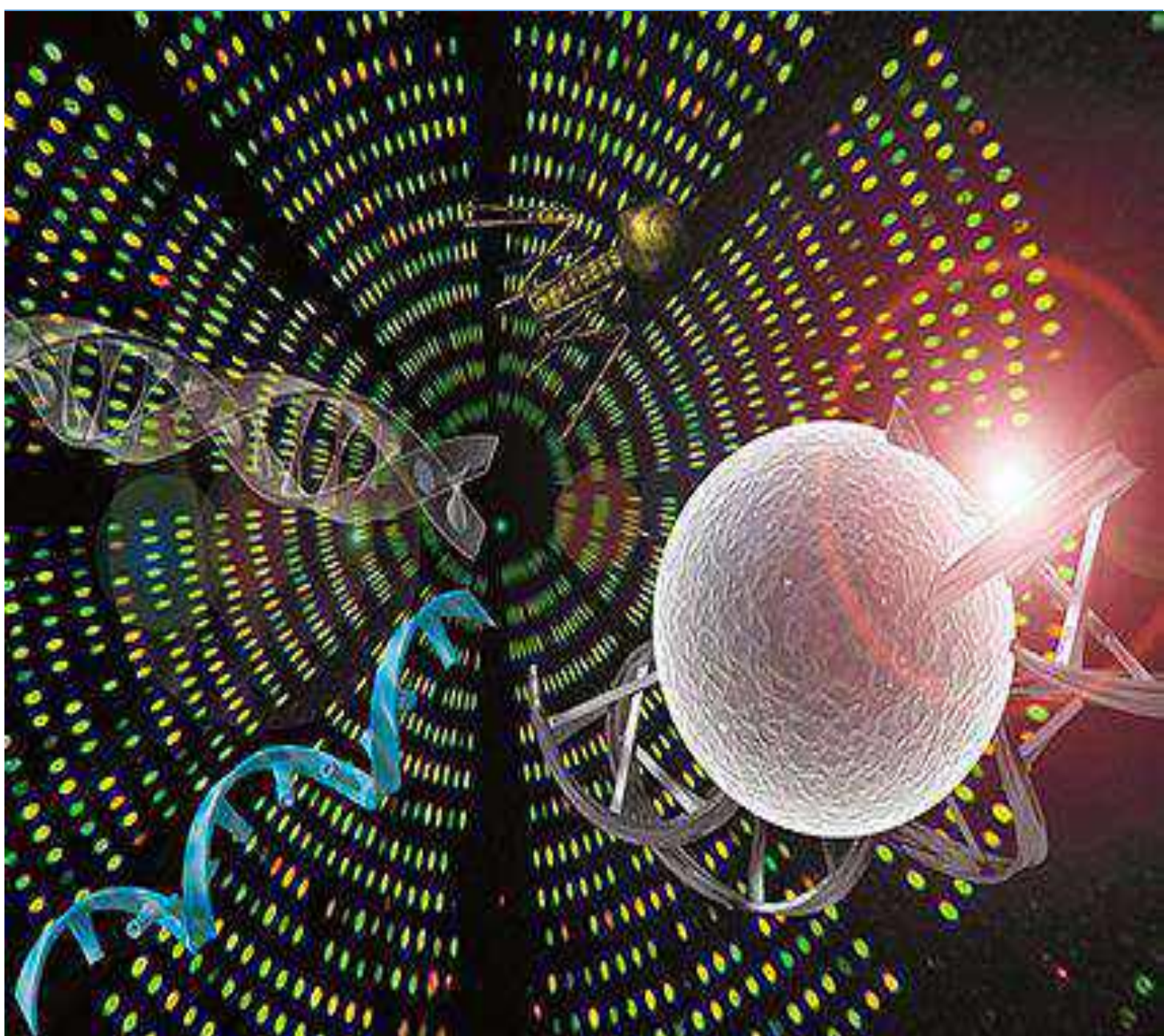
1. Name of Research Guide with signature and seal:

Place & Date:

2. Name of Research Guide (Co-Guide) with signature and seal:

Place & Date:





# BVDU-RGITBT-ADB (Advanced Diploma in Bioinformatics, Post Graduate Diploma) Syllabus

**2019**



**Bharati Vidyapeeth**  
(Deemed to be University)  
Pune, India.



Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Chancellor

Prof. Dr. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Founder Chancellor : Dr. Patangrao Kadam

★ Accredited with 'A' Grade (2017) by NAAC ★  
★ Category-I University Status by UGC ★  
★ NIRF Ranking - 86 ★

"Social Transformation Through Dynamic Education"

Dr. Vishwajeet Kadam  
B.Tech., M.B.A., Ph.D.  
Pro Vice Chancellor

G. Jayakumar  
M.Com., Dip. Pro Admin.  
Registrar

**NOTIFICATION NO. 988**

It is hereby notified for the information of all concerned that the University authorities have approved the revised course structure, syllabus and rules of examinations of M.Sc. Bioinformatics and Advanced Diploma in Bioinformatics under the Faculty of Interdisciplinary Studies to be implemented from the academic year 2019-20.

A copy of the revised course structure, syllabus and rules of examinations of M.Sc. Bioinformatics and Advanced Diploma in Bioinformatics is enclosed.

All the concerned are requested to make a note of this.

Ref. No. BVDU/2019-20/ 162

Date : June 8, 2019

*G. Jayakumar*  
Registrar

To,

1. The Dean, Faculty of Interdisciplinary Studies, College of Engineering, Pune 411043.
2. The Principal, Rajiv Gandhi Institute of IT & BT, Pune 411043.
3. The Controller of Examinations, BVDU.
- ✓ 4. The IT Cell for uploading in the website.

**BHARATI VIDYAPEETH DEEMED TO BE UNIVERSITY  
PUNE**

**REVISED SYLLABUS FOR  
Advanced Diploma in Bioinformatics  
(Post Graduate Diploma)**

**UNDER  
FACULTY OF INTERDISCIPLINARY STUDIES**



**SYLLABUS OF SEM I – SEM II**

**UNDER  
CREDIT SYSTEM**

**To be effective from Academic Year  
2019-20**

Bharati Vidyapeeth Deemed To Be University is a multidisciplinary, multicampus university having 32 Institutions imparting quality education in various disciplines. All programmes of the University are approved by UGC and respective statutory councils. BVDU has been re accredited for the third time with 'A+' grade by NAAC in 2017. UGC has accorded 12B Status [UGC ACT1956] to the university. Ministry of Human Resource and Development, Government of India has awarded "A" category to the University in 2012 based on parameters including innovative programs, research and infrastructure facilities. The University is a member of Association of Indian Universities [AIU] which has ranked BVDU among top 10 universities of India for International students' enrollment. BVDU is also a member of International Association of Universities.

Rajiv Gandhi Institute of IT and Biotechnology is a constituent unit of BVDU established in 2003. The Institute is approved by UGC to conduct graduate and post graduate courses in Biotechnology. The Institute has excellent infrastructure, state-of-the-art laboratories and competent faculty facilitating appropriate learning environment. The Institute offers one undergraduate and four postgraduate programmes in Biotechnology.

## INTRODUCTION

The Advanced Diploma in Bioinformatics (ADB) is a full time post graduate diploma offered by **Bharati Vidyapeeth (Deemed to be University (BVDU))** in its constituent unit, Rajiv Gandhi Institute of IT and Biotechnology (RGITBT). The course was initiated in the year 2010 and was designed to facilitate empowerment of students to face cutting edge technological applications in bioinformatics sector. 21st century biology has been transformed into integrative biology due to paradigm shift from reductionist to holistic approach. The data explosion is one of the obvious causes of the transformation to holistic or systems biology mode. In order to have deeper insights in to biological systems, integration of the data from genome to phenome levels to generate dynamic models has surfaced as key area of bioinformatics. On its implementation for 10 years, the curriculum is being revised two times to embrace newer emerging disciplines and value added courses. The revised **ADB** is a full time **60 credits** Program to be implemented in Rajiv Gandhi Institute of IT and Biotechnology from the academic year 2019-20. The feedback of students, alumni, faculty, employers and parents has a substantial contribution in designing of this curriculum.

## OBJECTIVES

1. To impart deep knowledge of the discipline
2. Develop skills in relevant areas to enhance employment opportunities
3. Introduce emerging areas of NGS, Drug designing and data mining
4. Build interdisciplinary approach
5. Foster global competence among students
6. Inculcate social and moral values and sense of scientific responsibilities in students

## ELIGIBILITY FOR ADMISSION TO THE COURSE

Candidates satisfying following criteria are eligible to apply for ADB Course

1. A student who has obtained Bachelor's degree with minimum **45%** in (i) B.Sc. (Biotechnology / Microbiology / Biochemistry / Zoology / Botany / Chemistry /Agriculture/ Mathematics /Statistics / Computer Science). (ii)B. Pharm (iii).

MBBS (iv) BDS (v) BAMS (vi) BHMS (vii) B.E. in Computer Science or Information technology or Biomedical Engineering will be considered eligible for admission to M.Sc. Bioinformatics course or **40%** aggregate marks for **SC / ST** category respectively at graduate level university examination.

2. Subject to above conditions, the admission will be based on first come first serve basis.

### **DURATION OF THE COURSE**

The course will be executed in two semesters. The medium of instruction and examination will be only English.

### **RULES FOR THE COURSE**

1. The entire course is of 60 credits.
2. One credit for theory course is equivalent to 15 lectures/tutorials; while one credit for practical course is equivalent to 25 – 30 hrs. of lab /field work or demonstration.
3. The curriculum comprises of core, advanced and value added courses. The Core and Advanced Courses are compulsory where as Value Added are elective.
4. The Core Courses are aimed at providing fundamental knowledge of the discipline. The advanced courses are designed to develop manpower for bioinformatics industries as per current need. The Value Added Courses are intended to inculcate the thrust of new domains of bioinformatics within students.
5. The teaching schedule for the 3 credits and 2 credits theory courses will be 3 and 2 lectures per week respectively. All courses will have one tutorial fortnightly.
6. The respective elective course will be implemented only if more than 10 students enroll for that course.
7. All core courses will be evaluated by University Examination. The elective courses will be evaluated by University Examination and Continuous Assessment.
8. Two extra credits will be awarded to students if there is any significant outcome of their dissertation study. The research outcome in terms of publication in indexed national/International journal; filing of patent; or commercialization of technology will be considered for the award of credits.

## RULES FOR EXAMINATION

### A: Nature of Examination:

1. Each course will have 40% marks for internal assessment and 60% marks for semester-end examination.
2. The assessment for 1, 2 and 3 Credits courses will be as given in following table:

**Table 1: Evaluation pattern for one to three Credit Courses**

Course Credits	Marks for UE (60% Weightage)	Marks for IE (40% weightage)	Total Marks for evaluation
1	15	10	25
2	30	20	50
3	45	30	75
4	60	40	100

3. The duration of **60 Marks UE theory paper will be 3.00 Hrs; for 30 Marks 1.30 Hrs.** respectively.
4. The Internal Assessments (IA) will be conducted by the Institute and an end-of-the term University Examination (UE) conducted by the university. The UE will be based on the entire syllabus.
5. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course.

## STANDARD OF PASSING

**A: Grading System:** A **10-point absolute grading system** will be adapted for grading in each head of passing. The system will have seven grade points, the highest being 10. The grading system shall be as shown in Table-2 below. The performance indicators O, A+, A, B+, B, C, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, Satisfactory, and Poor.

Table-2: The grading system under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \geq \text{Marks} \leq 100$	10	O
$70 \geq \text{Marks} \leq 80$	9	A+
$60 \geq \text{Marks} \leq 70$	8	A
$55 \geq \text{Marks} \leq 60$	7	B+
$50 \geq \text{Marks} \leq 55$	6	B
$40 \geq \text{Marks} \leq 50$	5	C
$\text{Marks} < 40$	0	D

1. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table-2) shall be the GPA for the course.**
2. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses up to and including the current semester. The CGPA of a student when he/she completes the program is his/her final result.
3. The SGPA is calculated by the formula ,  $\text{SGPA} = \frac{\sum C_k \times \text{GPA}_k}{\sum C_k}$  where  $C_k$  is the Credit-value assigned to a course and  $\text{GPA}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**
4. The CGPA is calculated by the formula ,  $\text{CGPA} = \frac{\sum C_k \times \text{GPA}_k}{\sum C_k}$  where  $C_k$  is the Credit-value assigned to a course and  $\text{GPA}_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment and also the



during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

5. The CGPA, calculated after the minimum credits specified for the program are 'earned', will be the final result grace marks of 1, 2 or 3 may be awarded to a candidate at UE as per the university rules.

**B: Standards of Passing and ATKT rules:**

1. For all Core Courses, both UE and IA

Constitute separate heads-of-passing (HoP). In order to pass in such courses and to 'earn' the assigned credits

- (a) the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA;

**OR**

- (b) If he/she fails in IA, then also the learner passes in the course, **provided that a minimum of 25% is obtained in IA and GPA for the course is at least 6.0 (50%marks ) in aggregate.** The GPA for a course will be calculated only if the learner passes in that course.

2. A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP. **A student who passes in aggregate in a course need not reappear even if he failed at IA if he/she obtains 25% at IA.**
3. The students of Semester I and II & III will be admitted to next Semester even if he/she gets backlog in any of the course. They can reappear in the next semester examination as a backlog candidate.

**C: AWARD OF HONOURS:**

1. A student who has completed the minimum credits specified for the program shall be declared to have passed in the program. The final result will be in terms

of letter grade and CGPA only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given in Table 3.

**Table 3: Criteria for the award of honors at the end of the program**

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \geq CGPA \leq 10.00$	O	Outstanding	$80 \geq Marks \leq 100$
$9.00 \geq CGPA \leq 9.49$	A+	Excellent	$70 \geq Marks \leq 80$
$8.00 \geq CGPA \leq 8.99$	A	Very Good	$60 \geq Marks \leq 70$
$7.00 \geq CGPA \leq 7.99$	B+	Good	$55 \geq Marks \leq 60$
$6.00 \geq CGPA \leq 6.99$	B	Average	$50 \geq Marks \leq 55$
$5.00 \geq CGPA \leq 5.99$	C	Satisfactory	$40 \geq Marks \leq 50$
CGPA Below 5.00	F	Fail	Marks below 40

### THE FORMAT OF THE TRANSCRIPTS

The transcripts may be acquired by the students indicating his/her performance in every semester examination. The transcript shall show the performance indicators given in the following table, in addition to any other information.

Course Number	Course Description	Number of Credits	University Examination		IA/CA		Grade Point Average (GPA)	Result
			Grade	Grade Point	Grade	Grade Point		

Total Cumulative Credits Completed	SGPA	CGPA	Equivalent Marks (%)	<b>Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be GPA</b>
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### PATTERN FOR ASSESSMENT

#### A: Pattern of Evaluation for Internal Assessment of Theory Courses:

The weightage for Internal Assessment is 40%. Students for IA of every theory course will be assessed for total of 40 marks for 3 credit course and for 20 marks for 2 credit course which will be cumulative marks obtained in two separate assessments specified below.

1. Two internal written examinations of 20 marks each for 3 credit course and 10 marks each for 2 credit course. A total of the two tests will be considered.
2. An optional assignment/ oral/ open book examination may be undertaken if desired.

#### B. Pattern of Evaluation for Internal Assessment of Practical Courses:

The Internal Assessment for every practical course will be of 20 Marks for 2 credits and 40 marks for 4 credits practical courses. The students for IA will be assessed on the basis of;

1. Performance for every practical: 10 Marks/20 Marks for 2/4 Credits practical courses respectively. (Marks to be distributed depending on total number of practical)
2. Assignment/ Oral examination/Tour Report: 10/20 Marks for 2/4 Credits courses

#### C: Pattern of question paper at University Examination

University Examination for 3 credit and 2 credit theory course will be of 60 marks and 30 marks respectively. **For 3 credit course**, the question paper will comprise of 6

questions, 3 questions each in section I and section II. Each question will be of 10 marks. All questions will be compulsory. The pattern of question paper will be as given on next page.

**PATTERN OF QUESTION PAPER FOR 3 CREDIT COURSE OF UNIVERSITY THEORY EXAMINATION OF ADB 2019 Credit System Based Course (TOTAL MARKS: 60, TME: 2.00 HRS.)**

**Instructions to Paper Setter:**

1. Question paper of each course will comprise of total 6 questions,
2. Section I will have 3 questions and Section II 3 questions.
3. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
4. Q. no 1 will be objective, comprising of 7 questions of 2 mark each. They will be based on entire portion of Section I. Students will have to attempt any 5 out of these.
5. Q no 4 will be objective, comprising of 7 questions of 2 mark each. They will be based on entire portion of Section II. Students will have to attempt any 5 out of these.
6. Questions 2 & 3 of **Section I** and 5 & 6 of **Section II** will be descriptive and contain 3 sub-questions of 5 marks each out of which students will attempt any two.
7. Q 2 and 3 will be based solely on Unit I and II whereas Q 5 and 6 will be based on Unit III and IV of the syllabus respectively.
8. Students will attempt answers to Section I and Section II in separate answer books

## SECTION I

**Q.1** Attempt **Any FIVE** of the following:(Define, Explain why, Fill in the blanks, Give examples, Answer in brief) (10)

a

b

c

d

e

f

g

**Q.2** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of) (10)

a

b

c

**Q.3** Write short notes on **Any Two** of the following (10)

a

b

c

## SECTION II

**Q.4** Attempt **Any five** of the following: :(Define, explain why, Fill in the blanks, Give examples, Answer in brief) (10)

a

b

c

d

e

f

g

**Q.5** Attempt **Any Two** of the following: (Answer the following, Differentiate Between, Give neat labeled diagram of) (10)

a

b

c

**Q.6** Write short notes on **Any Two** of the following (10)

a

b

c

**QUESTION PAPER PATTERN FOR 2 CREDITS THEORY COURSE AT UNIVERSITY**  
**EXAMINATION**

**For 2 credit course**, the question paper will comprise of 4 questions, 2 questions each in section I and section II. Q1 of section I and Q3 of section II will be of 7 marks each while Q2 and Q4 will be of 8 marks each .All questions will be compulsory. The pattern of question paper will be as given on next page.

**Pattern of question paper for 2 credit course of university theory examination of ADB 2019 Credit System Based Course (Total Marks: 30, Tme:1.50 Hrs.)**

**Instructions to Paper Setter:**

1. Question paper of each course will comprise of total 4 questions,
2. Section I will have 2questions and Section II 2 questions.
3. All questions will be compulsory. Each question will carry an internal option of one extra sub-question.
4. Questions 1 of section I and 3 of section II will be objective, and contain 7 questions of 1 mark each out of which students will attempt any 5. They will be based on entire portion of Section I and section II respectively.
5. Questions 2 of **Section I** and 4 of **Section II** will be descriptive and contain 3 sub-questions of 5 marks each out of which students will attempt any two.
6. Q 2 and 4 will be based solely on Unit I and II of the syllabus respectively.
7. Students will attempt answers to Section I and Section II in separate answer books

**SECTION I**

**Q.1** Attempt **Any Five** of the following: :(Define, Explain why, Fill in the blanks, Give examples, Answer in brief) (05)

- a
- b
- c
- d
- e
- f

g

**Q.2** Attempt **Any Two** of the following: (Answer the following, Differentiate (10)  
Between, Give neat labeled diagram of, Write short notes on)

a

b

c

## SECTION II

**Q.3** Attempt **Any Five** of the following: (Define, Explain why, Fill in the (05)  
blanks, Give examples, Answer in brief)

a

b

c

d

e

f

g

h

**Q.4** Attempt **Any Two** of the following: (Answer the following, Differentiate (10)  
Between, Give neat labeled diagram of, Write short notes on)

a

b

c

### D: PATTERN FOR QUESTION PAPER OF UNIVERSITY PRACTICAL EXAMINATION OF ADB 2019 Credit System Based Course

(Total Marks: 30/60 for 2/4 credit courses, Time: 3 .00/6.00 Hrs.)

**Q. 1** Major Practical (10/20)

**Q. 2** Spotting/Minor Experiment (10/20)

**Q. 3** Viva (05/10)

**Q. 4** Journal (05/10)

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**Course structure of Advanced Diploma in Bioinformatics**  
**Under Credit System Based Course 2019-20**

**SEMESTER I**

<b>Course No. &amp; Description</b>	<b>Title</b>	<b>Credits</b>	<b>IA</b>	<b>Univ. Exam</b>	<b>Total Credits</b>
<b>ADB 101</b> Basic Course-Theory	Cell Biology (C)	2	20	30	<b>28</b>
<b>ADB 102</b> Basic Course –Theory	Biochemistry(C)	2	20	30	
<b>ADB 103</b> Basic Course –Theory	Biomathematics(C)	2	20	30	
<b>ADB 104</b> Basic Course –Theory	Biostatistics(C)	2	20	30	
<b>ADB 105</b> Basic Course –Theory	C Programming and Data structure(C)	3	40	60	
<b>ADB 106</b> Basic Course – Theory	Biological Informatics(C)	2	20	30	
<b>ADB 107</b> Basic Course – Theory	DBMS & MongoDB (C)	3	40	60	
<b>ADB 108</b> Core Course - Theory	Python	2	20	30	
<b>ADB 109</b> Basic Course –Practical	Cell Biology and Biochemistry Lab (C)	2	20	30	
<b>ADB 110</b> Basic Course –Practical	C Programming and Data Structure Lab (C)	2	20	30	
<b>ADB 111</b> Basic Course –Practical	Biological Informatics Lab (C)	2	20	30	
<b>ADB 112</b> Basic Course –Practical	DBMS & MongoDB lab(C)	2	20	30	
<b>ADB 113</b> Core Course - Practical	Python Lab	2	20	30	



## SEMESTER II

Course No. & Description	Title	Credits	IA	Univ. Exam	Total Credits
<b>ADB 201</b> Core Course –Theory	Statistical Analysis System (SAS) (C)	2	20	30	<b>32</b>
<b>ADB 202</b> Core Course –Theory	R and Data Analytics (C)	3	40	60	
<b>ADB 203</b> Core Course –Theory	JAVA and BioJAVA Programming (C)	3	40	60	
<b>ADB 204</b> Core Course –Theory	Science of Omics (C)	3	40	60	
<b>ADB 205</b> Core Course - Theory	Proteomics (C)	2	20	30	
<b>ADB 206</b> Advance Course -Theory	Advanced Bioinformatics	2	20	30	
<b>ADB 207</b> Advance Course -Theory	Data Mining through Machine Learning	2	20	30	
<b>ADB 208</b> Advance Course-Theory	Molecular Modeling & Drug Designing	3	40	60	
<b>ADB 209</b> Core Course - Practical	SAS and Data Analytics lab (C)	2	20	30	
<b>ADB 210</b> Core Course - Practical	JAVA and BioJAVA Programming lab (C)	2	20	30	
<b>ADB 211</b> Core Course - Practical	Omics Analysis Lab (C)	2	20	30	
<b>ADB 212</b> Advance Course - Practical	Advanced Bioinformatics Lab	2	20	30	
<b>ADB 213</b> Advance Course- Practical	Data Mining through Machine Learning Lab	2	20	30	
<b>ADB 214</b> Advance Course- Practical	Molecular Modeling & Drug Designing Lab	2	20	30	

**Total Credits Offered: 28 C, Sem I+ 32 C, Sem II = 60**

# **SEMESTER I**

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**ADB 101: Cell Biology (C)** **Total**  
**Basic Course – Theory; 2 Credits** **30L**

**UNIT I**

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | <b>Cell as a basic unit of life.</b>   | <b>4</b> |
|           | Basic structure, organization and composition of prokaryotic and eukaryotic cell. Plasma membrane structure and functions, Membrane models. Components of blood & their functions (Plasma, RBC, WBC, Platelets).   |          |
| <b>2.</b> | <b>Cytoskeleton:</b> Organization and functions cytoskeleton, Actin filaments, actin binding proteins, Intermediate filaments, Microtubules  | <b>3</b> |
| <b>3.</b> | <b>Cell Junctions:</b><br>Gap junctions, Tight junctions, Cell adhesion-integrins, selectins, cadherins. desmosomes and hemidesmosomes, plasmodesmata  | <b>2</b> |
| <b>4.</b> | <b>Membrane Transport:</b><br>Transport across membrane- passive diffusion, osmosis, active transport, Ion Channels, Na <sup>+</sup> and K <sup>+</sup> pump, Ca <sup>2+</sup> ATPase pump, co-transport, symport, antiport, endocytosis and exocytosis. | <b>6</b> |

**UNIT II**

- |           |   |          |
|-----------|---|----------|
| <b>6.</b> | <b>Cell Cycle:</b> Molecular events of cell division and cell cycle, regulation of cell cycle events- Cyclins, Cyclin dependent kinases, inhibitors.    | <b>5</b> |
| <b>7.</b> | <b>Cell Signaling:</b> General principles of cell signaling, signaling via G-protein coupled receptors, kinase receptors, role of secondary messengers. | <b>6</b> |
| <b>8.</b> | Ageing and apoptosis, abnormal development and teratogenesis in animals   | <b>4</b> |

**References:**

1. Alberts, B., Bray, D., Lewis, J., Raf, M., Roberts, K., Watson, J.D. (1994). Molecular Biology of the Cell
2. Cooper, G.M. (1997). The Cell: A molecular approach, ASM Press, USA.
3. Darnell, J., Lodish, H., Baltimore, D. (1990). Molecular Cell Biology. Scientific American Books Inc. NY.
4. Hallwell, B., Gutteridge, J.M.C. (2002). Free Radicals Biology and Medicine. Oxford Press.UK.
5. Karp, G. (1996). Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.

<b>ADB 102: Biochemistry (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Introduction to Biomolecules: Carbohydrates, Lipids and Proteins – their biological roles and functions</b>	<b>1</b>
<b>2. Carbohydrates:</b> Classification-on basis of carbon no & functional grs.; Structure with molecular formulae; Stereochemistry (structural and conformational isomers); isomers with one and more chiral centres, properties of stereoisomers; cyclization of sugars; conformations of cyclic forms (chair & boat forms).	<b>3</b>
<b>3. Important monosaccharides:</b> 6 C sugars- glucose, fructose, mannose, galactose, 5 C sugars- ribose, deoxyribose, important modified monosaccharides (2-keto-3-deoxy-D-manno-octulosonic acid (KDO), <u>2-keto-3-deoxy-D-glycero-D-galacto-nonulosonic acid (KDN)</u> , sialic acids, aminosugars, sugar acids (their biological role/ occurrence)	<b>1</b>
<b>4. Linkages in Sugars:</b> Structure and functions of important di-saccharides (sucrose, lactose, maltose, cellobiose) and poly-saccharides (homo and heteropolymers, storage and structural polymers – starch, glycogen, cellulose, chitin, peptidoglycan)	<b>1</b>
<b>5. Physico-chemical properties of carbohydrates:</b> Reducing-non-reducing properties; Exploitation for detection and separation –Benedict’s test; Introduction to conjugate sugars (Glycoproteins and glycolipids and their importance)	<b>2</b>
<b>6. Significance of carbohydrates in microbial, plant and animal system:</b> ABO blood groups, heparin, lectins, carbohydrate vaccines	<b>2</b>
<b>7. Lipids:</b> Occurrence/sources: plant derived oils, ghee	<b>1</b>
<b>8. Structure :</b> Structure of fatty acids, triglycerides; Classification viz., simple and compound, structural and storage with examples; unsaturated-saturated, Oils (refined/unrefined significance); fats, waxes, rancidity/spoilage of fats (microbial, oxidative)	<b>2</b>
<b>9. Functions:</b> Functions in a living system: significance of hydrophobicity and water immiscibility for compartmentalisation, in vitamins, cofactors, for signalling, pigments	<b>2</b>
<b>10. Lipid conjugates:</b> Important conjugates and their functions: phospholipids, glycerophospholipids, sphingolipids; structure of membranes, micellar	<b>3</b>

- structures, Cholesterol- Structure, function and significance
11. **Liposomes:** Liposomes in drug delivery, soaps, bio-surfactants **1**
- Physico-chemical properties of carbohydrates and lipids:** Compare and contrast of properties arising due to differences in C:O ratio

## UNIT II

12. **Amino acids, peptides and proteins:** Occurrence/sources, Naturally occurring amino acids; structures; abbreviated names; stereoisomerism; amphoteric nature of amino acids, Classification of amino acids (on basis of functional groups, essential/non-essential); Chemical reactivity due to functional group (amide, acid, amine); peptides & proteins peptide bond, bond properties, N-Terminal, C-Terminal, Complex proteins– Proteoglycans, Lipoproteins, metalloproteins, phosphoproteins, chromoproteins and their significance **3**
13. **Protein structure:** Primary, secondary ( $\alpha$  helix and  $\beta$  conformation), tertiary and quaternary structure. Forces stabilizing molecular structure (covalent bond, ionic bond, hydrogen bond, salt linkage, van der Waal's forces) a brief over view of Ramchandran plot, Structure-Function relationship in proteins with examples of Fibrous proteins, Collagen, Hemoglobin; importance of sequence of amino acids for structure and function of protein (eg. Sickle cell anaemia), **4**
14. **Introduction to enzymes as biocatalysts:** Enzyme-substrate interaction, Rates of enzyme reaction, Concept of  $K_m$ ,  $V_{max}$  **4**

### References:

1. Biochemistry, Berg, J.M., Tymoczko, J. L. and Stryer, L. W.H. Freeman and Co., New York, USA (2003).
2. Principles of Biochemistry by Lehninger, A., Nelson, D. L. and Cox, M.M. W.H. Freeman and Co., New York, USA (2008).
3. Biochemistry, Satyanarayan, U. Books and Allied (P) Ltd., Kolkata, India (2008).

<b>ADB 103: Mathematics (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

1.	Calculus: Limits, Continuity, Differentiation (1D & Partial), Definite Integrals.	8
2.	Numerical Techniques: Vector algebra, Matrices, Finding Eigen values & Eigen vectors	3
3	2Dimensional & 3Dimensional Geometry: Cartesians and Polar Coordinates, Locus, Equation of a straight line, Pair of straight lines, Circle, Ellipse, Parabola, Hyperbola. 3D Coordinate System, Spherical and Cylindrical Coordinates.	4

**UNIT II**

4.	Ordinary & Partial Differential Equation: 1'st Order & 2'nd Order Ordinary Differential Equations. Nature of Partial Differential Equations, Method of Separation of Variables, Methods for Solving Equations, Solving ODE & PDE.	5
5.	Integral transform: Fourier Series, Fourier Transform, Laplace Transform	7
6.	Applications To Mathematical Biology: Enzyme kinetics, Immunology, Population genetics, Tumor modeling, Applications of ordinary & partial differential equations to Biology.	3

**References:**

1. Introduction to mathematical methods in bioinformatics by Isaev, Alexander Berlin Springer, 2004.
2. Mathematics in chemistry by K. V. Raman & Pal, Sourav, New Delhi, Vikas publishing house Pvt. Ltd., 2005
3. Calculations in molecular biology and biotechnology: a guide to mathematics in the laboratory by Stephenson, F.H. Amsterdam, Academic Press, 2003.
4. Mathematics and computer science in medical imaging by Viergever, Max A.& Todd-Pokropek, Andrew.,1988.
5. Mathematical Methods for Physicists by G. Arfken, Academic Press, New York,1970.
6. Mathematical Biology, by J. D. Murray Springer Verlag, 1989.
7. Mathematical Models in Molecular and Cellular Biology by Segal, L., ed. 1980. Cambridge: Cambridge University Press.
8. Numerical Methods by Balaguruswamy, TMH.

<b>ADB 104: Biostatistics (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

- |  |          |
|--|----------|
| 1. Probabilities, Random Variables, Multiple Random Variables, Distributions, Random Sampling, Maximum Likelihood Estimators, Bayes Estimators, Mean Squared Error. Hypothesis Testing., t-tests, Likelihood Ratio Tests , Interval Estimation | <b>7</b> |
| 2. Analysis of Variance ,One-Way Analysis of Variance , Two-Way Analysis of Variance , Regression Models, Simple Linear Regression, Logistic Regression  | <b>8</b> |

**UNIT II**

- |   |          |
|---|----------|
| 3. Bayesian Method with Examples, basics of Markov chains, Dynamic Programming and Hidden Markov Model, Metropolis–Hastings Algorithm and Gibbs Sampling.<br>Gene Expression and Microarray Analysis ,Unsupervised Learning , Supervised Learning Sequence Alignment, Pair-Wise Sequence Analysis, Multiple Sequence Alignment , Sequence Pattern Discovery | <b>7</b> |
| 4. Some Common Tools and Techniques : (Brief introduction and case studies only)<br>Classification and clustering ( Use WEKA)<br>Artificial Neural Networks.<br>Fuzzy Sets and Fuzzy Logic<br>Genetic Algorithms  | <b>8</b> |

**Note:** Practice on XLminer analysis tool-pack or R (no hand computations). Theory to focus on basic concepts, applications and interpretations/inferencing with secondary data, no mathematical derivations

**References:**

1. Basics of Bioinformatics, Rui Jiang Xuegong Zhang Michael Q. Zhang Editors
2. “Basic Statistics for Bioinformatics,”(free open-source package called R. /XL Miner for solving problems / No hand computation, Use of XL-miner in practicals - 10 excercises, focus should be on estimating and interpreting outputs)

3. Probability statistics, and reliability for engineers by Boca Raton, Ayyub B. M. & McCuen, R H, CRC Press, 1997.
4. Statistics: concepts and applications by Frank, Harry & Althoen, S. C., Cambridge University Press, 1995.
5. Statistical methods in bioinformatics: an introduction by Ewens, W. J. & Grant, G. R., New York. Springer, 2001.



<b>ADB 105: C Programming and Data Structure (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1. Introduction and First Program</b>	<b>3</b>
➤ Why Programming	
➤ Types of Programming	
➤ Introduction to C	
➤ C programming features	
➤ Benefits of C	
➤ Some Facts about C	
➤ Understanding First C Program	
<b>2. Variables and Data Types</b>	<b>3</b>
➤ Identifiers	
➤ Keywords	
➤ Data Types	
➤ Variables	
➤ Constants	
<b>3. Console IO Operations</b>	<b>2</b>
➤ printf function	
➤ scanf function	
➤ Unformatted Functions	
<b>4. Operators and Expressions</b>	<b>2</b>
➤ Expressions	
➤ Types of Operators	
➤ Type Casting	
<b>5. Control Flow Statements</b>	<b>2</b>
➤ Decision Making in C	
➤ If Statement	
➤ Switch Statement	
➤ Unconditional Branching	
➤ While Loop	
➤ Do...While Loop	
➤ For Loop	
➤ Break and continue statements	

**UNIT II**

<b>6. Working with Functions</b>	<b>5</b>
➤ What is a Function	

- Benefits of a Function
  - Function Terminology
  - Array of Structures
  - How does Function Works
  - Scope and Lifetime of Variables in function
  - Storage Classes of Variables
  - Call by value and call by reference
  - Recursion
- 7. Working with Arrays and Strings 5**
- Understanding Arrays
  - Arrays Declaration and Initialization
  - Sample Programs
  - Multidimensional Arrays.
  - Arrays and Functions
  - String operation

### UNIT III

- 8. Pointers 4**
- Understanding Pointers
  - Declaring and Initializing Pointers
  - Function and Pointer Parameters
  - Pointer Arithmetic
  - Pointer and Arrays
  - Two Dimensional Arrays and Pointers
  - void Pointer
  - Dynamic allocation of memory
  - Difference between malloc and calloc
- 9. Structure and Unions 4**
- Overview of Structures
  - Defining and Using a Structure
  - Structures within a Structure
  - typedef keyword
  - Passing Structures to Functions
  - Structure and Pointers
  - Unions
- 10. File Handling 4**
- What is a Stream
  - Opening and Closing of Files
  - Writing and Reading in Text Format
  - Writing and Reading in Binary Format

**Unit IV**

- |            |   |          |
|------------|---|----------|
| <b>11.</b> | Introduction to Data Structures<br>Data Structures- Data structure, Abstract Data Types (ADT), Concept of linear and Non-linear, static and dynamic data structures, and relationship among data, data structure  | <b>2</b> |
| <b>10.</b> | Linked Lists<br>Concept, Comparison of sequential and linked organizations, Primitive operations, Realization of Linked Lists, Linked list operations, Head pointer and header node, Types of linked list- Linear and circular linked lists, Doubly Linked List and operations, Circular Linked List, Singly circular linked list, Doubly circular linked list. | <b>3</b> |
| <b>11.</b> | Stacks<br>Stacks- concept, Primitive operations, stack operations, Applications of Stack- Expression, Evaluation and Conversion, Need for prefix and postfix expressions, Postfix expression evaluation, Recursion- concept, Backtracking algorithmic strategy, use of stack in backtracking.   | <b>2</b> |
| <b>12.</b> | Queues<br>Concept, Realization of Queues Using Arrays , Circular Queue, Advantages of using circular queues, operations on queue  | <b>2</b> |
| <b>13.</b> | Sorting and Searching<br>Searching- Search Techniques, Sequential search, Binary search.<br>Sorting methods- Bubble sort, Insertion sort, Selection sort, Quick sort, Heap sort, Shell sort, Comparison of All Sorting Methods.   | <b>2</b> |

**References:**

1. C & Data structures - P. Padmanabham, B.S. Publications.
2. The C Programming Language, B.W. Kernighan, Dennis M. Ritchie, PHI/Pearson Education.
3. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.
4. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.
5. Data Structures and Program Design in C, R. Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.
6. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
7. Data Structures Using C - A.S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson education.
8. Let us C – Yashwant Kanetkar

<b>ADB 106: Biological Informatics (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I****1. Introduction to Bioinformatics 5**

- Nature of biological data types
- Overview of available Bioinformatics resources on the web
- Primary Resource Institutes: NCBI, EMBL & DDBJ
- Hierarchy of Biological databases: Primary, Secondary & Derived

**2. Biological Databases & Tools 10**

- Database search engines: Entrez, SRS
- Nucleic acid databases: GenBank, ENA, Gentry
- Protein sequence databases: NCBI Protein, EMBL Protein, PIR-PSD, SwissProt/ UniProtKB/ TrEMBL, ExPasy
- Structural Databases: PDB, SCOP, CATH, NDB, CCSD, CSD
- Molecular visualization tools: RasMol, Cn3D, SPDBV, Chime, Mol4D, etc
- Databases and search methods for chemical compounds: PubChem Compound, PubChem Substance, ChEBI, ChEMBL, PDBeChem, RESID, EuroCarbDB
- Sequence Submission Tools: Sequin, BankIt, ENA, IMGT/HLA, DGVa, SPIN, Metagenomics

**UNIT II****3. Overview/concepts in Sequence Analysis 7**

- Local & Global alignment, DotPlot, Gap Penalties
- Dynamic Programming, Heuristic Methods
- Pairwise Sequence Alignment algorithms: Needleman & Wunsch, Smith & Waterman
- Scoring matrices for Nucleic acids and proteins: PAM/MDM, BLOSUM, CSW

**4. Database Similarity Searches 8**

- BLAST & FASTA

Other Tools: LALIGN, Dotlet

- Multiple Sequence Alignment: ClustalW, ClustalX, PRAS  
Other Tools: DbClustal, Kalign, MAFFT, MUSCLE, MView, T-Coffee
- Motifs, Pattern & Profiles
- Derived Databases: PROSITE, BLOCK, ProDom, Pfam, PRINTS, SBASE

### References:

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J., Delhi, Pearson Education (Singapore) Pte.Ltd., 2001.
2. Bioinformatics: Sequence and Genome Analysis by Mount, David, New York, Cold Spring Harbor Laboratory Press, 2004.
3. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., New York, John Wiley & Sons Inc., 2004.
4. Claverie, J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
5. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
6. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press.
7. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
8. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.
9. Rastogi, S.C., Mendiratta, N. and Rastogi, P. 2004 Bioinformatics: Concepts, Skills & Applications. CBS Publishers & Distributors, New Delhi.
10. Vyas, S.P. and Kohli, D.V., Methods in Biotechnology and Bioengineering.
11. Genetic Library Construction and Screening: Advanced Techniques and Applications: Lab Manual
12. Mont, D.W., Bioinformatics: Sequence and Genome Analysis.
13. Pierre Baldi and Soren Brunak, Bioinformatics: The Machine Learning Approach.

<b>ADB 107: DBMS &amp; MongoDB (C)</b>	<b>Total</b>
<b>Basic Course – Theory; 3 Credits</b>	<b>45L</b>

**UNIT I**

<b>1. DBMS</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Database designing, data capturing</li> <li>➤ Data Abstraction</li> <li>➤ Data Models</li> <li>➤ Instances &amp; Schemes</li> <li>➤ E-R Model - Entity and entity sets</li> <li>➤ Relations and relationship sets</li> <li>➤ E-R diagrams</li> </ul> <p>Reducing E-R Diagrams to tables</p>	

**UNIT II**

<b>2. Basic concepts in Indexing and hashing</b>	<b>15</b>
<ul style="list-style-type: none"> <li>➤ Types of Indexing</li> <li>➤ Data warehousing</li> <li>➤ Data mining</li> <li>➤ Oracle Architecture</li> <li>➤ Basic concepts in Oracle: <ul style="list-style-type: none"> <li>○ Table space</li> <li>○ Data files</li> <li>○ Blocks</li> <li>○ Extents</li> <li>○ Segments</li> <li>○ Oracle Background Processes</li> <li>○ Control files</li> <li>○ Oracle Memory Management</li> <li>○ Rollback</li> <li>○ Redo logs etc.</li> </ul> </li> <li>➤ Oracle Report generation, Grants, Roles, Privileges</li> <li>➤ Introduction to SQL</li> </ul>	

**UNIT III**

<b>3. MongoDB</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Introduction of mongoDB</li> <li>➤ Uses and Advantages</li> </ul>	

- RDBMS/SQL vs. MongoDB
- Structure of MongoDB
- Database, Collection – operation
- Data type

#### UNIT IV

- |           |  |           |
|-----------|--|-----------|
| <b>4.</b> | <ul style="list-style-type: none"> <li>➤ CRVD commands</li> <li>➤ Limit Records, Sorting Record</li> <li>➤ Indexing, Aggregation</li> <li>➤ Covered queries</li> <li>➤ ObjectID</li> <li>➤ Regular Expression</li> </ul> | <b>10</b> |
|-----------|--|-----------|

#### References:

1. Database System Concepts by Hanery Korth and Abraham Silberschatz, McGraw Hill publication.
2. An Introduction to Database Systems by C.J. Date, Addison-Wesley.
3. Database systems by Nilkamal Surve, Tech Max publications.
4. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers.
5. Oracle PL/SQL Programming by Steven Feuerstein, Bill Pribyl, O'Reilly Media.
6. The Relational Database Dictionary by C.J. Date, O'Reilly Media
7. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education.
8. Database Design and Relational Theory by C.J. Date, O'Reilly Media.
9. Oracle Database 11g A Beginners Guide by Ian Abramson, Michael Abbey, Michael J. Corey and Michelle Malcher, McGraw Hill publication.
10. Developing Bioinformatics Computer Skills by Gibas, & Jambeck, O-Reilly.
11. Linux : The Complete Reference 6th Edition by Richard Petersen, Tata McGraw-Hill Education (2007)

**ADB 108: Python** **Total**  
**Core Course – Theory; 2 Credits** **30L**

## UNIT I

**1. Introduction and Overview of Python** **4**

- Installation and understanding Python Environment
- Introduction to Python variables
- basic Operators, keywords, python blocks

**2. Data types and Program Flow Structures** **6**

- Numeric data types: int, float, complex, string data type and string operations,
- Control Structure: if, else and elif , nested control structures
- Python Loop : for loops in python using ranges, string, list and dictionaries, while loops in python, Controlling loop using pass, continue, break and else

**3. String , Lists, Tuples & Dictionaries** **5**

- String: String operators, String manipulation using in built methods
- Lists: list operations, slicing, list methods, - list comprehension.
- Tuples: definition, assignment, tuple operations.
- Dictionaries: definition, operations and methods

## UNIT II

**4. Functions , Modules & Packages** **4**

- Function: Definition, Function calling, lambda function
- Modules: Introduction to inbuilt Modules, User defined Modules
- Package: Understanding in built package, building own package,



importing package

- 5. File Handling & Exceptional Handling 6**
- File Handling: Opening a file, Read and Write operations, File and Directory related methods
  - Exceptional Handling: try-except-else, Assert, try-finally, Raise, Exception Names & descriptions, User defined exceptions.
- 6. Python Database Interaction 5**
- Python Database interaction, Insertion and retrieval information in database.
  - Reading and storing information on database.

### References:

1. Python: The Complete Reference Paperback – 20 Mar 2018, Martin C. Brown
2. Python Programming: A modular approach by Pearson Paperback – 26 Sep 2017, by Taneja Sheetal , Kumar Naveen
3. Python Machine Learning By Example Paperback – Import, 31 May 2017
4. by Yuxi (Hayden) Liu
5. Artificial Intelligence with Python Paperback – Import, 27 Jan 2017, by Prateek Joshi
6. Python Deep Learning Paperback – Import, 28 Apr 2017, by Valentino Zocca , Gianmario Spacagna , Daniel Slater, Peter Roelants

<b>ADB 109:Cell Biology and Biochemistry Lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>20 P</b>

### Cell Biology Lab

1. Chloroplast isolation from spinach leaves	1
2. Staining of prokaryotic cell organelles: Staining of capsule, spore, cell wall and metachromatic granule	2
3. Study of mitosis with onion root tip chromosomes	2
4. Observation of permanent slides of meiosis	1
5. Isolation of nuclei from rat liver	2
6. To determine Erythrocyte ( <i>RBC</i> ) count of a blood sample	1
7. To determine Leucocytes ( <i>WBC</i> ) count of a blood sample	1
8. Temporary mounting of mitochondria by Janus green B	1

### Biochemistry Lab

9. Preparation of buffers-acetate buffer & Preparation of biochemical reagents (Benedict's reagent)	2
10. Isolation of biomolecules	2
a. Isolation of starch from corn (separation on the basis of density)	
b. Isolation of protein from a suitable source	
c. Extraction of triglycerides from oilseeds (separation on the basis of differential solubility)	
11. Quantitative estimation of Glucose by DNSA method	1
12. Quantitative estimation of Protein by Biuret method and absorption at 280 nm	2
13. Acid value or saponification value. Determination with reference to fatty acids.	2

### References:

1. An Introduction to Practical Biochemistry, Plummer, D.T., Tata-McGraw-Hill Publishing Co., New Delhi (2005).
2. Principles and Techniques of Biochemistry and Molecular Biology, Wilson, K. and Walker, J., Cambridge University Press, New York (2005).

3. Laboratory Manual in Biochemistry, Jayraman J., New Age International (P) Ltd., New Delhi (2007).
4. Alberts B. and Jhonson A. 4<sup>th</sup> edition (2002) Molecular Biology of the cell, Garland science.
5. Berg J., Tymoczko J, and Stryer L, 5<sup>th</sup> edition (2002) Biochemistry, W. H. Freeman and company, New York.
6. Cooper G.M., Hausman R. E. The cell: A molecular approach. 5<sup>th</sup> edition. ASM Press and Cinauer Associates Inc. 2009
7. Practical Microbiology: Principles and Techniques, (2005), 1<sup>st</sup> Edn., Kale, V and Bhusari, K. Himalaya Publishing House, New Delhi.

<b>ADB 110: C Programming and Data Structure Lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>15 P</b>

**1. Laboratory assignments based on the following topics in ‘C’ programming: 5**

- Data types, operators and expressions, Hierarchy of operators,
- control statements including decision (if, if-else), loops (while, do-while, for), branching statements (switch, break, continue),
- Functions,
- Arrays (1D, 2D- all matrix operations including inverse of a matrix),
- Strings,
- File handling etc.

**10**

**2. Writing C programs for Bioinformatics applications:**

- Extract a protein or nucleic acid sequence from any of the databank files (GenBank entry, Swiss-Prot, EMBL entry etc.)
- Interconverting the sequence from one databank format to the other eg. GenBank format to FASTA format, FASTA to PIR format etc.
- Determining the base composition in a nucleic acid sequence and amino acid composition in a protein sequence.
- Generating the complimentary sequence of a DNA sequence o Pattern search algorithms o Search for a specific oligonucleotide pattern (eg. GAACATCC) in a given DNA sequence.
- Find the position where a specific sequence say “GGTCCCGAC” will hybridize a given DNA sequence.
- Find the restriction enzyme cleavage sites eg. where PVUZ, ECORI etc. will cut the DNA.
- Locate palindromic sequence stretches in a DNA sequence. Count the number of Open Reading frames (ORF’s) in a DNA sequence.
- Calculate the codon usage in a nucleic acid sequence.
- Translate a DNA sequence into protein sequence in the forward and reverse frames.
- Implementation of the Needleman-Wunsch algorithm for pair wise

alignment and testing alignment score with randomized pairs of sequences also.

- Numerical Techniques (4 assignments)
- Basic Formalism, Methods for Solving Equations, Finding Eigen values & Eigenvectors (5 assignments)

**References:**

1. Let Us C by Yashavant Kanetkar, BPB Publications.
2. The C programming language by Kerighan and Richie, PHI Publication.
3. Programming in ANSI C by Balaguruswamy, Tata McGraw-Hill Education.
4. Sams Teach Yourself C in 21 Days Peter Aitken and Bradley L. Jones, Macmillan Computer publishing.

<b>ADB 111: Biological Informatics lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>15 P</b>
1. Exploring the integrated database system at NCBI server and querying the PUBMED and GenBank databases using the ENTREZ search engine.	1
2. Exploring the integrated database system at EBI server and searching the EMBL Nucleotide database using the SRS search engine.	1
3. Exploring & querying SWISSPROT & UniProtKB.	1
4. Exploring and querying the PIR database.	1
5. Exploring tools on ExPASy.	1
6. Exploring utilities in EMBOSS packages.	1
7. Explore Pair-wise global alignments.	1
8. Explore Pair-wise local alignments.	1
9. Database (homology) searches using different versions of BLAST and FASTA interpretation of the results to derive the biologically significant relationships of the query sequences (proteins/DNA) with the database sequences. Exploring other databases: LALIGN, Dotlet	2
10. Multiple sequence alignments: CLUSTALW, Clustal Omega, DbClustal, Kalign, MAFFT, MUSCLE, MView, T-Coffee.	2
11. Exploring Alignment Analysis tools: AMAS, CINEMA, MaxAlign, PhyloGibbs, SVA, PVS.	1
12. Exploring and using the derived databases: PROSITE, PRINTS, BLOCKS, Pfam and Prodom for pattern searching, domain searches etc.	1
13. Studying the format & content of structural databases & visualization of structure using Rasmol, Cn3D and other utilities.	1

**References:**

1. Bioinformatics: A Practical Guide to the analysis of Genes and Proteins (3<sup>rd</sup> Ed.) by Baxevanis, A.D. & Ouellette, B., F. F., New York, John Wiley & Sons, Inc. Publications, 2004.
2. Practical Bioinformatics, Michael Agostino, 1st Edition,

ISBN:9780815344568 , September 26, 2012

3. Bioinformatics: A Practical Approach, Shui Qing Ye, CRC Press, 20-Aug-2007
4. Bioinformatics: Methods Express, Paul Dear (Editor) , Publication Date: September 18, 2007 | ISBN-10: 190484216X | ISBN-13: 978-1904842163 | Edition: 1st Edition
5. Current Protocols in Bioinformatics by Baxevanis, A.D., Davison, D.B., Page, R. D. M. & Petsko, G.A., New York, John Wiley & Sons Inc., 2004.
6. Bioinformatics: Sequence, Structure and Databanks: A Practical Approach [Paperback]

<b>ADB 112: DBMS &amp; MongoDB lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Basic Course Practical)</b>	<b>20 P</b>
<b>1. Part I: ORACLE</b>	<b>2</b>
Assignment based on “Data Definition Language”.	
➤ A set of SQL commands used to create table, modify table structure, drop table, rename table.	
<b>2. Assignment based on “Data Manipulation Language”</b>	<b>2</b>
➤ A set of SQL commands used to change the data within the database.	
➤ Insertion of records in the tables, updating of all or specific set of records in tables.	
➤ Viewing the attributes of table’s column.	
<b>3. Assignment based on “Data Query Language”</b>	<b>2</b>
➤ Different forms of Select statement	
➤ Arithmetic and logical operators.	
➤ Range searching and pattern matching.	
<b>4. Assignment based on defining Constraints.</b>	<b>2</b>
➤ Types: I/O constraints like Primary Key, Foreign key, Null and Unique	
➤ Constraints. Business constraints like check constraints.	
<b>5. Assignment based on using joins.</b>	<b>2</b>
➤ Joining multiple tables, joining a table to it.	
<b>6.</b>	<b>2</b>
➤ Granting rights on user objects such as Tables, Views, and Sequences.	
➤ Revoking rights on user objects such as Tables, Views, and Sequences.	
➤ XAMPP for MySQL	
➤	
<b>7. Part II: MongoDB based practical</b>	<b>8</b>

**References:**

1. Database System Concepts by Hanery Korth and Abraham Silberschatz, McGraw Hill publication.
2. An Introduction to Database Systems by C.J. Date, Addison-Wesley.



3. Database systems by Nilkamal Surve, Tech Max publications.
4. Data Mining: Concepts and Techniques by Jiawei Han and Micheline Kamber, Morgan Kaufmann publishers.
5. Oracle PL/SQL Programming by Steven Feuerstein, Bill Pribyl, O'Reilly Media.
6. The Relational Database Dictionary by C.J. Date, O'Reilly Media
7. Fundamentals of Database Systems by Elmasri and Navathe, Pearson Education.
8. Oracle Database 11g A Beginners Guide by Ian Abramson, Michael Abbey, Michael J. Corey and Michelle Malcher, McGraw Hill publication.

**ADB 113: Python lab** **Total**  
**(2 Credits, 1 P, 4.00 Hr., Core Course Practical)** **20 labs**

- |           |   |           |
|-----------|---|-----------|
| <b>1.</b> | Basic Python Programming  | <b>10</b> |
|           | <ul style="list-style-type: none"> <li>➤ Python Basic</li> <li>➤ Python Basic (Part -II)</li> <li>➤ Python Data Types - String</li> <li>➤ Python Data Types - List</li> <li>➤ Python Data Types - Dictionary</li> <li>➤ Python Data Types - Tuple</li> <li>➤ Python Data Types - Sets</li> <li>➤ Python Array</li> <li>➤ Python Conditional statements and loops</li> <li>➤ Python functions</li> </ul> |           |
| <b>2.</b> | Python Data Structures and Algorithms   | <b>3</b>  |
|           | <ul style="list-style-type: none"> <li>➤ Data Structure</li> <li>➤ Search and Sorting</li> <li>➤ Recursion</li> </ul>   |           |
| <b>3.</b> | <ul style="list-style-type: none"> <li>➤ Python Date Time</li> <li>➤ Python Class</li> <li>➤ Python Math</li> <li>➤ Python File Input Output</li> <li>➤ Python Regular Expression</li> </ul>  | <b>7</b>  |

**References:**

1. <https://www.w3resource.com/python-exercises/>
2. Python: The Complete Reference Paperback – 20 Mar 2018, Martin C. Brown
3. Python Programming: A modular approach by Pearson Paperback – 26 Sep 2017, by Taneja Sheetal , Kumar Naveen
4. Python Machine Learning By Example Paperback – Import, 31 May 2017
5. by Yuxi (Hayden) Liu
6. Artificial Intelligence with Python Paperback – Import, 27 Jan 2017, by Prateek Joshi
7. Python Deep Learning Paperback – Import, 28 Apr 2017, by Valentino Zocca , Gianmario Spacagna , Daniel Slater, Peter Roelants

# **SEMESTER II**

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<b>ADB 201: Statistical Analysis System (SAS) (C)</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1.</b>	<b>Introduction to SAS</b>	<b>1</b>
	<ul style="list-style-type: none"> <li>➤ An overview of SAS foundation</li> <li>➤ Introduction to SAS programs submitting a SAS program</li> <li>➤ Working with SAS program syntax</li> </ul>	
<b>2.</b>	<b>Accessing Data</b>	<b>1</b>
	<ul style="list-style-type: none"> <li>➤ Examining SAS data sets</li> <li>➤ Accessing SAS libraries- Proc contents</li> </ul>	
<b>3.</b>	<b>Reading and Creating SAS Data sets</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>➤ Introduction to SAS Data sets</li> <li>➤ Reading from existing SAS Data Sets</li> <li>➤ Reading Spreadsheet and Database Data</li> <li>➤ Reading Raw Data Files               <ul style="list-style-type: none"> <li>○ Reading standard delimited data</li> <li>○ Reading nonstandard delimited data</li> <li>○ Handling missing data</li> <li>○ Reading raw data files with formatted input</li> <li>○ Controlling when a record loads</li> </ul> </li> </ul>	
<b>4.</b>	<b>Formatting Data Values</b>	<b>1</b>
	<ul style="list-style-type: none"> <li>➤ Using SAS formats</li> <li>➤ Creating user-defined formats</li> </ul>	
<b>5.</b>	<b>Manipulating Data</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>➤ using SAS functions</li> <li>➤ conditional processing</li> </ul>	
<b>6.</b>	<b>CoADBning SAS Data Sets</b>	<b>2</b>
	<ul style="list-style-type: none"> <li>➤ Concatening</li> <li>➤ Merging - one-one, one-many, merging with non-matches</li> </ul>	
<b>7.</b>	<b>Processing Data in groups</b>	<b>1</b>

- |   |          |
|---|----------|
| <b>8. Processing Data Iteratively</b>         | <b>2</b> |
| ➤ DO loop processing                          |          |
| ➤ conditional DO loop processing              |          |
| ➤ SAS array processing                        |          |
| ➤ using SAS arrays                            |          |
| <b>9. Restruction / Rotating SAS Data Set</b> | <b>1</b> |
| <b>10. Creating Summary Reports</b>           | <b>2</b> |
| ➤ Proc Print                                  |          |
| ➤ Proc Freq                                   |          |
| ➤ Proc Report                                 |          |
| ➤ Proc Tabulate                               |          |
| ➤ Report Enhancement                          |          |

## UNIT II

- |  |          |
|--|----------|
| <b>11. SAS Macros Language</b>   | <b>1</b> |
| ➤ Purpose of Macro Facility  |          |
| ➤ Program Flow   |          |
| <b>12. Macro Variables introduction to macro variables</b>               | <b>2</b> |
| ➤ Automatic macro variables  |          |
| ➤ Macro variable references  |          |
| ➤ User-defined macro variables   |          |
| ➤ Delimiting macro variable references                                   |          |
| <b>13. Macro Definitions defining and calling a macro</b>                | <b>2</b> |
| ➤ Macro parameters   |          |
| ➤ DATA Step and SQL Interfaces creating macro variables in the DATA step |          |
| <b>14. DATA Step and SQL Interfaces creating macro variables in the</b>  | <b>2</b> |

<b>DATA step</b>	
➤ Indirect references to macro variables	
➤ Creating macro variables in SQL	
<b>15. Macro Programs conditional processing</b>	<b>2</b>
➤ Parameter validation	
➤ Iterative processing	
➤ Global and local symbol tables	
<b>16. SAS SQL – Language</b>	<b>1</b>
➤ Introduction to SAS- SQL	
➤ Basic Queries	
➤ Overview of the SQL procedure	
➤ Specifying columns	
➤ Specifying rows	
<b>17. Types of Joins</b>	<b>1</b>
<b>18. Introduction to Subqueries</b>	<b>2</b>
<b>19. Set Operators</b>	<b>2</b>

**References:**

1. Berger, J. O. (1985), Statistical Decision Theory and Bayesian Analysis, 2nd Edition, New York: Springer-Verlag.
2. Cameron, A. C. and Trivedi, P. K. (1998), Regression Analysis of Count Data, Cambridge: Cambridge University Press.
3. Gallant, A. R. (1987), Nonlinear Statistical Models, New York: John Wiley & Sons.
4. Gelman, A., Carlin, J. B., Stern, H. S., and Rubin, D. B. (2004) , Bayesian Data Analysis, 2nd Edition, London: Chapman & Hall.
5. Powers, D. A. and Xie, Y. (2000), Statistical Methods for Categorical Data Analysis, San Diego: Academic Press.
6. Schervish, M. J. (1995), Theory of Statistics, New York: Springer-Verlag.

<b>ADB 202: R and Data Analytics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45 L</b>

**UNIT I**

<b>1.</b>	<b>An Introduction to R and Basic Programming</b>	<b>5</b>
	➤ Overview	
	➤ Environment set up (Note: Only for Lab Demonstration)	
	➤ Data Types	
	➤ Variables	
	➤ Operator	
	➤ Decision making	
<b>2.</b>	<b>R Core Programming</b>	<b>5</b>
	➤ Loops	
	➤ Functions	
	➤ Strings	
	➤ Vector	
	➤ List	
	➤ Matrix	

**UNIT II**

<b>3.</b>	<b>R Core Programming</b>	<b>5</b>
	➤ Arrays	
	➤ Factors	
	➤ Data Frames	
	➤ Packages	
	➤ Data Shaping	
	➤ Library	
<b>4.</b>	<b>R Charts and Graphs</b>	<b>5</b>
	➤ R-Pie Chart	
	➤ R – Bar Chart	

- R- Box Plots
- R - Histogram
- R- Line Graph
- R- Scatter Plots

### UNIT III

- |           |  |          |
|-----------|--|----------|
| <b>5.</b> | R Data Interfaces 1  | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ R-CSV</li> <li>➤ R-Excel</li> <li>➤ R-Binary files</li> <li>➤ R-XML files</li> </ul>    |          |
| <b>6.</b> | R Data Interfaces 1  | <b>5</b> |
|           | <ul style="list-style-type: none"> <li>➤ R-JSON files</li> <li>➤ R-Web Data</li> <li>➤ R-Database</li> <li>➤ R- NoSQL</li> </ul> |          |

### UNIT IV

- |           |  |          |
|-----------|--|----------|
| <b>7.</b> | Analytics with R Statistics  | <b>6</b> |
|           | <ul style="list-style-type: none"> <li>➤ Mean, Median, Mode</li> <li>➤ Normal Distribution</li> <li>➤ Multiple regression</li> <li>➤ Supervised Model</li> <li>➤ Unsupervised Model</li> </ul> |          |
| <b>8.</b> | Algorithm  | <b>9</b> |
|           | <ul style="list-style-type: none"> <li>➤ Logistic regression</li> <li>➤ Linear Regression</li> <li>➤ Decision tree</li> <li>➤ Random Forest</li> <li>➤ SVM model</li> </ul>                    |          |



**References:**

1. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2nd Edition Paperback – Import, 28 Mar 2018
2. Python Machine Learning, Uxi (Hayden) Liu By Example Paperback,– Import, 31 May 2017
3. Data Analytics for Beginners: Basic Guide to Master Data Analytics Paperback – November 3, 2016, by Paul Kinley
4. Data Analytics Made Accessible: 2019 edition Kindle Edition by Anil Maheshwari
5. Learn R in a Day, 2013, Kindle Edition, by Steven Murray
6. Beginning R: The Statistical Programming Language, 2013 by Mark Gardener, Paperback
7. Statistical Programming in R, 5 June 2017 by K.G. Srinivasa and G.M. Siddesh Paperback

<b>ADB 203: JAVA and BioJAVA Programming (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

## UNIT I

<b>1. An Introduction to Java</b>	<b>2</b>
A Short History of Java	
➤ Features or buzzwords of Java	
➤ Comparison of Java and C++	
➤ Java Environment	
➤ Simple java program	
➤ Java Tools – jdb, javap, javadoc	
➤ Java IDE – Eclipse/NetBeans (Note: Only for Lab Demonstration)	
<b>2. An Overview of Java</b>	<b>4</b>
➤ Types of Comments	
➤ Data Types	
➤ Final Variable	
➤ Declaring 1D, 2D array	
➤ Accepting input using Command line argument	
➤ Accepting input from console (Using Buffered Reader class)	
<b>3. Objects and Classes</b>	<b>6</b>
➤ Defining Your Own Classes	
➤ Access Specifiers (public, protected, private, default)	
➤ Array of Objects	
➤ Constructor, Overloading Constructors and use of ‘this’ Keyword	
➤ Static block, static Fields and methods	
➤ Predefined class – Object class methods (equals(), toString(), hashCode(), getClass())	
➤ Creating, Accessing and using Packages	
➤ Creating jar file and manifest file	

- Wrapper Classes
- Garbage Collection (finalize() Method)

## UNIT II

### 4. Inheritance and Interface 7

- Inheritance Basics (extends Keyword) and Types of Inheritance
- Superclass, Subclass and use of Super Keyword
- Method Overriding and runtime polymorphism
- Use of final keyword related to method and class
- Use of abstract class and abstract methods
- Defining and Implementing Interfaces
- Runtime polymorphism using interface
- Object Cloning

### 5. Exception Handling 4

Dealing Errors

- Exception class, Checked and Unchecked exception
- Catching exception and exception handling
- Creating user defined exception
- Assertions

## UNIT III

### 6. Strings, Streams and Files 5

- String class and StringBuffer Class
- Formatting string data using format() method
- Using the File class
- Stream classes
- Byte Stream classes
- Character Stream Classes
- Creation of files
- Reading/Writing characters and bytes

- Handling primitive data types
- Random Access files

## 7. **Collection** **6**

Introduction to the Collection framework

- List – ArrayList, LinkedList and Vector, Stack, Queue
- Set - HashSet, TreeSet, and LinkedHashSet
- Map – HashMap, LinkedHashMap, Hashtable and TreeMap
- Interfaces such as Comparator, Iterator, ListIterator, Enumeration

## UNIT IV

## 8. **Database Programming** **6**

- The design of jdbc, jdbc configuration
- Types of drivers
- Create and Execute sql statements, query execution
- The Result Set Object

## 9. **Multithreading** **3**

- What are threads?
- Life cycle of thread
- Running and starting thread using Thread class
- Thread priorities
- Running multiple threads
- The Runnable interface
- Synchronization and interthread communication

## 10. **Networking** **2**

Networking basics – Protocol, Addressing, DNS, URL, Socket, Port

- The java.net package – InetAddress, URL, URLConnection class
- SocketServer and Socket class
- Creating a Socket to a remote host on a port (creating TCP client and server)

➤ Simple Socket Program Example

**References:**

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J.,  
Delhi, Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann,  
Gary Cornell,  
Prentice Hall, Sun Microsystems Press
5. Core Java Volume-II-Advanced Features, Eighth Edition, Cay S.  
Horstmann, Gary
6. Cornell, Prentice Hall, Sun Microsystems Press

<b>ADB 204: Science of Omics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 3 Credits</b>	<b>45L</b>

## UNIT I

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | ➤ <b>Introduction to Genomics:</b>   | <b>5</b> |
|           | ➤ Genome sequencing:   |          |
|           | ○ Strategies & Approaches  |          |
|           | ○ Conventional DNA sequencing methodologies  |          |
|           | ○ NGS(Next generation sequencing)  |          |
|           | ✓ Introduction, Next-generation sequencing methods,  |          |
|           | ✓ NGS File formats (Recognizing different file formats related to genome sequencing data), |          |
|           | ✓ NGS data quality check & cleaning,   |          |
|           | ○ Third generation sequencing  |          |
| <b>2.</b> | ➤ <b>Genome Assemblies:</b>  | <b>6</b> |
|           | ○ Reference assembly, Assembly statistics & visualization,                                 |          |
|           | ○ De-novo assemblies & assemblers for genome makeup(MIRA, RAYMETA etc)                     |          |
|           | ➤ Basic Aspects of Genome Annotation   |          |
|           | ➤ Genome mapping techniques: Genetic Mapping and Physical mapping                          |          |
|           | ➤ Structural Genomics and Functional Genomics  |          |

## UNIT II

- |           |   |          |
|-----------|---|----------|
| <b>3.</b> | <b>Genomics and Comparative genomics Databases:</b>   | <b>6</b> |
|           | ➤ Genome Databases: Genome Sequence DataBase (GSDB), Genome Database (GDB), 1000 Genomes Project , AceDB, FlyBase, UCSC Genome Browser, Wormbase, MaizeGDB, MGI |          |
|           | ➤ Comparative Genomics Databases: COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb, Gramene   |          |
|           | ➤ Genetic Disorders Databases: OMIM, OMIA, Genetic Association  |          |

Database, Genetic Disorder Guide, IGDD, DisGenet, Genetic Disorder UK

- 4. Genomics and Comparative genomics Tools: 6**
- Genome Alignments tools:BLAST2, MUMmer, PipMaker, VISTA
  - Comparison of Gene Order :GeneOrder, Gene Synteny
  - Prediction of genes: ORFs, Prediction of Signal sequences (Promoters, Primers, splice sites, UTRs etc.), Operons
  - Primer Designing Tools: Primer, Primer3, NetPrimer, Primerfinder
  - DNA/RNA Sequence Analysis: CENSOR, Gene Finder, GENEID, GenHunt, GENIE, GRAIL, ORD ID, ORF Finder, ORFGene, Pol3Scan, tRNAscan
  - Translation Tools: Translation Tool, The Protein Machine, 6 Frame Translation Tool, Reverse Translation Tools
  - Restriction Analysis Tools: WEB Cutter, ENZFINDER, TACG

### UNIT III

- 5. Transcriptomics: 6**
- Biology of Transcription
  - Search for transcription factor binding sites
  - RNA Sequencing & Techniques of RNA analysis RNA-Seq, Microarrays, Regulatory RNAs: small or large, Computational prediction of miRNA target genes, RNA Darkmatter
  - Generating Transcriptome expression Data
- 6. Metagenomics: 6**
- Introduction & Study of metagenomics
  - Metagenomics Samples
  - Qualitative and quantitative analysis of metagenome: DGGE, T-RFLP, RT-PCR, NGS
  - Sequence to identification of biodiversity
  - Metagenomics Algorithms (metagenomics data analysis): RAST, IMG/M,

## MEGAN

## UNIT IV

- |   |          |
|---|----------|
| <b>7. Metabolomics:</b>   | <b>5</b> |
| <ul style="list-style-type: none"> <li>➤ Fundamental concept,</li> <li>➤ Tools of metabolomics- Capillary electrophoresis, Gas chromatography, Electrochemical detectors</li> <li>➤ Case studies.</li> </ul>  |          |
| <b>8. Lipidomics:</b>   | <b>2</b> |
| Basic concepts and tools Case studies   |          |
| <b>9. Degradomics:</b>  | <b>3</b> |
| <ul style="list-style-type: none"> <li>➤ Techniques and concepts</li> <li>➤ Approaches to identify the protease and protease-substrate repertoires, or 'degradomes', on an organism-wide scale</li> <li>➤ Uncover new roles for proteases in vivo.</li> <li>➤ Identification of new pharmaceutical targets to treat disease (Emerging degradomic )</li> </ul> |          |

**References:**

1. She Has Her Mother's Laugh: The Powers, Perversions, and Potential of Heredity Hardcover – May 29, 2018, Dutton; 1st Edition by Carl Zimmer
2. The Gene: An Intimate History Paperback – May 2, 2017, by Siddhartha Mukherjee
3. Introduction to genomics by Arthur M. Lesk, 2007, Published by OUP Oxford
4. Bioinformatics and Functional Genomics, Textbook by Jonathan Pevsner, 2003, Wiley publication
5. Metabolomics- Methods and Protocols by Wolfram Weckwerth, Humana Press.
6. Lipidomics- Technologies and Applications by Kim Ekroos, Wiley-VCH.
7. Web/Journal Resources.
8. Transcriptomics: Expression Pattern Analysis, Virendra Gomase, Somnath Tagore; VDM Publishing, 2009 – Science



<b>ADB 205: Proteomics (C)</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1.</b>	<b>Overview of Proteomics:</b>	<b>7</b>
	➤ Introduction and scope of proteomics	
	➤ Protein separation techniques:	
	○ ion-exchange	
	○ size-exclusion and	
	○ affinity chromatography techniques	
	○ Polyacrylamide gel electrophoresis	
	○ Two dimensional PAGE for proteome analysis; Image analysis of 2D gels	
<b>2.</b>	➤ Determination of Amino acid composition	<b>1</b>
	○ Hydrolysis	
	○ Separation	
	○ Quantitative analysis	
<b>3.</b>	➤ Protein sequencing Methods	<b>1</b>
	○ Sanger's method	
	○ Edman's method	
<b>4.</b>	➤ Protein structure determination methods:	<b>3</b>
	○ X ray crystallography,	
	○ Mass spectrometry	
	○ NMR	
<b>5.</b>	<b>Proteomics tools:</b>	<b>3</b>
	➤ <u>Protein Databases</u>	
	➤ <u>Structural databases: PDB, MMDB, SCOP, CATH.</u>	
	➤ <u>3D structure visualization tools: Rasmol, Pymol, SPDBV, Cn3D</u> (already covered in ADB 106)	
	➤ Secondary structure prediction algorithms: Chou-Fasman, Jpred, Psipred, GOR methods; PHD	

- 3D structure validation databases: PROSA, Ramchandran Plot, Procheck
- Proteomics tools on Expasy

## UNIT II

- |           |   |          |
|-----------|---|----------|
| <b>6.</b> | <ul style="list-style-type: none"> <li>➤ Protein modifications: Post transcriptional and post translational</li> <li>➤ Applications of proteome analysis to drug; Protein-protein interaction (Two hybrid interaction screening)</li> <li>➤ Protein engineering, Protein chips and functional proteomics</li> <li>➤ Clinical and biomedical application of proteomics</li> <li>➤ Proteome databases</li> <li>➤ Proteomics industries</li> </ul>   | <b>9</b> |
| <b>7.</b> | <p><b>Protein-protein interaction Databases :</b></p> <ul style="list-style-type: none"> <li>➤ BIND - Biomolecular Interaction Network Database,</li> <li>➤ STRING</li> <li>➤ DIP (Database of Interacting Proteins)</li> <li>➤ PPI Server</li> <li>➤ BIND - Biomolecular Interaction Network Database</li> <li>➤ PIM -Hybrigenics</li> <li>➤ PathCalling Yeast Interaction Database</li> <li>➤ MINT - a Molecular Interactions Database</li> <li>➤ GRID - The General Repository for Interaction Datasets</li> <li>➤ InterPreTS - protein interaction prediction through tertiary structure</li> </ul> | <b>6</b> |

### References:

1. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Business Media, LLC.
2. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003,

Marcel Dekker.

3. Proteomics: Methods Express (Methods Express Series) Paperback – Import, 2007, by C. David O'Connor (Editor), B. David Hames (Editor)
4. Proteomics: A Comprehensive Study of Proteins Hardcover – Import, 30 Jun 2017 by Tanner Perry (Editor)
5. Principles of Proteomics, English, Paperback, Twyman, 2004
6. Introduction to Proteomics -Tools for the New Biology by Daniel C. Liebler, Humana Press
7. Mass Spectrometry for Biotechnology by Gary Siuzdak, Academic Press.
8. Proteomics for Biological Discovery by Timothy Veenstra and John Yates, Wiley.

<b>ADB 206: Advanced Bioinformatics</b>	<b>Total</b>
<b>Advance Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

<b>1. Linux:</b> Linux Essentials, Hands-on Exercises Querying Biological Databases with SQL	<b>3</b>
<b>2.</b> Statistics and graphing software: GraphPad Prism Creating Phylogenetic Trees with MEGA	<b>3</b>
<b>3. NGS:</b>	<b>4</b>
➤ QC'ing Reads	
➤ Mapping Next Generation Sequence Reads	
➤ Analysis of ChIP-seq data in Galaxy	
➤ Analysis of RNA-seq data in Galaxy	
➤ Analysis of differential gene expression	
➤ Finding and annotating indels in Human genome	
➤ Bedtool: Toolset for genome arithmetic	
<b>5. Structural Variant Analysis</b>	<b>5</b>
➤ Variant detection: VarScan and SVDetect	
➤ Variant annotation: TASSEL, GATK	

**UNIT II**

<b>6. Advanced Genomics</b>	<b>5</b>
Visualizing Genomes: Browsers	
Introduction to ENSEMBL	
Integrative Genomics Viewer (IGV)	
Juggling Genome Coordinates	
Gene list enrichment analysis	
Visualizing Genomes: Circos Plots	
<b>7. Introduction to Microarray</b>	<b>6</b>
DNA and Protein Array	
Microarray data Analysis pipeline	
Microarray Techniques	
Data analysis with R/Bioconductor	
Clustering and Displaying Microarray Data	
Expression Atlas	
Cool BaRC Web Tools	
<b>8. Sequence analysis using DotPlot</b>	<b>4</b>
GeneGo: Bioinformatics Technology for Systems Biology	
Visualizing Networks: Cytoscape	

**References:**

1. Next-Generation DNA Sequencing Informatics, Stuart M. Brown, New York University School of Medicine 2013 ISBN 978-1-936113-87-3
2. Chip Technology, Volume 77, Jörg D. Hoheisel, Alvis Brazma, illustrated Publisher Springer, 2002, ISBN 3540432159, 9783540432159
3. Microarray biochip technology, Mark Schena, illustrated Publisher Eaton Pub., 2000, Original from the University of California, ISBN 1881299376, 9781881299370
4. Discovering Statistics Using R, Andy Field, Jeremy Miles, Zoë Field, SAGE, 2012, ISBN 1446258467, 9781446258460
5. The R Book, Michael J. Crawley, John Wiley & Sons, 2012 ISBN 1118448944, 9781118448946
6. A Guide to MATLAB: For Beginners And Experienced Users, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Edition 2, illustrated Publisher Cambridge University Press, 2006, ISBN 1139452533, 9781139452533
7. MATLAB Guide, Desmond J. Higham, Nicholas J. Higham, Edition 2, illustrated Publisher SIAM, 2005 ISBN 0898715784, 9780898715781
8. MATLAB Primer, , Kermit Sigmon, Timothy A. Davis, Edition 7, CRC Press, 2004 ISBN 1420034952, 9781420034950
9. Foundations of Comparative Genomics, Arcady R. Mushegian, Academic Press, 2010 ISBN 0080546099, 9780080546094
10. Essentials of Genomic and Personalized Medicine, Geoffrey S. Ginsburg, Huntington F Willard, Academic Press, 2009 ISBN 0080958117, 9780080958118

<b>ADB 207: Data Mining through Machine Learning</b>	<b>Total</b>
<b>Advance Course – Theory; 2 Credits</b>	<b>30L</b>

**UNIT I**

- |  |          |
|--|----------|
| <p><b>1.</b> Introduction to Machine Learning (ML)</p> <ul style="list-style-type: none"> <li>➤ .Introduction to Artificial Intelligence &amp; Machine Learning,</li> <li>➤ Elements of ML,</li> <li>➤ Life Cycle of ML,</li> <li>➤ Applications of Machine Learning.</li> </ul> | <b>2</b> |
| <p><b>2.</b> Introduction to Data Mining</p> <ul style="list-style-type: none"> <li>➤ Data Science and Visualization</li> <li>➤ Important Python Libraries</li> <li>➤ pandas</li> <li>➤ numpy</li> <li>➤ scikit-learn</li> <li>➤ matplotlib</li> <li>➤ seaborn.</li> </ul>       | <b>3</b> |
| <b>3.</b> Biological Data and its Application in Machine Learning  | <b>1</b> |
| <p><b>4.</b> Genetic Algorithm</p> <ul style="list-style-type: none"> <li>➤ What is genetic algorithm?</li> <li>➤ Types of genetic algorithm</li> <li>➤ Introduction to feature selection</li> </ul>   | <b>1</b> |
| <p><b>5.</b> Introduction to Linear Regression</p> <ul style="list-style-type: none"> <li>➤ loss functions</li> <li>➤ over fitting</li> <li>➤ gradient descent</li> </ul>  | <b>3</b> |
| <p><b>6.</b> Classification Algorithm</p> <ul style="list-style-type: none"> <li>➤ Logistic Regression,</li> <li>➤ Support Vector Machine</li> </ul>   | <b>6</b> |

- Naïve Bayes Classifier.

## UNIT II

<b>7.</b>	Introduction & Types of Unsupervised Learning	<b>1</b>
<b>8.</b>	Neural Computation <ul style="list-style-type: none"> <li>➤ Introduction to Neural computation</li> <li>➤ Neural network model</li> </ul>	<b>2</b>
<b>9.</b>	Evolutionary computation <ul style="list-style-type: none"> <li>➤ Introduction to evolutionary Processes</li> <li>➤ Genetic Operators</li> <li>➤ Evolutionary Optimization Algorithms</li> </ul>	<b>4</b>
<b>10.</b>	Fuzzy Computation <ul style="list-style-type: none"> <li>➤ Introduction</li> <li>➤ Fuzzy sets &amp; systems</li> <li>➤ Ant colony Optimization (ACO)</li> </ul>	<b>3</b>
<b>11.</b>	Introduction to Human Language Technology & Machine Learning <ul style="list-style-type: none"> <li>➤ Stochastic Grammar &amp; linguistics, Language models</li> <li>➤ Statistical language Model,</li> <li>➤ Markov model</li> <li>➤ Hidden Markov Model</li> </ul>	<b>2</b>
<b>12.</b>	Optimization Techniques <ul style="list-style-type: none"> <li>➤ Conjugate Gradient,</li> <li>➤ Newton Raphson,</li> <li>➤ Steepest descent,</li> <li>➤ Simulated annealing</li> </ul>	<b>2</b>

**References:**

1. Data Mining: Concepts and Techniques by Han and Kamber, Morgan Kaufmann.
2. Machine Learning by Tom Mitchell, McGraw Hill.
3. Data Mining: Practical Machine Learning Tools and Techniques by Witten and Frank, Elsevier.
4. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G. Cambridge Univ. Press, 1998.
5. Optimization Theory and Application by Rao, S.S., 1984.
6. Discrete optimization by Parker, R. G. & Rardin, R. L., 1988.
7. Stochastic simulation by Repley, Brian D, Wiley series, 1987.
8. Methods of microarray data analysis III by Johnson, K.F. & Lin, S.M. Boston. Kluwer academic publishers, 2003.
9. Exploration and analysis of DNA microarray and protein array data by Amaratunga, D. & Cabrera, J. New Jersey. John Wiley & Sons Inc., 90 BVDU-RGITBT-M.Sc. BIOINFORMATICS- SEM III 2004.
10. Ant colony optimization by Dorigo, Marco & Stutzle, Thomas New Delhi, Prentice-Hall of India Pvt Ltd, 2004.
11. Data mining: introductory and advanced topics by Dunham, M.H.: New Delhi, Pearson Education, 2003.
12. An introduction to bioinformatics algorithms by Jones, Neil.C. & Pevzner, Pavel A. New Delhi, Anne Books, 2005.
13. Fuzzy sets and fuzzy logic: theory and applications by Klir, G.J. & Yuan Bo, New Delhi. Printice Hall of India, 2002. 81-203-1136-1.
14. Fuzzy and neuro-fuzzy systems in medicine by Teodorrescu, Horia Nicolai, Kandel, Abraham. & Jain, Lakhmi, C New York, CRS Press



<b>ADB 208:Molecular Modeling&amp; Drug Designing</b>	<b>Total</b>
<b>Advance Course –Theory;3 Credits</b>	<b>45L</b>

**UNIT I**

- |    |  |          |
|----|--|----------|
| 1. | Homology Modeling, fold recognition, and ab-initio structure prediction methods - protocols/algorithms.  | <b>3</b> |
| 2. | General features- bond stretching, angle bending, improper torsions, cross terms, non-bonded interactions, point charges, calculation of atomic charges, polarization, Van Der Waals interactions, hydrogen bond interactions, Water models. | <b>3</b> |
| 3. | Types of force field - all atoms force field, united atom force field, etc.  | <b>2</b> |
| 4. | Molecular Energy minimization methods:steepest descent, conjugate gradient– derivatives, First order steepest decent and conjugate gradients.  | <b>3</b> |

**UNIT II**

- |    |   |          |
|----|---|----------|
| 5. | Second order derivatives Newton-Raphson, Minima, maxima saddle points and convergence criteria.-non derivatives minimization methods, the simplex.                    | <b>3</b> |
| 6. | Molecular Dynamics Simulation:Newtonian dynamics, Periodic boundary conditions and minimum image convention, Potential truncation, Neighbor list, Force calculations. | <b>3</b> |
| 7. | Classical Monte Carlo: Random numbers, Evaluating integrals using random numbers, Importance sampling, Metropolis algorithm.  | <b>3</b> |
| 8. | Analysis of simulated trajectories: Radial distribution functions, Self diffusion coefficient.  | <b>3</b> |

**UNIT III**

- |    |  |           |
|----|--|-----------|
| 9. | <b>Drug discovery and QSAR</b>                                   | <b>11</b> |
|    | ➤ Drug discovery process, role of Bioinformatics in drug design. |           |

- Target identification and validation, lead optimization and validation.
- Structure-based drug design and ligand based drug design.
- Concept of *de novo* design for lead identification.
- Structure Activity Relationship: QSARs and QSPRs, QSAR Methodology, Training data, test data and external validation data, applicability domain in QSAR
- 3D QSAR techniques: CoMFA and CoMSIA.

## UNIT IV

### 10. Pharmacophore and molecular docking 11

- Pharmacophore features, Pharmacophore model, Receptor-based and ligand-based pharmacophore modeling.
- Virtual screening based on pharmacophore model.
- Receptor site, molecular docking study, flexible docking, rigid docking, molecular interactions.
- Scoring functions, correlation between ligand-based and receptor-based studies.

#### References:

1. Molecular Modeling Principles and Applications (2nd Ed.) by Andrew R. Leach, 2001, Prentice Hall, USA.
2. Principles of Protein Structure by G. E. Schulz, 2009, Springer
3. Textbook of Structural Biology by Anders Liljas, Lars Liljas, Jure Piskur and GÅranLindblom, World Scientific Publishic Co. Pvt. Ltd.
4. Structural Bioinformatics, Edited by Jenny Gu, Philip E. Bourne, Wiely Blackwell
5. Computational Structural Biology: Methods and Applications by orstenSchwede, TorstenSchwede, Manuel C. Peitsch, 2008, World Scientific Publishing Company.
6. Molecular Modeling Of Nucleic Acids, Leontis N.B. and SantaLucia J. Jr. (eds), 1998, American Chemical Society.
7. Molecular Modeling of Proteins by Andreas Kukol, 2008, Humana Press.
8. Molecular Modeling and Simulation: An Interdisciplinary Guide by Schlick T., 2012, Springer.
9. Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology)by Russell Schwartz, The MIT Press, Cambridge, Massachusetts, London, England

<b>ADB 209: SAS and Data Analytics lab (C)</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Core Course Practical)</b>	<b>20P</b>
<b>1. SAS based practical</b>	<b>10</b>
<b>2. Data Analysis lab</b>	<b>10</b>
<ul style="list-style-type: none"> <li>➤ Install R from CRAN and setup R studio</li> <li>➤ Write a Program to print list of Student, Marks and Percentage considering <ul style="list-style-type: none"> <li>○ Different data types variables in R using logical, numeric</li> <li>○ integer, complex, character and raw</li> <li>○ Valid/invalid variables declaration</li> <li>○ Variable assignment</li> <li>○ Getting variables in environment</li> <li>○ Class of variables</li> <li>○ Deleting variables</li> <li>○ Vectors declaration</li> <li>○ Different operators demonstration using Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Miscellaneous Operators</li> <li>○ if-else demonstration for negative, positive and zero number test</li> <li>○ Switch case for different operations</li> </ul> </li> <li>➤ Write program to classify odd and even number to demonstrate For, While and Repeat loops with break and next keywords</li> <li>➤ Create a function to calculate Area and circumference of circle/rectangle <ul style="list-style-type: none"> <li>○ calling a function with/without arguments</li> <li>○ calling by argument position and names</li> </ul> </li> <li>➤ Write R program to demonstrate string functions in R , String manipulations in R <ul style="list-style-type: none"> <li>○ Vector declaration</li> <li>○ Accessing vector elements</li> </ul> </li> </ul>	

- Vector manipulations
- Create a list and modify
  - Name elements
  - Access elements
  - Manipulate the list
  - Merging list
  - convert list to vector
- Create a numeric matrix
  - Access elements
  - Matrix computation
  - Demonstration
- Create array name columns, rows, matrix, Access array elements  
matrix computations
- Create a categorical vector and convert it to
  - Factor
  - Factor validations
  - Generating levels
  - Order change
- Create a data frame
  - Get structure and summary
  - Extract data from DF
  - Expand the data frame add column and rows
  - Check packages
  - Install packages
  - Load package
  - Join cols/rows in DF
  - Merge DF
  - Melting and casting
- Read/write files and access from
  - CSV files
  - Binary file
  - Xls file

- Read access and manipulate JSON data
  - Download and load data from website
  - Connect to mysql/oracle DB and access data from table
  - Working with MongoDB/Redis
- Create data records and create
  - Plot Pie chart for Profit sharing among individuals. Percentage plotting , pie chart
  - Plot a bar graph for monthly revenue. Group bar graph/stacked chart
  - Plot a boxplot for match data mpg vs cylinder
  - Create a vector and plot a histogram , Ranged histogram
  - Create a vector and plot line, point both graph
  - Plot scatterplot for mtcars\$wt and mtcars\$mpg
- Create data from Hospital, Patient, and disease use case
  - Calculate mean, median, mode of a distribution for data
  - Demonstration of dnorm, pnorm, qnorm and rnorm
  - Demonstration of multiple regression with mtcars dataset
- Get records and perform below
  - Use case of admission into university
  - Use case for weight calculation
  - Use case for Titanic survival prediction
  - Use case for Car acceptability
  - Use case for Heart disease recognition with caret package

### References:

1. Data Analysis with R: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2nd Edition Paperback – Import, 28 Mar 2018
2. Python Machine Learning, Uxi (Hayden) Liu By Example Paperback, – Import, 31 May 2017
3. Data Analytics for Beginners: Basic Guide to Master Data

Analytics Paperback – November 3, 2016, by Paul Kinley

4. Data Analytics Made Accessible: 2019 edition Kindle Edition by Anil Maheshwari
5. Learn R in a Day, 2013, Kindle Edition, by Steven Murray
6. Beginning R: The Statistical Programming Language, 2013 by Mark Gardener, Paperback
7. Statistical Programming in R, 5 June 2017 by K.G. Srinivasa and G.M. Siddesh Paperback

<b>ADB 210: JAVA and BioJAVA programming Lab (C)</b>		<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>		<b>20 P</b>
<b>1.</b>	➤ Class and Method Implementation by – <ul style="list-style-type: none"> <li>○ Method overloading</li> <li>○ Constructor Overloading</li> <li>○ Static members and methods</li> </ul>	<b>2</b>
<b>2.</b>	➤ Implementation of Multiple Inheritance using Interface.	<b>1</b>
<b>3.</b>	➤ Implementation of Inheritance by <ul style="list-style-type: none"> <li>○ Method overriding</li> <li>○ super constructor and super keyword</li> <li>○ abstract class</li> </ul>	<b>2</b>
<b>4.</b>	➤ Implementation of Package	<b>1</b>
<b>5.</b>	➤ Program to read basic data types from keyboard using Scanner/BufferedReader and check the entered values' data type for its appropriateness.	<b>1</b>
<b>6.</b>	➤ Exception Handling for – <ul style="list-style-type: none"> <li>○ Divide by zero error</li> <li>○ Null values</li> </ul>	<b>2</b>
<b>7.</b>	➤ Program to read the data from user and save it to two different files, display the contents and exchange the contents of those two files using IO package.	<b>2</b>
<b>8.</b>	➤ Synchronization of threads. <ul style="list-style-type: none"> <li>➤ Develop an animation program using Multithreading viz. Bouncing Ball.</li> <li>➤ Implementation of Client / Server mechanism using Socket classes.</li> <li>➤ Design Database program for Employee details and implement INSERT,</li> <li>➤ SELECT, DELETE, UPDATE queries.</li> <li>➤ Design concurrent server that will handle multiple clients using</li> <li>➤ Multithreading.</li> </ul>	<b>9</b>

- Develop a simple client-server application using RMI.
- Programs using IO streams.
- Programs using files.

**References:**

1. Introduction to Bioinformatics by Attwood, T.K. & Parry-Smith, D.J.,  
Delhi, Complete reference Java by Herbert Schildt(5th edition)
2. Java 2 programming black books, Steven Horlzner
3. Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4. Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann,  
Gary Cornell,  
Prentice Hall, Sun Microsystems Press
5. Core Java Volume-II-Advanced Features, Eighth Edition, Cay S.  
Horstmann, Gary  
Prentice Hall, Sun Microsystems Press
6. Cornell, Prentice Hall, Sun Microsystems Press



<b>ADB 211: Omics Analysis Lab (C)</b>	<b>Total</b>
<b>Core Course – Theory; 2 Credits</b>	<b>20P</b>
1. Browsing & viewing genome data	<b>1</b>
Ensembl@EBI	
➤ MapViewer@NCBI	
2. Explore comparative genomics resources and NCBI and EBI	<b>1</b>
3. Viewing regions exhibiting Synteny	<b>1</b>
➤ Genome assembly	
➤ Genome Annotation:	
Using integrated genome annotation servers such as the	
server	
developed at IMTech, Chandigarh	
( <a href="http://imtech.res.in/raghava/gp.html">http://imtech.res.in/raghava/gp.html</a> )	
4. Gene Prediction and Gene Modeling	<b>2</b>
➤ Prediction of genes and gene structures (gene modeling)	
using online (web) servers of different methods tailored for	
prokaryotic and eukaryotic organisms such as GLIMMER,	
GeneMark, Grail, GENSCAN etc. Interpretation of results	
and comparison with known gene models (where available).	
Evaluation of accuracy of the methods.	
➤ Prediction of promoters using methods such as Neural	
Network Promoter Prediction (NNPP) at Berkeley	
Drosophila Genome Project server, Genome inspector for	
coADBned analysis of multiple signals in genomes etc.	
Using Promoter databases.	
➤ Prediction of alternate splice sites using methods such as	
Splice Site Prediction by Neural Network (at Berkeley	
Drosophila Genome Project server), GenScan, NetGene2	
GeneSplicer etc. Prediction of PCR primers using Primer 3,	
ePCR etc.	

- |     |   |   |
|-----|---|---|
| 5.  | Comparison of full / partial genomic sequences using following methods to identify conserved genes and map/compare the annotations of the two sequences | 2 |
|     | ➤ BLAST2  |   |
|     | ➤ MegaBLAST and Discontiguous MegaBLAST   |   |
|     | ➤ MUMmer  |   |
|     | ➤ PipMaker  |   |
|     | ➤ VISTA   |   |
|     | ➤ Artemis   |   |
| 6.  | Compare gene order of given genomic sequences using the GeneOrder tool  | 1 |
| 7.  | Explore and query the comparative genomics databases: COG, VirGen, CORG, HOBACGEN, Homophila, XREFdb, Gramene etc.                                      | 1 |
| 8.  | Explore and query SNP and SNP-related databases   | 1 |
| 9.  | RNA seq data Analysis   | 1 |
| 10. | Transcriptomics data analysis   | 1 |
| 11. | Metagenomics Data Analysis  | 1 |
| 12. | Explore and query the protein-protein interaction databases: DIP, PPI Server, BIND, PIM, PathCalling, MINT, GRID, InterPreTS                            | 2 |
| 13. | Gene annotation of unknown sequence   | 1 |
| 14. | Functional Genomics   | 4 |
- Using primary databases (such as UniProt) and derived databases such as InterPro, PRINTS, BLOCKS, PRODOM, Pfam etc. along with advanced sequence analysis tools such as profiles searches, pattern searches for function annotation of genomic sequences.
- Validation and verification of results for known case studies
- Using sequence-based and structure-based Function Annotation Servers such as: ProKnow (<http://www.doe-ADB.ucla.edu/Services/ProKnow/>)
  - Joined Assembly of Function Annotations (JAFA) at <http://jafa.burnham.org/learnMore.html> etc. which are integrated

services for function annotation

- ProFunc (<http://www.ebi.ac.uk/thornton-srv/databases/ProFunc>)

### References:

1. Fundamentals of Data Mining in Genomics and Proteomics, By Werner Dubitzky, Martin Granzow, Daniel P. Berrar, 2007, Springer Science + Bussiness Media, LLC.
2. Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery edited by Joanna S. Albala, Ian Humphery-Smith, ISBN-0-8247-4212-1, 2003, Marcel Dekker.
3. Proteomics: Methods Express (Methods Express Series) Paperback – Import, 2007, by C. David O'Connor (Editor), B. David Hames (Editor)
4. Principles of Proteomics, English, Paperback, Twyman, 2004.
5. Dale Jeremy, Schantz Malcolm Von. From genes to genomes: concepts and applications of DNA technology. Publisher: John Wiley & Sons Ltd., 2007. ISBN:9780470017340.
9. Brown, T.A., Genomes, 3rd edition Garland Science publishers, 2006. ISBN: 1859960294.
10. Primrose Sandy B., Twyman Richard. Principles of Gene Manipulation and Genomics. Publisher: Wiley-Blackwell. 7th edition 2006. ISBN: 1405135441.

<b>ADB 212: Advanced Bioinformatics Lab</b> <b>(2 Credits, 1 P, 4.00 Hr., Advance Course Practical)</b>	<b>Total 20P</b>
<b>1. Linux:</b> Linux Essentials, Hands-on Exercises Querying Biological Databases with SQL	<b>2</b>
<b>2.</b> Statistics and graphing software: GraphPad Prism Creating Phylogenetic Trees with MEGA	<b>2</b>
<b>3. NGS:</b>	<b>4</b>
➤ QC'ing Reads	
➤ Mapping Next Generation Sequence Reads	
➤ Analysis of ChIP-seq data in Galaxy	
➤ Analysis of RNA-seq data in Galaxy	
➤ Analysis of differential gene expression	
➤ Finding and annotating indels in Human genome	
➤ Bedtool: Toolset for genome arithmetic	
<b>5. Structural Variant Analysis</b>	<b>2</b>
➤ Variant detection: VarScan and SVDetect	
➤ Variant annotation: TASSEL, GATK	
<b>6. Advanced Genomics</b>	<b>4</b>
Visualizing Genomes: Browsers	
Introduction to ENSEMBL	
Integrative Genomics Viewer (IGV)	
Juggling Genome Coordinates	
Gene list enrichment analysis	
Visualizing Genomes: Circos Plots	
<b>7. Introduction to Microarray</b>	<b>4</b>
DNA and Protein Array	
Microarray data Analysis pipeline	
Microarray Techniques	
Data analysis with R/Bioconductor	
Clustering and Displaying Microarray Data	

- Expression Atlas  
Cool BaRC Web Tools
8. Sequence analysis using DotPlot 2
- GeneGo: Bioinformatics Technology for Systems Biology  
Visualizing Networks: Cytoscape

### References:

1. Next-Generation DNA Sequencing Informatics, Stuart M. Brown, New York University School of Medicine 2013 ISBN 978-1-936113-87-3
2. Chip Technology, Volume 77, Jörg D. Hoheisel, Alvis Brazma, illustrated Publisher Springer, 2002, ISBN 3540432159, 9783540432159
3. Microarray biochip technology, Mark Schena, illustrated Publisher Eaton Pub., 2000, Original from the University of California, ISBN 1881299376, 9781881299370
4. Discovering Statistics Using R, Andy Field, Jeremy Miles, Zoë Field, SAGE, 2012, ISBN 1446258467, 9781446258460
5. The R Book, Michael J. Crawley, John Wiley & Sons, 2012 ISBN 1118448944, 9781118448946
6. A Guide to MATLAB: For Beginners And Experienced Users, Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, Edition 2, illustrated Publisher Cambridge University Press, 2006, ISBN 1139452533, 9781139452533
7. MATLAB Guide, Desmond J. Higham, Nicholas J. Higham, Edition 2, illustrated Publisher SIAM, 2005 ISBN 0898715784, 9780898715781
8. MATLAB Primer, , Kermit Sigmon, Timothy A. Davis, Edition 7, CRC Press, 2004 ISBN 1420034952, 9781420034950
9. Foundations of Comparative Genomics, Arcady R. Mushegian, Academic Press, 2010 ISBN 0080546099, 9780080546094
10. Essentials of Genomic and Personalized Medicine, Geoffrey S. Ginsburg, Huntington F Willard, Academic Press, 2009 ISBN 0080958117, 9780080958118

<b>ADB 213: Data Mining through Machine Learning Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Advance Course Practical)</b>	<b>20P</b>

Implementation of following Algorithms using Python Programming

**20**

1. Logistic Regression,
2. Support Vector Machine,
3. Naïve Bayes Classifier. :
4. K- Nearest Neighbors,
5. Random Forest Classifier.
6. K-means Clustering
7. Association Rule Mining
8. Ant colony optimization
9. Simulated annealing algorithm for energy minimization
10. Estimator of transition probabilities for markov models based—  
on various sample sizes

#### References:

1. Data Mining: Concepts and Techniques by Han and Kamber, Morgan Kaufmann.
2. Machine Learning by Tom Mitchell, McGraw Hill.
3. Data Mining: Practical Machine Learning Tools and Techniques by Witten and Frank, Elsevier.
4. Biological Sequence Analysis: probabilistic models of proteins and nucleic acids by Durbin, R., Eddy, S., Krogh, A. & Mitchison, G. Cambridge Univ. Press, 1998.
5. Optimization Theory and Application by Rao, S.S., 1984.
6. Discrete optimization by Parker, R. G. & Rardin, R. L., 1988.
7. Stochastic simulation by Repley, Brian D, Wiley series, 1987.
8. Methods of microarray data analysis III by Johnson, K.F. & Lin, S.M. Boston. Kluwer academic publishers, 2003.
9. Exploration and analysis of DNA microarray and protein array data by Amaratunga, D. & Cabrera, J. New Jersey. John Wiley & Sons Inc., 90 BVDU-RGITBT-M.Sc. BIOINFORMATICS- SEM III 2004.
10. Ant colony optimization by Dorigo, Marco & Stutzle, Thomas New Delhi, Prentice-Hall of India Pvt Ltd, 2004.
11. Data mining: introductory and advanced topics by Dunham, M.H.: New Delhi, Pearson Education, 2003.
12. An introduction to bioinformatics algorithms by Jones, Neil.C. & Pevzner, Pavel A. New Delhi, Anne Books, 2005.
13. Fuzzy sets and fuzzy logic: theory and applications by Klir, G.J. & Yuan Bo, New Delhi. Printice Hall of India, 2002. 81-203-1136-1.

<b>ADB 214: Molecular Modeling &amp; Drug Designing Lab</b>	<b>Total</b>
<b>(2 Credits, 1 P, 4.00 Hr., Advance Course Practical)</b>	<b>20P</b>

**Molecular Modeling:**

- Homology Modeling **10**
- Conformational Analysis
- Molecular dynamics simulations
- Molecular Dynamics analysis

**Drug Design:**

- Development of 2D QSAR models. **10**
- Development of 3D QSAR models.
- Pharmacophore model.
- Molecular docking study.
  - Rigid Docking
  - Flexible Docking
  - Self Docking
- Virtual Screening.

**References:**

1. Molecular Modeling Principles and Applications (2nd Ed.) by Andrew R. Leach, 2001, Prentice Hall, USA.
2. Principles of Protein Structure by G. E. Schulz, 2009, Springer
3. Textbook of Structural Biology by Anders Liljas, Lars Liljas, Jure Piskur and GÅran Lindblom, World Scientific Publishic Co. Pvt. Ltd.
4. Structural Bioinformatics, Edited by Jenny Gu, Philip E. Bourne, Wiely Blackwell

5. Computational Structural Biology: Methods and Applications by orsten Schwede, Torsten Schwede, Manuel C. Peitsch, 2008, World Scientific Publishing Company.
6. Molecular Modeling Of Nucleic Acids, Leontis N.B. and SantaLucia J. Jr. (eds), 1998, American Chemical Society.
7. Molecular Modeling of Proteins by Andreas Kukol, 2008, Humana Press.
8. Molecular Modeling and Simulation: An Interdisciplinary Guide by Schlick T., 2012, Springer.
9. Biological Modeling and Simulation: A Survey of Practical Models, Algorithms, and Numerical Methods (Computational Molecular Biology) by Russell Schwartz, The MIT Press, Cambridge, Massachusetts, London, England.



**BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (India)**

**Faculty of Science: Doctor of Philosophy (Ph.D.)**

**Syllabus for Ph.D. Course Work (2017)**

**For subjects under the Faculty of Science**

**(Biotechnology)**

**Course work Details-**

Paper I	Research Methodology	4 credits
Paper II	Recent advances in the Biotechnology	4 credits
Paper III	Review of Literature on the proposed work In the form of presentations- a) Presentation on review of literature - 2 credits b) Presentation on the area of research - 2 credits	4 credits
<b>Total – 12 credits</b> (One credit being equivalent to 15 clock hours)		

**1. QUANTITATIVE METHODS**

**(15)**

**i. Collection of Data:** Introduction, Primary and secondary data, methods of collecting primary data, Drafting or framing the questionnaire, Sources of secondary data, Precautions in the use of secondary data.

**ii. Classification and Tabulation:** Introduction: Organization of data, Classification, Frequency distribution, Basic principles for forming a grouped frequency distribution, Cumulative frequency distribution, Bivariate frequency distribution, Tabulation meaning and importance

**iii. Graphic Representation Of Data:** Introduction, Difference between diagrams and graphs, Diagrammatic representation, Graphic representation of data, Limitations of diagrams and graphs.

**iv. Correlation Analysis:** Introduction, methods of studying correlation, scatter diagram method, Karl Pearson's method of correlation (covariance method), probable error, correlation in bivariate frequency table, rank correlation method, method of concurrent deviations, coefficient of determination, lag and lead correlation.

**v. Linear Regression Analysis:** Introduction, Linear and non linear regression, Lines of Regression, Coefficient of regression, To find the mean value from the two lines of regression, To find the regression coefficients and the correlation coefficient from the two lines of regression, Standard error of an estimate, Regression equations for a bivariate frequency table, Correlation analysis vs Regression analysis

**2. COMPUTER APPLICATIONS**

**(15)**

**i. Computers in research:**

- i. Role of computers in Conceptual phase: role of computers in literature review.
- ii. Role of computers in Design and planning phase: role of computers in sample size calculations.
- iii. Role of computers in Empirical phase: Data storage.
- iv. Role of computers in Analytic phase: Data analysis
- v. Role of computers in Dissemination phase: Research publishing
- vi. References and computer

**ii. Research Methodology and Computer applications:**

Introduction, source of data, experimental technique, methods of data collection measurement of scaling techniques, sampling methods, probability, probability distribution estimation and testing, nonparametric tests, contingency tests, computer applications

**3. Review of Literature relevant field, Research ethics:**

**(15)**

**i. Research ethics:** What is ethics, The development of ethics, The growth of ethics, Ethics in the 21<sup>st</sup> century, Making decisions,.

**ii. Environmental ethics:** Two current themes in environmental ethics.

Three current issues in environmental ethics: Terrestrial and aquatic pollution, Global climate change, Environmental degradation and loss of biodiversity.

**iii. How to write a Thesis**

**a. What is PhD**

**b. Introduction :** Status of a thesis, Get advice, Read before you write, Time table and mile stones, content of a thesis, What belongs into which section, Time: past and present tense, Graphs and figures, Tables, Format, Further information

**c. Writing a thesis:** Structuring the thesis, Sign posting, Code of practice for research, Content Chapters

The Exit strategy, Front matter, back matter and appendices, Notation, glossary and index, Look and feel, tone, grammar and style,

**d.The viva:** Role of the participants, Selecting the examiners,Preparing for viva, On the Day ,Corrections if any

#### **iv.Proposals to various funding agencies**

**a. Developing a grant proposal:** Preparation, Initial proposal development, Developing Ideas for the community support, Identification of a funding resource, Getting organized to write the proposal, Review, Criticism, Signature, Neatness ,Mailing .

**b. Writing the grant proposal :**The Basic components of a proposal, The Proposal summary: Outline of project ,Introduction: Presenting a credible applicant or organization ,The problem statement: stating the purpose at hand ,Project objectives: Goals and desired outcome ,Program methods and program design: A Plan of action, Evaluation: product and process ,Future funding: long-term project ,The proposal budget: planning the budget, Guidelines and literature .

#### **4.Training and field work:**

**(15)**

##### **i.Biosafety:**

a. General principles, b .Biosafety guidelines, c. Basic laboratories – Biosafety Levels 1 and 2

d. The containment laboratory – Biosafety Level 3, e. The maximum containment laboratory – Biosafety Level 4 ,f. Guidelines for laboratory/facility commissioning ,g Guidelines for laboratory/facility certification ,hLaboratory biosecurity,i. Laboratory biosecurity concepts,j. Laboratory equipment

k. Safety equipment ,l Good microbiological techniques ,m. Laboratory techniques ,n. Contingency plans and emergency procedures. Chemical, fire and electrical safety ,p.. Hazardous chemicals ,q. Additional laboratory hazards ,r.Safety organization and training ,s. Safety for support staff, t. Training programmers, u. Safety checklist.

##### **ii.Plagiarism:**

a. Introduction: Forms of plagiarism, Why does plagiarism matter? Why should you avoid plagiarism? What happens if you are thought to have plagiarised? Does this mean that I shouldn't use the work of other authors? Does every statement in my essay have to be backed up with references? Does this only matter in exams?, Unintentional plagiarism, Examples of plagiarism

B .Understand what plagiarism is and why it happens

c. Fully reference and acknowledge the work of others

d. Use your own words and develop your own writing style

e. Organize and structure your work in your own way

f. Don't be afraid to express your own views

g. Managing references in your thesis

h. Use of published work within research degree theses,

I. Penalties for plagiarism

##### **iii. Patent:**

**a .Introduction:**IPR, Governing laws in India for IPR, What is an innovation or invention, The patent system, Novelty and inventiveness, Commercialization of invention, Disclosing an invention, Academic research, Applying for patent, Patent specifications, , Patent Examination, Infringement.

**b.About the patent:** What is a patent, Term of patent, Territorial scope, What is patentable, Patentability searches, Information required for conducting research, Why one should go for patent, Who can apply for patent, What is not patentable invention, Documents required for filling a patent, What is patent specification.

**c.FAQs:**What does a patent application contain: Bibliographic, Background of the invention or state of art, Description of the invention, Claims. What is the Date of priority, What happens to the application after filling ,How does a patent get expired, What is traditional knowledge, What is prior information content, What is Patent cooperation treaty,

## BOOKS RECOMMENDED

1. Anekwe, T.D. 2010. Profits and plagiarism: The case of medical ghostwriting. *Bioethics* 24(6): 267–272.
2. Baždarić, K., L. Bilić-Zulle, G. Brumini, and M. Petrovečki. 2012. Prevalence of plagiarism in recent submissions to the Croatian Medical Journal. *Science and Engineering Ethics* 18: 223–239.
3. Brogan, M. 1992. Recycling ideas. *College and Research Libraries* 52(5): 453–464.
4. Bruton, S.V. 2014. Self-plagiarism and textual recycling: Legitimate forms of research misconduct. *Accountability in Research: Policies and Quality Assurance* 21(3): 176–197. Butler, D. 2010. Journals step up plagiarism policing. *Nature* 466(7303): 167.
5. Chandrasoma, R., C. Thompson, and A. Pennycook. 2004. Beyond plagiarism: Transgressive and nontransgressive intertextuality. *Journal of Language, Identity and Education* 3(3): 171–193.
6. Couzin-Frankel, J., and J. Grom. 2009. Plagiarism sleuths. *Science* 324(5930): 1004–1007.
7. DeVoss, D., and A.C. Rosati. 2002. “It wasn’t me, was it?” Plagiarism and the web. *Computers and Composition* 19: 191–203.
8. Gupta, S.C. (2013) Fundamentals of statistics .Himalaya Publishing House
9. Khan, B.A. 2011. Plagiarism: An academic theft. *International Journal of Pharmaceutical Investigation* 1(4): 255. Kothari.C.R. Research Methodology and Techniques, 2nd edition
10. Mahajan, B.K. Methods in Biostatistics: For Medical students and Research workers. 6<sup>th</sup> edition
11. Pecorari, D. 2012. Textual plagiarism: How should it be regarded? *Office of Research Integrity Newsletter* 20(3): 3,10.
12. Rathod, S.D. 2012. Plagiarism: the human solution. *Office of Research Integrity Newsletter* 20(3): 1,7.
13. Roig, M. 2006. Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. Office of Research Integrity 2006.
14. Samuelson, P. 1994. Self-plagiarism or fair use. *Communications of the ACM* 37(8): 21–
15. Sox, H. C. 2012. Plagiarism in the digital age. *Office of Research Integrity Newsletter* 20(3): 1,6.
16. Sun, Y.C. 2012. Does text readability matter? A study of paraphrasing and plagiarism in English as a foreign language writing context. *The Asia-Pacific Education Researcher* 21(2): 296
17. Sunder Rao P.S.S, J. Richard. Introduction to Biostatistics and Research Methodology, 4<sup>th</sup> edition
18. Vitse, C.L., and G.A. Poland. 2012. Plagiarism, self-plagiarism, scientific misconduct and VACCINE: Protecting the science and the public. *Vaccine* 30(50): 7131–7133. doi: Wager, L. 2011.
19. How should editors respond to plagiarism? COPE discussion paper. 26th April, 2011
20. World Health Organization, Laboratory biosafety manual. – 3rd ed, Wiley Int
21. Yilmaz, I. 2007. Plagiarism? No, we’re just borrowing better English. *Nature* 449(7163): 658.
22. Zhang, Y. 2010. Chinese journal finds 31% of submissions plagiarized. *Nature* 467(7312): 153.

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## Paper II

### Pre-Ph D Course Structure for Specialized Subject in Biotechnology 2017-2018 Credits : 4 (Module 1-3 = 2 Crs, Module 4 = 2 Crs)

	No of Lectures
<b>Module 1: An Overview of Biotechnology</b>	<b>11</b>
<ul style="list-style-type: none"><li>- History &amp; landmark Discoveries</li><li>- Applications of Biotechnology in agriculture, environment and health</li></ul>	
<b>Module 2: Basics of Genetic Engineering &amp; Tissue Culture</b>	<b>15</b>
<ul style="list-style-type: none"><li>- RNA, DNA, Flow of Genetic information, Gene &amp; its Expression &amp; Regulation</li><li>- An Overview of r-DNA Technology, Vectors and Promoters</li><li>- Plant &amp; Animal Tissue Cultures</li></ul>	
<b>Module 3: Principles &amp; Applications of Tools &amp; Techniques in Biotech Research</b>	<b>17</b>
<ul style="list-style-type: none"><li>- Microscopic Techniques: Electron Microscopy, Confocal &amp; Fluorescence, histology and immunohistochemistry</li><li>- Chromatographic Techniques : GC – MS, LC – MS</li><li>- Molecular Techniques: Types of PCR, Real - Time PCR, Microarray, DNA Sequencing and Bioinformatics</li><li>- Protein Analysis; Western Blotting, ELISA, Mass Spectrometry</li><li>- Nanotechnology; Types of nanomaterials, their classification, properties, overview of synthetic and biological methods, applications</li></ul>	
<b>Module 4: Industrial Biotechnology</b>	<b>17</b>
<ul style="list-style-type: none"><li>- Genetically Modified Organisms in Agriculture, Environment and Health</li><li>- Molecular Diversity &amp; Taxonomy and Bio-prospecting</li><li>- Fermentation Technology - I, Biofuels, Single Cell Protein, secondary metabolites, biofertilizers</li><li>- Bioremediation, Vaccines and therapeutics</li><li>- Applications of biotechnology in food, agriculture, environment and health</li></ul>	



**BHARATI VIDYAPEETH DEEMED UNIVERSITY,**  
**PUNE (India)**

**Faculty of Science: Doctor of Philosophy (Ph.D.)**  
**Syllabus for Ph.D. Course Work in Microbiology (2017)**

**PAPER I: RESEARCH METHODOLOGY**

**For subjects under the Faculty of Science**  
**(Physics, Chemistry, Botany, Zoology, Microbiology ,**  
**Environmental Sciences & Biotechnology)**

**PAPER II: ADVANCES IN MICROBIOLOGY**

BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE-38.

Faculty of Science  
Choice Based Credit and Grading System Coursework for Doctor of Philosophy (Ph.D.)  
(To be implemented from June, 2017)  
Course Structure in MICROBIOLOGY

Paper-I:	Research Methodology	04 Credits
Paper-II:	Recent Advances in MICROBIOLOGY	04 Credits
Paper-III:	Review Writing and Oral Presentations	
	Part A: Review Writing (02 Credits)	
	Part B: Oral Presentations (02 Credits)	
		04 Credits
		-----
		Total: 12 Credits

**Rules & Regulations:**

1. The duration of the coursework will be of one semester.
2. There will be a written examination for Paper-I and II at the end of the semester.
3. Each paper will contains 5 questions carrying 20 marks each and questions may have internal options.
4. A researcher should secure minimum 50% marks in each paper to qualify for the further research.
5. Part-A of Paper-III will be supervised by respective guide and Part-B will be coordinated by the Head of the Institution.

Faculty of Science

Choice Based Credit and Grading System Coursework for Doctor of Philosophy (Ph.D.)  
(To be implemented from June, 2017)

Course Structure in MICROBIOLOGY

Paper- I:	Research Methodology	04 Credits
Paper- II:	Recent Advances in MICROBIOLOGY	04 Credits
Paper- III:	Review Writing and Oral Presentations	
	Part A: Review Writing ( 02 Credits)	
	Part B: Oral Presentations ( 02 Credits)	
		04 Credits
		-----
		<b>Total: 12 Credits</b>

**Rules & Regulations:**

1. The duration of the coursework will be of one semester.
2. There will be a written examination for Paper-I and II at the end of the semester.
3. Each paper will contains 5 questions carrying 20 marks each and questions may have internal options.
4. A researcher should secure minimum 50% marks in each paper to qualify for the further research.
5. Part-A of Paper-III will be supervised by respective guide and Part-B will be coordinated by the Head of the Institution.



**BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (India)**

Faculty of Science: Doctor of Philosophy (Ph.D.)

Syllabus for Ph.D. Course Work (2017)

For subjects under the Faculty of Science

(Physics, Chemistry, Botany, Zoology, Microbiology, Environmental Sciences & Biotechnology)

**Paper I: RESEARCH METHODOLOGY**

Credits 4

Total No. of Lectures (60)

**1. QUANTITATIVE METHODS (15)**

i. **Collection of Data:** Introduction, Primary and secondary data, methods of collecting primary data, Drawing or framing the questionnaire, Sources of secondary data, Precautions in the use of secondary data.

ii. **Classification and Tabulation:** Introduction: Organization of data, Classification, Frequency distribution, Basic principles for forming a grouped frequency distribution, Cumulative frequency distribution, Bivariate frequency distribution, Tabulation meaning and importance

iii. **Graphic Representation of Data:** Introduction, Difference between diagrams and graphs, Diagrammatic representation, Graphic representation of data, Limitations of diagrams and graphs.

iv. **Correlation Analysis:** Introduction, methods of studying correlation, scatter diagram method, Karl Pearson's method of correlation (covariance method), probable error, correlation in bivariate frequency table, rank correlation method, method of concurrent deviations, coefficient of determination, lag and lead correlation.

v. **Linear Regression Analysis:** Introduction, Linear and non linear regression, Lines of Regression, Coefficient of regression, To find the mean value from the two lines of regression, To find the regression coefficients and the correlation coefficient from the two lines of regression, Standard error of an estimate, Regression equations for a bivariate frequency table, Correlation analysis vs Regression analysis

**2. COMPUTER APPLICATIONS**

(15)

**i. Computers in research:**

- i. Role of computers in Conceptual phase: role of computers in literature review.
- ii. Role of computers in Design and planning phase: role of computers in sample size calculations.
- iii. Role of computers in Empirical phase: Data storage.
- iv. Role of computers in Analytical phase: Data analysis
- v. Role of computers in Dissemination phase: Research publishing
- vi. References and computer

**ii. Research Methodology and Computer applications:**

Introduction, source of data, experimental technique, methods of data collection, measurement of scaling techniques, sampling methods, probability, probability distribution, estimation and testing, nonparametric tests, contingency tests, computer applications

**3. Review of Literature relevant field, Research ethics:**

(15)

i. **Research ethics:** What is ethics, The development of ethics, The growth of ethics, Ethics in the 21<sup>st</sup> century, Making decisions.

ii. **Environmental ethics:** Two current themes in environmental ethics.

Three current issues in environmental ethics: Terrestrial and aquatic pollution, Global climate change, Environmental degradation and loss of biodiversity.

### iii. How to write a Thesis

#### a. What is PhD

b. Introduction: Status of a thesis, Get advice, Read before you write, Time table and mile stones, content of a thesis, What belongs into which section, Time: past and present tense, Graphs and figures, Tables, Format, Further information

c. Writing a thesis: Structuring the thesis, Signposting, Code of practice for research, Content Chapters The Exit strategy, Front matter, back matter and appendices, Notation, glossary and index, Look and feel, tone, grammar and style,

d. The viva: Role of the participants, Selecting the examiners, Preparing for viva, On the Day, Corrections if any

#### iv. Proposals to various funding agencies

a. Developing a grant proposal: Preparation, Initial proposal development, Developing Ideas for the community support, Identification of a funding resource, Getting organized to write the proposal, Review, Criticism, Signature, Neatness, Mailing.

b. Writing the grant proposal: The Basic components of a proposal, The Proposal summary: Outline of project, Introduction: Presenting a credible applicant or organization, The problem statement: stating the purpose at hand, Project objectives: Goals and desired outcome, Program methods and program design: A Plan of action, Evaluation: product and process, Future funding: long-term project, The proposal budget: planning the budget, Guidelines and literature.

#### 4. Training and field work:

(15)

##### i. Biosafety:

a. General principles, b. Biosafety guidelines, c. Basic laboratories – Biosafety Levels 1 and 2  
d. The containment laboratory – Biosafety Level 3, e. The maximum containment laboratory – Biosafety Level 4, f. Guidelines for laboratory/facility commissioning, g. Guidelines for laboratory/facility certification, h. Laboratory biosecurity, i. Laboratory biosecurity concepts, j. Laboratory equipment  
k. Safety equipment, l. Good microbiological techniques, m. Laboratory techniques, n. Contingency plans and emergency procedures. Chemical, fire and electrical safety, p. Hazardous chemicals, q. Additional laboratory hazards, r. Safety organization and training, s. Safety for support staff, t. Training programmers, u. Safety checklist.

##### ii. Plagiarism:

a. Introduction: Forms of plagiarism, Why does plagiarism matter? Why should you avoid plagiarism? What happens if you are thought to have plagiarised? Does this mean that I shouldn't use the work of other authors? Does every statement in my essay have to be backed up with references?

Does this only matter in exams?, Unintentional plagiarism, Examples of plagiarism

B. Understand what plagiarism is and why it happens

c. Fully reference and acknowledge the work of others

d. Use your own words and develop your own writing style

e. Organize and structure your work in your own way

f. Don't be afraid to express your own views

g. Managing references in your thesis

h. Use of published work within research degree theses,

i. Penalties for plagiarism

### iii. Patent:

a. **Introduction:** IPR, Governing laws in India for IPR, What is an innovation or invention, The patent system, Novelty and inventiveness, Commercialization of invention, Disclosing an invention, Academic research, Applying for patent, Patent specifications, Patent Examination, Infringement.

b. **About the patent:** What is a patent, Term of patent, Territorial scope, What is patentable, Patentability searches, Information required for conducting research, Why one should go for patent, Who can apply for patent, What is not patentable invention, Documents required for filing a patent, What is patent specification.

c. **FAQs:** What does a patent application contain: Bibliographic, Background of the invention or state of art, Description of the invention, Claims. What is the Date of priority, What happens to the application after filing, How does a patent get expired, What is traditional knowledge, What is prior information content, What is Patent cooperation treaty,

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18. Sun, Y.C. 2012. Does text readability matter? A study of paraphrasing and plagiarism in English as a foreign language writing context. *The Asia-Pacific Education Researcher* 21(2): 296

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20. Wise, C.L., and G.A. Poland. 2012. Plagiarism, self-plagiarism, scientific misconduct and  
VACCINE: Protecting the science and the public. *Vaccine* 30(50): 7131-7133. doi: Wager, L. 2011.  
21. How should editors respond to plagiarism? COPE discussion paper. 26th April, 2011  
22. World Health Organization, *Laboratory biosafety manual*. – 3rd ed, Wiley Int  
23. Yilmaz, I. 2007. Plagiarism? No, we're just borrowing better English. *Nature* 449(7163): 658.  
24. Zhang, Y. 2010. Chinese journal finds 31% of submissions plagiarized. *Nature* 467(7312): 153.
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**BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (India)**

Faculty of Science :Doctor of Philosophy (Ph.D.)  
Syllabus for Ph.D. Course Work (2017) in Microbiology

**Paper II- RECENT ADVANCES IN MICROBIOLOGY**

credits 4

Total No. of Lectures (60)

**1. MICROSCOPY**

(05)

Differential interference contrast microscopy, Confocal microscopy,  
Scanning acoustic microscopy, Scanning tunneling microscopy,  
Atomic force microscopy

**2. ANALYTICAL TOOLS :**

(46)

**i. Radioisotopic Techniques:**

(04)

Radioactivity, Detection and measurement of radioactivity, Geiger Muller Counter,  
Scintillation Counter, Tracer Studies, Applications of radioisotopes in biological sciences

**ii. Centrifugation Techniques :**

(04)

Separation methods in preparative ultracentrifuges, Performing density gradient  
separations, Analysis of sub-cellular fractions, some applications of the analytical  
ultracentrifuge

**iii. Chromatographic Techniques:**

(04)

High performance liquid chromatography, Ion-exchange chromatography, Affinity  
chromatography, Gas-liquid chromatography, Thin-layer (Planar) chromatography,  
Selection of a chromatography system, Calculations

**iv. Electrophoretic Techniques:**

(04)

Electrophoresis of Proteins, Electrophoresis of nucleic acids, Capillary Electrophoresis

**v. Spectrophotometric Techniques:**

(04)

Ultraviolet and visible light spectrophotometer, Atomic spectrophotometer, NMR,  
Fluorimetry, Spectrofluorimetry, GCMS, Luminometry, Mass spectrophotometer

**vi. Genetic Methods:**

(04)

G+C %, Tm Value, DNA - DNA homology, DNA - RNA Homology, 16S RNA sequencing

**vii. Sequencing and mutagenesis:**

(04)

Basic DNA sequencing, Whole genome sequencing, Analyzing sequence data,  
Changing genes, site directed mutagenesis

**viii. Blotting techniques**

(04)

**ix. Tools and techniques ,**

(06)

PCR, LCR, RAPD, HGP, RFLP, STRP, AFLP, Genomics, Proteomics, Metagenomics,  
Metabolomics, Protein Engineering.

**x. Immunological Techniques:**

(04)

FAT, ELISA, Autoradiography, Radioimmunoassay, Rocket Electrophoresis, Techniques  
based on Agglutination and precipitation reactions.

**xi. Techniques of measurement of cell number and cell growth.**

(04)

Microbial, Plant and Animals-dead and living. Flow Cytometry.AFM.

(05)

### 3. SUSCEPTIBILITY TESTING:

- i Use of liquid and solid media, Factors affecting susceptibility testing, CLSI guidelines.
- ii Dilution methods – agar dilution technique, gradient plate techniques, E-test, Kirby Bauer method, Stokes method.
- iii Susceptibility testing for: Anti-mycobacterial agents, Anti-fungal agents, Anti-protozoal agents, Anti-viral agents

(04)

### 4 INTERPRETATION OF DATA OF ANALYTICAL TOOLS:

#### BOOKS RECOMMENDED

1. Alberts. B.; Johnson. A, Lewis J. Ra , M. Roberts. K. and P. Walter (2002) *Molecular Biology of the cell* 4<sup>th</sup> Edition. Garland Science, Taylor & Francis Group.
2. Bergey's Manual of Systematic bacteriology (2<sup>nd</sup> Ed.), Volume, 1 to 5, Springer.
3. Boyer. R. (2000) *Modern Experimental Biochemistry*. 3<sup>rd</sup> Edition. Pearson Education Asia.
4. Cruse J and R. Lewis (2004) *Atlas of Immunology* 2<sup>nd</sup> Edn. CRC Press
5. David Male, Jonathan Brostoff, David B Rivani Roi (2006). *Immunology* 7<sup>th</sup> edition.
6. Frank H. Stephenson (2003) *Calculations for Molecular Biology and Biotechnology. A guide to Mathematics in the laboratory* Academic Press an imprint of Elsevier.
7. Freshney R.I. (2000) *Culture of Animal cells. A Manual of Basic Technique*. 4<sup>th</sup> Edn. Publ: Wiley – Liss:
8. Goldsby R.A. Kindt T.S. and B.A. Osborne Kuby (2000) *Immunology* Fourth Edition W.H. Freeman & Co New York
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21. Staley J. T. Bryant : M. P. Pfenning : N and J. G. Holt (Eds) (1989) Bergey's Manual of Systematic bacteriology Vol. III Williams and Wilkins, Baltimore, London, Tokyo.
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  23. Watson J.D. Baker T.A., Bell S.P. Gann A, Levine M. and R. Losick. (2004) Molecular Biology of the Gene. 5<sup>th</sup> Edn. Low Price edition. Pearson Education.
  24. Williams S. T. Sharpe : M.E. and J. G. Holt (Eds) (1989) Bergey's Manual of Systematic Bacteriology, Vol IV Williams and Wilkins, Baltimore, London, Tokyo.
  25. Wilson and Walker (2000) 5<sup>th</sup> edition Practical Biochemistry Principles and Techniques, Cambridge University Press
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UNIVERSITY OF WINDHOEK  
FACULTY OF SCIENCE  
DEPARTMENT OF MICROBIOLOGY  
ADVANCED MICROBIOLOGY  
PAPER IN ADVANCED MICROBIOLOGY

**BHARATI VIDYAPEETH DEEMED UNIVERSITY, PUNE (India)**

Faculty of Science :Doctor of Philosophy (Ph.D.)  
Syllabus for Ph.D. Course Work (2017) in Microbiology

**Paper II- RECENT ADVANCES IN MICROBIOLOGY**

credits 4

Total No. of Lectures (60)

**1. MICROSCOPY**

(05)

Differential interference contrast microscopy, Confocal microscopy,  
Scanning acoustic microscopy, Scanning tunneling microscopy,  
Atomic force microscopy

**2. ANALYTICAL TOOLS :**

(46)

- i. **Radioisotopic Techniques:** (04)  
Radioactivity, Detection and measurement of radioactivity, Geiger Muller Counter, Scintillation Counter, Tracer Studies, Applications of radioisotopes in biological sciences
- ii. **Centrifugation Techniques:** (04)  
Separation methods in preparative ultracentrifuges, Performing density gradient separations, Analysis of sub-cellular fractions, some applications of the analytical ultracentrifuge
- iii. **Chromatographic Techniques:** (04)  
High performance liquid chromatography, Ion-exchange chromatography, Affinity chromatography, Gas-liquid chromatography, Thin-layer (Planar) chromatography, Selection of a chromatography system, Calculations
- iv. **Electrophoretic Techniques:** (04)  
Electrophoresis of Proteins, Electrophoresis of nucleic acids, Capillary Electrophoresis
- v. **Spectrophotometric Techniques:** (04)  
Ultraviolet and visible light spectrophotometer, Atomic spectrophotometer, NMR, Fluorimetry, Spectrofluorimetry, GCMS, Luminometry, Mass spectrophotometer
- vi. **Genetic Methods:** (04)  
G+C %, Tm Value, DNA - DNA homology, DNA - RNA Homology, 16S RNA sequencing
- vii. **Sequencing and mutagenesis:** (04)  
Basic DNA sequencing, Whole genome sequencing, Analyzing sequence data, Changing genes, site directed mutagenesis
- viii. **Cloning techniques** (04)
- ix. **Tools and techniques ,** (06)  
PCR, LCR, RAPD, HGP, RFLP, STRP, AFLP, Genomics, Proteomics, Metagenomics, Metabolomics, Protein Engineering.
- x. **Immunological Techniques:** (04)  
FAT, ELISA, Autoradiography, Radioimmunoassay, Rocket Electrophoresis, Techniques based on Agglutination and precipitation reactions.
- xi. **Techniques of measurement of cell number and cell growth.** (04)



- Bergey's manual of Systematic bacteriology Vol. II Williams and Wilkins, Baltimore, London, Tokyo.
21. Staley J. T. Bryant : M. P. Pfenning : N and J. G. Holt (Eds) (1989) Bergey's Manual of Systematic bacteriology Vol. III Williams and Wilkins, Baltimore, London, Tokyo.
  22. Tizard; I.R. (1995) Immunology an Introduction 4<sup>th</sup> Edn. Saunders College Publishing. Harcourt Brace College Publishers
  23. Watson J.D. Baker T.A., Bell S.P. Gann A, Levine M. and R. Losick. (2004) Molecular Biology of the Gene. 5<sup>th</sup> Edn. Low Price edition. Pearson Education.
  24. Williams S. T. Sharpe : M.E. and J. G. Holt (Eds) (1989) Bergey's Manual of Systematic Bacteriology, Vol IV Williams and Wilkins, Baltimore, London, Tokyo.
  25. Wilson and Walker (2000) 5<sup>th</sup> edition Practical Biochemistry Principles and Techniques, Cambridge University Press
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UNIVERSITY OF WINDHOLE  
SCHOOL OF SCIENCE  
DEPARTMENT OF MICROBIOLOGY  
ADVANCED MICROBIOLOGY  
PAPER IN ADVANCED MICROBIOLOGY

1.1.3 Average percentage of courses having focus on Employability/ Entrepreneurship/ skill development

25% courses offer Employability/ Entrepreneurship/ skill development

List of courses

AE-1	Corporate Social responsibility
AE-2	Environmental Issues and Disaster management
SE - 1	Social Work and Skill development
SE -2	Media and Development
HRM&LW-6	Business Communication and Presentation Skills
CC-12	Community Health and Health Care System.
URCD-10	Sustainable development

*hwl*

DIRECTOR  
Bharati Vidyapeeth  
(Deemed to be University)  
Social Science Centre(M.S.W)  
Erandwane, Pune - 411 038.

66

MSW Regular (CBCS 2019-20 pattern)  
AE-1: CORPORATE SOCIAL RESPONSIBILITY

**Section – I**

**Unit – I: Introduction**

- Concept, meaning and definitions of CSR
- Objectives and Scope of CSR
- Development of CSR
- Functions of CSR
- Scope for Social Work in CSR Activities

**Unit – II: Fields of Corporate Social Responsibility**

- Education
- Health and Sanitation
- Gender Empowerment
- Infrastructure development
- Rural Development
- Environment

**Unit – III: Essentials of Corporate Social Responsibility**

- Identifying Priorities of the Community
- Community Investment and Employee Volunteering
- Partnership and Stakeholder Dialogue
- Managing CSR Along with Supply Chains

**Section – II**

**Unit – IV: Aspects of Corporate Social Responsibility**

- Social Aspects
- Economical Aspects
- Environment Aspects
- Role of Social Worker in CSR activities

**Unit – V: Corporate Social Responsibility Policy and Programmes**

- Policies and Programmes of CSR
- CSR programmes for employees
- Networking with Stakeholders

**Unit – VI: Corporate Social Responsibility Strategic Planning and Management**

- Non-financial Risk Assessment and Management
- Aligning CSR Strategies with Financial Performance
- CSR Investment for Poverty Alleviation
- Long Term Development and Commitment

## **AE-2: ENVIRONMENTAL ISSUES AND DISASTER MANAGEMENT**

### **Section – I**

#### **Unit – I: Introduction**

- Concept and Definitions of Environment
- Physical, Social and Communal Environment
- Environment Education; need and objectives
- Global Environmental Issues

#### **Unit – II: Approaches and Models of Environment Education**

- Service approach and Action approach
- Sustainable development approach
- Interdisciplinary model and Multi – disciplinary model
- Social Development model and Economic development model

#### **Unit – III: Concepts in Disaster Management**

- Disasters, Risks, Hazards, Vulnerability, Disaster Cycle
- Relief and Rehabilitation in Disaster, Logistic Management
- Disaster preparedness and disaster mitigation
- Initiatives in disaster management

### **Section – II**

#### **Unit – IV: Classification of Disasters**

- Meaning of Natural and Human made disasters.
- Types of disasters: Famine and drought, Floods, Cyclone, Storms, Tsunami, Earthquakes, Riots, Industrial Accidents, Road-Air-Rail Accidents, Bomb-blast and explosions, War, Avalanches and landslides.

#### **Unit – V: Disaster Responses and Mitigation:**

- Prevention and preparedness – Disaster response at various stages of disasters: evacuation and rescue; emergency supplies; early warning systems and vulnerability reduction; disaster financing; provisions and procedures.
- Aid administration and management
- Technological options for disaster response and preparedness

#### **Unit – VI: Relief and Rehabilitation**

- Relief – Damage and needs assessment.
- Rehabilitation and Recovery - Planning for rehabilitation and recovery, displacement and resettlement.
- Community Participation and capacity building for facing disasters
- Disaster Management Act, 2005.

## SE-1: SOCIAL WORK AND SKILL DEVELOPMENT

### Section – I

#### Unit – I: Self Awareness and Development

- Self-concept and Factors affecting Self-concept
- Concept and meaning of Self-Development
- Significance of Self Development for Social Workers

#### Unit – II: Sensitivity

- Meaning of Sensitivity
- Gender Sensitivity
- Sensitivity regarding Special- Needs

#### Unit – III: Perception

- Understanding Perception
- Distortions in Perception
- Understanding Stereotypes

### Section – II

#### Unit – IV: Communication

- Concept of Communication
- Communication Process
- Barriers in Communication
- Use of Audio-Visual Media

#### Unit – V: Skills for Social Work Methods

- Skills for working with Individuals
- Skills for working with Groups
- Simulation Games
- Role Play and Street Plays

#### Unit – VI: Career and Work

- Models of career choice and development: Holland and Super
- Work life balance: Work holism, family roles, recreation

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## SE-2 : MEDIA AND DEVELOPMENT

### Section – I

#### Unit – I: Understanding Media

- Concept and meaning of Media
- Scope of media in development
- Role of Media in a Democracy
- 

#### Unit – II: Types of Media:

- Print Media
- Electronic media
- Folk and cultural media
- Challenges for media

#### Unit – III: Media and Development – I

- Role of Press in Social & Political Movements
- Freedom of Press
- Role of Press Council of India

### Section – II

#### Unit – IV: Media and Development – II

- Representation of Different Groups- Stereotyping and Labelling in Media
- Content of Newspaper: News Stories, Features, Articles, Editorial, Advertorial, Advertisements & Public Relations

#### Unit – V: Media and Society

- Understanding the Role of Media in Development
- Writing on Development Issues
- Media as Public Service
- Media and Civil Society

#### Unit – VI: Advertising

- Role of Advertising in Marketing
- Types of Advertisements
- Ethics in Advertising

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## HRM&LW – 6: BUSINESS COMMUNICATION AND PRESENTATION SKILLS

### Section – I

#### Unit – I: Concept and Nature of Communication

- Process and Objectives of Communication.
- Barriers to Communication.
- Seven Cs of effective communication

#### Unit – II: Verbal and Non-Verbal Communication

- Meaning of Verbal and Non-Verbal Communication
- Essentials of effective communication,
- Professional dressing and body language.

#### Unit – III: Types of Speeches

- Managerial speeches
- Presentations and Extempore speech
- Speech of thanks,
- Theme speech.

### Section – II

#### Unit – IV: Effective Presentations:

- Organising Presentation
- Principles of Effective Presentations,
- Qualities of skillful Presenter

#### Unit – V: Interview Skills:

- Mastering the art of giving interviews in:
  - Selection or placement interviews,
  - Appraisal interviews,
  - Exit interviews,
  - Web /video conferencing,
  - Skype Interview
  - Tele-meeting

#### Unit – VI: Report Writing:

- Report Planning and outline,
- Types of reports
- Logical Sequencing, Graphs and Charts,
- Executive Summary

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## CC-12: COMMUNITY HEALTH AND HEALTH CARE SYSTEM

### Section – I

#### Unit – I: Community Health

- Concept and definitions of Health, Standards of Health ,
- Individual and community health
- Factors Affecting Health
- Concept of Diseases, Classification of diseases ,Mode of Transmission of Diseases

#### Unit – II: Public Health and Health Care Services

- History of Public Health in India
- Public Health Programmes in India- Village , Block, District Levels
- Health Policy and Administration

#### Unit – III: Government Initiatives in Public Health

- National Urban Health Mission-Objectives, Structure, Services
- National Rural Health Mission- Objectives, Structure, Services
- Issues in Public Health services

### Section – II

#### Unit – IV: Prevention and Control of Diseases

- Concept of Control and Prevention of diseases
- Prevention and Control of : Communicable Diseases, -
- Measles ii) Mumps iii) Polio iv) Chicken Pox v) Rubella vi) Tetanus vii) Whooping cough viii) Diphtheria
- Levels of Prevention : Primary level, Secondary level & Tertiary level

#### Unit – V: Malnutrition

- Concept and Definition of Malnutrition
- Social aspects of Nutrition
- Diseases and Conditions related to Malnutrition
- Vitamin deficiency, Anemia, Iodine deficiency

#### Unit –VI: Community Health Care and Social Work

- Health Education and Counseling
- Application of Social Work Methods in Health Care
- Role of Social Worker in Community Health Care Programme



## URCD 10 SUSTAINABLE DEVELOPMENT

### Unit 1: Sustainable and Inclusive Development – Genesis and Definition

- Definition and concept of Human Development, Sustainable and Inclusive Development
- Approaches of Sustainable Development
- Genesis of Sustainable and Inclusive Development

### Unit 2: Mechanisms for Sustainable and Inclusive Development

- Mechanisms in Indian context (government, non-government, CSR, International Development Agencies)
- Planning Process of SD : five year plan to NITI Aayog
- Current schemes and Programmes of S & I D
- Impact of Schemes and Programmes

### Unit 3: Social Implications of Inclusive Development

- Inclusive Development and social Integration
- Inclusive Development and upliftment of weaker sections
- Inclusive Development and Women Empowerment

## Section II

### Unit 4: Sustainable development Goals and Indicators (I)

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

### Unit 5: Sustainable development Goals and Indicators (II)

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

### Unit 5: Sustainable development Goals and Indicators (III)

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

**BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY, PUNE**

**Syllabus for**  
**MASTER OF SCIENCE**  
**M.Sc. in ENVIRONMENT SCIENCE AND TECHNOLOGY**  
Under  
**FACULTY OF SCIENCE**

**Course Structure and Detailed Syllabus**  
**Semester I, II, III and IV**  
**(UNDER CHOICE BASED CREDIT SYSTEM)**  
**Effective from the Academic Year 2019-2020**

**SEMESTER WISE COURSE INFORMATION**

**Semester I**

Course Number	Course Title	Credit Value	Hours per week	Weightage (UE)	Weightage (IA)	EoTM
	<b>Core Courses</b>					
EST 101	Ecosystem Studies	3	3	60	40	University
EST 102	Environmental Chemistry and Microbiology	3	3	60	40	University
GEO 102	Fundamentals of Geoinformatics	3	3	60	40	University
EST 103	Sustainable development	3	3	60	40	University
EST 111	Field techniques - I	2	3	60	40	University
EST 112	Lab Analytical techniques - I	2	3	60	40	University
GEO 112	Techniques in Geographical Information Systems	2	3	60	40	University
	<b>Pre-requisites</b>					
EST 104	Basic Statistical Methods	3	3		100	Continuous
EST 105	Introduction to Data Analysis	3	3		100	Continuous
	<b>Total Credits / Hours</b>	<b>22</b>	<b>27</b>			

From the core courses:

Course Nos EST 101, EST 102, Geo 102, EST 103 are theory courses

Course Nos EST 111, EST 112, GEO 112 are practical courses

**Total credits offered in Semester I : 22**

### Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage (UE)	Weightage (IA)	EoTM
	<b>Core Courses</b>					
EST 201	Biodiversity Assessment and Conservation	3	3	60	40	University

EST 202	Engineered Systems for Water and Waste Water	3	3	60	40	University
EST 203	Solid and Hazardous Waste Management	3	3	60	40	University
EST 204	Air and Noise Pollution Management	3	3	60	40	University
EST 205	Research Methodology	2	3		100	Continuous
EST 211	Field Techniques - II	2	3	60	40	University
EST 212	Lab Analytical techniques - II	2	3	60	40	University
<b>EST 213</b>	<b>Field Work</b>	<b>2</b>	<b>60</b> <b>(cumulative)</b>		<b>100</b>	<b>Continuous</b>
	<b>Electives ( any two)</b>					
EST 206	Natural Resource Management	3	3		100	Continuous
EST 207	Environment and Health	3	3		100	Continuous
EST 208	Climate Change Science and Strategies	3	3		100	Continuous
EST 209	Data Analysis with R	3	3		100	Continuous
EST 210	Instrumentation and Lab Management for environmental analysis	3	3		100	Continuous
EST 211	Environmental biotechnology	3	3		100	Continuous
	<b>General Courses (any one)</b>					
<b>GEN 201</b>	<b>General English</b>	<b>2</b>	<b>2</b>		<b>50</b>	<b>Continuous</b>
<b>GEN 202</b>	<b>Project Management</b>	<b>2</b>	<b>2</b>		<b>50</b>	<b>Continuous</b>
	<b>Total</b>	<b>28</b>	<b>32</b>			

From the core courses:

Course Nos EST 201, EST 202, EST 203, EST 204 and EST 205 are theory courses

Course Nos EST 211, EST 212, EST 213 are practical courses

**Total Credits offered in Semester II : 28**

### Semester III

Course Number	Course Title	Credit Value	No. of hours per week	Weightage		EoTM
				UE	IE	
	<b>Core Courses</b>					
EST 301	Integrated Impact Assessment	3	3	60	40	University
EST 302	Environmental Policies and Law	3	3	60	40	University
EST 311	Dissertation	12	14	60	40	University
<b>EST 303</b>	<b>Technical Writing</b>	<b>2</b>	<b>3</b>		<b>100</b>	<b>Continuous</b>
	<b>Electives ( any three)</b>					
EST 304	Environment Management Techniques	3	3		100	Continuous
EST 305	Water Management	3	3		100	Continuous
GEO 303	Applications of geospatial technologies	3	3		100	Continuous
EST 306	Urban Environment Management	3	3		100	Continuous
EST 307	Advanced Pollution Control Technology	3	3		100	Continuous
	<b>General Courses (any one)</b>					
GEN 301	Swaach Bharat Abhiyan Internship	2	2		50	Continuous
GEN 302	Education for Sustainable Development	2	2		50	Continuous
	<b>Total</b>	<b>31</b>	<b>34</b>			

*From the core courses:*

*Course Nos EST 301, EST 302, EST 303 are theory courses*

*Course Nos EST 311 is dissertation.*

**Total Credits offered in Semester III : 31**

### Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
	<b>Core Courses</b>					
EST 411	Dissertation	12	14	60	40	University
	<b>Electives ( any four)</b>					
EST 401	Ecorestoration	3	3		100	Continuous
EST 402	Corporate Social Responsibility and Sustainability	3	3		100	Continuous
EST 403	Certification for ISO 14001	3	3		100	Continuous
EST 404	Urban Sustainability	3	3		100	Continuous
EST 405	Industrial Safety and Occupational Health (certifications)	3	3		100	Continuous
EST 406	Green technology and Management	3	3		100	Continuous
EST 407	Green Buildings	3	3		100	Continuous
	<b>General Courses (any one)</b>					Continuous
GEN 401	Entrepreneurship Development	2	2		50	Continuous
GEN 402	Soft Skills	2	2		50	Continuous
	<b>Total</b>	<b>26</b>	<b>28</b>			

From the core courses:

Course Nos EST 411 is dissertation.

**Total Credits offered in Semester IV : 30**

**BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY, PUNE**

**Syllabus for**  
**MASTER OF SCIENCE**  
**M.Sc. in GEOINFORMATICS**  
Under  
**FACULTY OF INTERDISCIPLINARY STUDIES**

**Course Structure and Detailed Syllabus**

**Semester I, II, III and IV**

**(UNDER CHOICE BASED CREDIT SYSTEM)**

**Effective from the Academic Year 2019-2020**

## SEMESTER WISE COURSE INFORMATION

## Semester I

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
GEO101	Fundamentals of remote sensing	3	3	60	40	University
GEO 102	Fundamentals of Geoinformatics	3	3	60	40	University
GEO 103	Fundamentals of programming	3	3	60	40	University
EST 101	Ecosystem Studies	3	3	60	40	University
EST 306	Urban Environment Management	3	3	60	40	University
EST 111	Field techniques –I	2	3	60	40	University
GEO 111	Techniques in image interpretation and remote sensing	2	3	60	40	University
GEO 112	Techniques in Geographical Information Systems	2	3	60	40	University
	<b>Pre-requisites</b>					
EST 104	Basic Statistical Methods	3	3		100	Continuous
EST 105	Introduction to Data Analysis	3	3		100	Continuous
	<b>Total</b>	<b>27</b>	<b>30</b>			

*From the core courses:*

*Course Nos GEO 101, GEO 102, Geo 103, EST 101, EST 306 are theory courses*

*Course Nos EST 111, GEO 111, GEO 112 are practical courses*

**Total credits offered in Semester I : 27**



## Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
GEO 201	Geodatabase Management	3	3	60	40	University
GEO 202	Advanced Remote Sensing	3	3	60	40	University
GEO 203	Digital Image Processing	3	3	60	40	University
GEO 204	WebGIS	3	3	60	40	University
GEO 205	Research Methodology	2	2		100	Continuous
GEO 211	Techniques in database management	2	3	60	40	University
EST 212	Techniques in digital image processing	2	3	60	40	University
GEO 213	Programming for GIS-I	2	3	60	40	University
<b>GEO 214</b>	<b>Field Work</b>	<b>2</b>	<b>60</b> <b>(cumulative)</b>		<b>100</b>	<b>Continuous</b>
	<b>Electives ( any two)</b>					
EST 201	Biodiversity assessment and conservation	3	3		100	Continuous
Est 206	Natural resource management	3	3		100	Continuous
EST 207	Health GIS	3	3		100	Continuous
EST 208	Climate change science and strategies	3	3		100	Continuous
EST 209	Data Analysis with R	3	3		100	Continuous
	<b>General Courses (any</b>					

	<b>one)</b>					
<b>GEN 201</b>	<b>General English</b>	<b>2</b>	<b>2</b>		<b>100</b>	<b>Continuous</b>
<b>GEN 202</b>	<b>Project Management</b>	<b>2</b>	<b>2</b>		<b>100</b>	<b>Continuous</b>
	<b>Total</b>	<b>30</b>	<b>31</b>			

*From the core courses:*

*Course Nos GEO 201, GEO 202, GEO 203, GEO 204, are theory courses*

*Course Nos GEO 211, GEO 212, Geo 213, GEO 214 are practical courses*

**Total Credits offered in Semester II : 30**

### Semester III

Course Number	Course Title	Credit Value	No. of Hours/ week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
GEO 301	Spatial analysis and modeling	3	3	60	40	University
GEO 311	Programming for GIS-II	3	3	60	40	University
GEO 312	Dissertation	12	14	60	40	University
GEO 313	Programming for GIS-III	2	3	60	40	University
GEO 314	Techniques in Spatial Statistics, Analysis and Modeling	2	3	60	40	University
	<b>Electives ( any two)</b>					
GEO 302	Geospatial Modeling	3	3		100	Continuous
GEO 303	Applications of geospatial technologies	3	3		100	Continuous
GEO 304	Photogrammetry	3	3		100	Continuous
GEO 305	Water management and Geospatial Technologies	3	3		100	Continuous
	<b>General Courses (any one)</b>					
GEN 301	Technical Writing	2	2		100	Continuous
GEN 302	Soft Skills	2	2		100	Continuous
	<b>Total</b>	<b>30</b>	<b>34</b>			

*From the core courses:*

*Course Nos GEO 301 is a theory course.*

*Course Nos GEO 311, GEO 313, GEO 314 are practical courses*

**Total Credits offered in Semester III : 30**

### Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
GEO 411	Dissertation	12	14	60	40	University
GEO 412	Internship	10	20	60	40	University
	<b>General Courses (any one)</b>					
GEN 401	Entrepreneurship Development	2	2		100	Continuous
	<b>Total</b>	<b>24</b>	<b>36</b>			

**Total Credits offered in Semester IV : 24**

**BHARATI VIDYAPEETH (DEEMED TO BE) UNIVERSITY,  
PUNE**

**Faculty Of Interdisciplinary Studies**

**M.Sc. (Wildlife Conservation Action)**

**COURSE STRUCTURE AND DETAILED SYLLABUS  
OF  
SEMESTER I, II, III and IV (UNDER CREDIT SYSTEM)  
EFFECTIVE FROM 2019-2020 AT SEMESTER I**

At the  
INSTITUTE OF ENVIRONMENT EDUCATION AND RESEARCH  
BHARATI VIDYAPEETH UNIVERSITY, PUNE  
**In collaboration with**  
WILDLIFE TRUST OF INDIA, NEW DELHI

## SEMESTER WISE COURSE INFORMATION

### Semester I

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
EST 101	Ecosystem Studies	3	3	60	40	University
CA 101	Sustainability Of Socio-Ecological Systems	3	3	60	40	University
CA 102	Wildlife Law And Trade Control	3	3	60	40	University
CA 103	Conservation Problems And Practices	3	3	60	40	University
GEO 102	Fundamentals Of Geoinformatics	3	3	60	40	University
EST 111	Field Techniques I	2	3	60	40	University
GEO 112	Techniques In Geographical Information Systems	2	3	60	40	University
CA 104	Research Methodology	2	2		100	Continuous
CA 111	Field Taxonomy I	2	60 hours cumulative		100	Continuous
<b>General Courses</b>						
EST 104	Statistical Methods	3	3		100	Continuous
EST 105	Introduction To Data Analysis	3	3		100	Continuous
	<b>Total</b>	<b>29</b>	<b>32</b>			

*From the core courses:*

*Course Nos EST 101, CA 101, CA 102, CA 103, GEO 102, CA 104 are theory courses*

*Course Nos EST 111, GEO 112, CA 111 are practical courses*

**Total Credits offered in Semester I : 29**

### Semester II

Course Number	Course Title	Credit Value	Hours per week	Weightage	Weightage	EoTM
				UE	IA	
EST 201	Biodiversity Assessment And Conservation	3	3	60	40	University
CA 201	Wildlife Health, Rescue And Rehabilitation	3	3	60	40	University
CA 202	Behavioural Ecology	3	3	60	40	University
CA 211	Advanced Statistics	2	3		100	Continuous
CA 212	Field Techniques II	2	3	60	40	University
CA 213	Field Taxonomy II	2				
CA 214	Field Work	2	60 (cumulative)		100	Continuous
	<b>Electives ( any two)</b>					
EST 206	Natural Resource Management	3	3		100	Continuous
EST 401	Ecorestoration	3	3		100	Continuous
CA 203	Urban Biodiversity	3	3		100	Continuous
	<b>General Courses</b>					
GEN 201	General English	2	2		100	Continuous
GEN 202	Technical Writing	2	2		100	Continuous
	<b>Total</b>	<b>25</b>	<b>26</b>			

*From the core courses:*

*Course Nos EST 201, CA 201, CA 202 are theory courses*

*Course Nos CA 211, CA 212, CA 213, CA 214 are practical courses*

**Total Credits offered in Semester II: 24**

### Semester III

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
CA 311	Dissertation	24	40	60	40	University
	<b>General Courses</b>					
GEN 301	Project Management	2	2		100	Continuous
	<b>Total</b>	<b>26</b>	<b>42</b>			

**Total Credits offered in Semester III : 26**

### Semester IV

Course Number	Course Title	Credit Value	Hours per week	Weightage UE	Weightage IA	EoTM
	<b>Core Courses</b>					
CA 411	Internship	10	40	60	40	University
	<b>Electives ( any three)</b>					
CA 401	Conservation Leadership	3	3		100	Continuous
CA 402	Conservation Communication, Education And Public Awareness	3	3		100	Continuous
CA 403	Conservation Management	3	3		100	Continuous
EST 208	Climate Change Science And Strategies	3	3		100	Continuous
	<b>General Credit Course</b>					
GEN 401	Entrepreneurship Development	2	2		100	Continuous
GEN 402	Soft Skills	2	2		100	Continuous
	<b>Total</b>	<b>24</b>	<b>54</b>			

**Total Credits offered in Semester IV : 24**



**BHARATI VIDYAPEETH UNIVERSITY PUNE (INDIA)**

**NEW LAW COLLEGE**

Erandwane, Pune- 411038.

**LL.M.**

**SYLLABUS**

**2013-14**

# BHARATI VIDYAPEETH

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Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established in May, 1964 by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and overall development of the people through education. Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing within a short span of 49 years, 167 or so educational institutions imparting education from the pre-imparting stage to post graduate stage. Our colleges and institutions of higher education impart education in different disciplines including medicine, dentistry, ayurved, homeopathy, nursing, arts, science, commerce, engineering, pharmacy, management, social science, law, environmental science, architecture, hotel management and catering technology, physical education, computer science, library science and information technology.

The spectacular success achieved by Bharati Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and

able guidance of the founder of Bharati Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavor to impart high quality education and training to our students and so, no wonder that our institutions have become nationally known for their academic excellence. In recognition of the academic merit achieved by these institutions and potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to its 29 constituent units.

These educational institutions which achieved an academic excellence cater to the educational needs of thousands of students coming from different parts of India and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational centers are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Karad, Panchagani, Jawhar and New Delhi.

The Department of Human Resource Development, Government of India on the recommendation of University Grants Commission accorded the status of Deemed University to twelve units of Bharati Vidyapeeth (vide their notification No. F.9- 15/95-U.3 dated 26/4/96 under the Section 3 of the University Grants Commission Act of

1956). Subsequently the Govt. of India on the recommendations of the UGC has brought more institutions of Bharati Vidyapeeth within the ambit of Bharati Vidyapeeth Deemed University. Today there are total 30 Constituent Units of BVU which includes Colleges and Research Centers.

### **Constituent Units of Bharati Vidyapeeth Deemed University**

- BVDU Medical College, Pune.
- BVDU Dental College & Hospital, Pune
- BVDU College of Ayurved, Pune
- BVDU Homoeopathic Medical College, Pune
- BVDU College of Nursing, Pune
- BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
- BVDU New Law College, Pune
- BVDU Social Sciences Centre (M.S.W.), Pune
- BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
- BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
- BVDU College of Physical Education, Pune.
- BVDU Institute of Environment Education & Research, Pune
- BVDU Institute of Management & Entrepreneurship Development, Pune
- BVDU Poona College of Pharmacy, Pune
- BVDU College of Engineering, Pune
- BVDU Interactive Research School in Health Affairs (IRSHA), Pune
- BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
- BVDU College of Architecture, Pune
- BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
- BVDU Institute of Management, Kolhapur
- BVDU Institute of Management & Rural Development administration, Sangli
- BVDU Institute of Management & Research, New Delhi
- BVDU Institute of Hotel Management & Catering Technology, Pune
- BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
- BVDU Medical College & Hospital, Sangli
- BVDU Dental College & Hospital, Mumbai

- BVDU Dental College & Hospital, Sangli
- BVDU College of Nursing, Sangli
- BVDU College of Nursing, Navi Mumbai

## New Law College, Pune

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### PROFILE

Bharati Vidyapeeth Deemed University's New Law College, Pune established in the year 1978 is one of the premier institutes of legal education in India. It is recognized by Bar Council of India & University Grants Commission. It is one of the constituent units of Bharati Vidyapeeth Deemed University, Pune.

### Ranking and Accreditation

It is consistently ranked amongst top 10 law colleges in India by reputed magazines like India Today, Outlook, Lawyers Collective, Legally India, Times of India, Indian Express, etc. The law college is reaccredited with 'A' grade by NAAC in 2011.

### Infrastructure

The new seven storied building of the law college was inaugurated in the year 2005 at hands of Hon. Mr. Justice R. C. Lahoti, the then Chief Justice of India. It consists of 32 classrooms, moot court room, human right cell, cyber cell, placement cell, legal aid cell, research cell & auditorium.

### Knowledge Partners

The college has teaching faculty comprising of retired judges of Supreme Court and High Court eminent academicians, senior lawyers, social activists and eminent jurists from abroad. The college has total 72 faculty members out of which 8 are Ph.D. and 40 are full time lecturers. Senior advocates like Adv. Ram Jethmalani, Adv. P. P. Rao, Adv. Abhishek Manu Singhvi, Adv. Soli Sorabjee, Adv. Geeta Luthra, Adv. Pinky Anand, etc. are invited to guide the law students.

### ICT Teaching Methods

The college has E-Facility in library, classrooms and moot court room. Emphasis is given on ICT Teaching and Learning Methods The college has an E-Court room in its building.

### Library

The college has a library worth Rs. 1 crore. In addition to the text books the college has international journals, online legal databases like Lexis Nexis, Manupatra, Westlaw, SCC Online, etc. The library is equipped with cyber cell consisting of more than 100 computers, with free internet and wi-fi facility. The

college also has a video – conferencing facility.

### **LL.M Program (one-year Course)**

In pursuance with guidelines issued by UGC in 2012 about introduction of one year LL.M Degree Program Bharati

Vidyapeeth New Law college offers one –year LL.M Course with Specialization in two groups namely International & Comparative Law and Constitutional & Administrative Law.

## **REGULATIONS RELATING TO THE TRIMESTER PATTERN OF LLM**

### **(ONE YEAR COURSE- 3 TRIMESTER PROGRAM)**

#### **(From the academic year- 2013-2014)**

1. The One year LL.M program is a trimester program, the duration of each trimester will be of three months with the University Examinations at the end of each trimester. Choice based credit system (consisting of 24 credits) has been implemented for this program.
2. The admission to One Year LLM program is through an All India Admission Test conducted by Bharati Vidyapeeth on the basis of merit.
3. **Eligibility for admission** LL.M. one year program- the applicant shall have obtained LL.B. degree of any university recognized by UGC.
4. **Scheme of Examination:** The examinations for one year LL.M. Degree course will be held in each Trimester. Every paper shall carry 100 marks out of which 60 marks for written examination i.e University Examination (UE) & 40 marks for Internal Assessment (IA). Internal Assessment (IA) will be as follows:
  - Class & Seminar participation - 10 marks
  - Home assignment - 10 marks
  - Tests - 15 marks
  - Attendance - 5 marks
5. **Credit System:**

The one year LL.M. program will have **24 credits**. The program will contain **3 compulsory courses of 3 credits each** (making total of 9 credits), **6 optional courses of 2 credits each** (making total of 12 credits) & **a dissertation of 3 credits**. Each credit is of **15 hours**. Apart from regular class room teaching the candidate has to undergo clinical legal education as per his/her choice during the One Year LL.M. Program. The clinical legal education will have 4 credits. The clinical legal education includes:

Area	Credit
Legal Aid	01
Seminar	01
Research	01
Tutorial	01
<b>Total</b>	<b>04</b>

6. **Evaluation System:** Both IA and UE will be conducted out of 100 marks and converted to grade points and grades using 10 point grade system as follows:

**The 10-point Grading System**

Range of Percent	[75, 100]	[70, 74.9]	[65, 69.9]	[60, 64.9]	[55, 59.9]	[50, 54.9]	[45, 49.9]	[40, 44.9]	[00, 39.9]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.5	5.0	4.5	0.0
Grade	O	A+	A	B+	B	C+	C	D	F

6. **Performance in a Course:** The performance in the course will be indicated by a Grade Point Index (GPI). The GPI is computed as a weighted average of grade points in UE and IA with respective weights 60% and 40%.

That is,  $GPI = 0.6 * GP (UE) + 0.4 * GP (IA)$ , Where GP (UE) is the grade point corresponding to UE and GP (IA) is the grade point corresponding to IA.

7. **Trimester Grade Point Average (TGPA) and Cumulative Grade Point Average (CGPA):** At the end of each trimester, TGPA is calculated as the weighted average of all GPI of courses **in the current trimester** in which the student has passed, the weights being the credit values of respective courses. Similarly, at the end of each trimester, CGPA is calculated as the weighted average of all GPI of all courses in which the student has passed up to the current trimester.

8. **Standards of Passing:**

- a. In order to pass in a course, a student must obtain a minimum grade point of 5.5 at the UE and also a minimum GPI of 5.0 in the course.
- b. A student who passes in a course is said to have completed the credits assigned to the course.
- c. A student who completed the minimum credits required for a program will be declared to have completed the program with the honours according to the Table given below:

**CGPA Ranges for Class Declaration**

<b>Range of CGPA</b>	[5.00, 5.49]	[5.50, 5.99]	[6.00, 7.99]	[8.00, 10.00]
<b>Division</b>	Pass Class	Second Class	First Class	First Class with Distinction
<b>Range of Marks (%)</b>	[50.0, 54.9]	[55.0, 59.9]	[60.0, 69.9]	[70.0, 100.0]

9. The medium of instruction and the examination shall be in English.

10. The scope of the subjects shall be as indicated in the prescribed syllabus.

**COURSE DESIGN OF LL.M (ONE YEAR PROGRAM)**

<b>Trimester</b>	<b>Foundation/ Compulsory Courses</b>	<b>Optional Course</b>	<b>Total No. of Papers</b>	<b>Total Marks</b>	<b>Total Credits</b>
<b>First Trimester</b>	3	Nil	3	300	9
<b>Second Trimester</b>	Nil	4	4	400	8
<b>Third Trimester</b>	Nil	2	2	200	4
	Dissertation			200	3
<b>Grand Total</b>			9	1100	24

# COURSE STRUCTURE OF LL.M (ONE YEAR PROGRAM)

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## **Foundation Course:**

- Research Methods and Legal Writing (3 Credits)
- Comparative Public Law/Systems of Governance (3 Credits)
- Law and Justice in a Globalizing World (3 Credits)
- Dissertation (3 Credits)

## **Optional Groups:**

### **International and Comparative Law**

- International Organizations (2 credits)
- International Economic Law (2 credits)
- International Human Rights Law (2 credits)
- AIR and Space Law (2 credits)
- Public International Law (2 credits)
- International Dispute Settlement (2 credits)

### **Constitutional and Administrative Law**

- Centre-State Relations and Constitutional Governance(2 credits)
- Fundamental Rights and Directive Principles(2 credits)
- Local Self Government & Federal Governance (2 credits)
- Administrative Law(2 credits)
- Media Law(2 credits)
- Health Law (2 Credits)



**DETAILED  
SYLLABUS  
OF  
LL.M PROGRAM  
(ONE YEAR)  
2013-14**

## FOUNDATION COURSES

### 01. RESEARCH METHODS AND LEGAL WRITING

#### **Objective of the course:**

Law is influenced by the prevailing social values and ethos. Law also attempts to mould or change the existing social values and attitudes. A systematic approach is required to understand the existing and emerging legislation policies, laws their social relevancy and efficacy, etc .Hence a law student should be acquainted with the scientific methods required for the inquiry of law.

In this backdrop, this course intends to make the students familiar with nature, scope, and significance of legal research. It endeavors to make them aware with various tools and techniques required for a successful legal research which plays an important role in the socio-legal development of the country.

#### **Syllabus**

##### **1. Research Methodology – An Introduction**

- 1.1. Meaning of Research
- 1.2. Objectives of Research
- 1.3. Characteristics of Research
- 1.4. Significance of Research
- 1.5. Research Methodology
- 1.6. Importance of Research Methodology

##### **2. Legal research Methodology**

- 2.1. Meaning of Legal Research
- 2.2. Characteristics of Legal Research
- 2.3. Objectives of Legal Research

- 2.4. Types of Legal Research
  - 2.4.1. Doctrinal Legal Research
    - 2.4.1.1. Characteristics
    - 2.4.1.2. Components
    - 2.4.1.3. Merits and Demerits
  - 2.4.2. Non-Doctrinal Legal Research
    - 2.4.2.1. Features
    - 2.4.2.2. Limitations

### **3. Methods for Legal Research**

- 3.1. Analytical Method
- 3.2. Historical Method
- 3.3. Empirical Method(socio-legal Research)
- 3.4. Scientific Method
- 3.5. Comparative Method
- 3.6. Ethical Method
- 3.7. Statistical Method
- 3.8. Critical Method

### **4. Steps involved in Legal Research**

### **5. Legal Research Problem**

- 5.1. Meaning of Research Problem
- 5.2. Types of Research Problems
- 5.3. Criteria of Research Problem
- 5.4. Evaluation of Research Problem
- 5.5. Advantages of right selection of Research Problem

### **6. Hypothesis**

- 6.1. Meaning- Significance-characteristics
- 6.2. Types of Hypothesis
- 6.3. Ideal formulation of hypothesis
- 6.4. Testing of Hypothesis

### **7. Research Design**

- 7.1. Meaning-Need-Characteristics
- 7.2. Important concepts-variable, independent variables, dependent variables, controls
- 7.3. Types of Research Design
  - 7.3.1. Descriptive Design

- 7.3.2. Exploratory Design
- 7.3.3. Experimental Design
- 7.3.4. Diagnostic Design

## **8. Sampling technique**

- 8.1. Need for Sampling
- 8.2. Assumptions related to sampling
- 8.3. Procedure to select a sample
- 8.4. Types of sampling
  - 8.4.1. Probability Sampling
    - 8.4.1.1. Random sampling
      - 8.4.1.1.1. Lottery method
      - 8.4.1.1.2. Random numbers
      - 8.4.1.1.3. Sequential List
      - 8.4.1.1.4. Grid system
    - 8.4.1.2. Systematic Sampling
    - 8.4.1.3. Stratified random sampling
    - 8.4.1.4. Cluster Sampling
    - 8.4.1.5. Multi-Stage Sampling
  - 8.4.2. Non-Probability Sampling
    - 8.4.2.1. Representative sampling
    - 8.4.2.2. Judgment Sampling
    - 8.4.2.3. Accident Sampling
    - 8.4.2.4. Purposive Sampling
  - 8.4.3. Quota Sampling
  - 8.4.4. Area Sampling
  - 8.4.5. Sampling by regular intervals
- 8.5. Reliability of sampling
  - 8.5.1. Sampling Error and Standard Error

## **9. Collection of Data**

- 9.1. Sources of data
- 9.2. Tools/Methods of Data Collection
  - 9.2.1. Observation Method
  - 9.2.2. Interview Method
  - 9.2.3. Questionnaire Method
  - 9.2.4. Survey Method

- 9.2.5. Case Study Method
- 9.2.6. Projective Techniques
- 9.2.7. Content Analysis

## **10. Data Processing**

- 10.1. Analysis of Data
- 10.2. Interpretation of Data
- 10.3. Socio-metrics and Jurimetrics
- 10.4. Induction and Deduction

## **11. Report writing**

- 11.1. Techniques of report writing
- 11.2. Citation rules

## **12. Legal Writing**

- 12.1. Objective
- 12.2. Types
- 12.3. Principles
- 12.4. Role of writing in Legal system
- 12.5. Writing a Law Review article
- 12.6. Approach ,structure and writing of dissertation
- 12.7. Use of research findings in legal writing
- 12.8. Correct referencing in dissertations
- 12.9. Legal citation system
- 12.10. Finishing and polishing the writing

## **13. Computerized Research-Lexis Nexis, Westlaw, Manupatra**

### **Recommended Books:**

1. M.O.Price, H.Bitner and Bysiewiez, Effective Legal Research (1978)
2. Pauline. V.Young , Scientific Social Survey and Research (1962)
3. Morris.L.Cohan, Legal Research in Butshell (1996)
4. C.R.Kothari, Research Methodology Methods and Techniques (2009)
5. Dr.S.R.Myneni, Legal Research Methodology (2012)
6. Shipra Agarwal, Legal Research Methodology (2009)
7. Amanda Martinsek, Legal Writing (2009)
8. Webley Lisa, Legal Writing (2012)

9. Legal Language and Legal Writing, B.M.Gandhi (2010)
10. Goode and Hatt, Methods in Social Research.
11. Miller D., Hand Book of Research Design and Social Measurement.
12. Jain S. N., Legal Research and Methodology.
13. Erwin C. Surrency, B. Fielf and J. Crea, A Guide to Legal Research (1959).
14. Wilkinson, Bhandarkar, Research Methodology.
15. Selltis Johoda, Research Methodology.
16. Stott D, Legal Research.
17. Mackie S., Legal Research, How to find & understand Law.
18. Campbell, Fox Kentey, Students guide to Legal writing.
19. Ackoff R. L., Design of social research.
20. Beveridge WIR, Art of Scientific investigation.
21. Claire Selltis and others-Research methods in Social Relations.

## 02. COMPARATIVE PUBLIC LAW

### Objective of the Course:

Constitutional Law and administrative Law together make Public Law. Public Law was first defined by Romans as “*res publica*” which meant Public Good. Public Law regulates the relationship between individual and the State. However with changing dimensions of the State the ambit of Public Law needs to be revisited.

This course highlights the various aspects of Public Law which has become significant due to the concept of “Welfare State”. It enlightens the students about the various systems of governance which have evolved worldwide. The course further provides a comparative approach which enables the students to make a critical analysis of the various systems.

### Syllabus

#### 1. Introduction

- 1.1. Meaning of Public Law
- 1.2. What is a Constitution
- 1.3. Significance of Constitution
- 1.4. Types of Constitution
- 1.5. Forms of government

#### 2. Overview of legal systems

- 2.1. Major legal systems of the world
- 2.2. Monarchical system
  - 2.2.1. French Legacy
  - 2.2.2. German Legacy
  - 2.2.3. English Monarchy
- 2.3. Defeat of Absolutism
- 2.4. Parliamentary Sovereignty
- 2.5. Present Scenario-US, UK, India and Australia

#### 3. Rule of Law

- 3.1. Origin and Evolution
- 3.2. Dicey’s Rule of Law
- 3.3. Recent Developments
  - 3.3.1. Britain

- 3.3.2. Australia
- 3.3.3. New Zealand
- 3.3.4. India

#### **4. Separation of Powers**

- 4.1. Montesquieu's Theory
- 4.2. The relations between organs of the State
- 4.3. Comparative Study
  - 4.3.1. U.S.A
  - 4.3.2. U.K.
  - 4.3.3. Australia
  - 4.3.4. India
  - 4.3.5. France-*Droit Administratif*

#### **5. Federalism**

- 5.1. Origin of Federalism
- 5.2. Principles and Legal Features of Federalism
- 5.3. Unitary State, Confederation and a Federal State-Comparison
- 5.4. Distribution of Legislative, Administrative and financial power in a Federal State
- 5.5. Evolution of Co-operative Federalism
- 5.6. Comparative Study
  - 5.6.1. U.S.A
  - 5.6.2. Australia
  - 5.6.3. Canada
  - 5.6.4. India

#### **6. Parliament**

- 6.1. Introduction
- 6.2. Structure and Composition
  - 6.2.1. U.K
  - 6.2.2. U.S.A
  - 6.2.3. India
- 6.3. Parliamentary Privileges-Comparative Approach

#### **7. Judicial Review**

- 7.1. Evolution and concept of Judicial Review
- 7.2. Meaning of Judicial Review
- 7.3. Grounds of Judicial Review



7.4. Impact of Judicial Review on Modern Constitutions

## **8. Right to Information**

8.1. Introduction

8.2. Access to information-U.S.A, U.K, Australia, India

## **9. Ombudsman**

9.1. Introduction

9.2. Need for Ombudsman

9.3. Ombudsman in New Zealand

9.4. Parliamentary Commissioner of England

9.5. Australian Ombudsman

9.6. Ombudsman in India

### **Recommended Books:**

1. M. P. Jain, Principles of Administrative Law, LexisNexis, 2010
2. Dr. Durga Das Basu, Comparative Federalism, Wadhwa, 2008
3. Dr. Durga Das Basu, Comparative Constitutional Law, Wadhwa, 2008
4. Prof.Dr.A.Lakshminath, Prof.Dr.Vijay Ghormade, Prof.Dr.Mukund Sarda, Comparative Law and select legal systems, Hind Law House,2011
5. Avasthi & Avasthi, Public Administration in India,Agarwal,2011
6. Hilaire Barnett, Understanding Public Law,Cavendish,2010
7. Elisabeth Zoller, Introduction to Public Law: A Comparative Study, Martinus Nijhoff,2008
8. M.P.Jain, Indian Constitutional Law,LexisNexis,2012
9. Dr. Durga Das Basu, Constitution of India,LexisNexis,2009

## **03. LAW AND JUSTICE IN A GLOBALIZING WORLD**

### **Objective of the Course:**

The course aims at enlightening the students about the meaning, nature and scope of law. It seeks to create an understanding about the nature of law and justice and, in particular, the relationship between the two in contemporary society. It begins by exploring the question “**what is justice**”? Since this is an enduring philosophical question, posed differently at different times, it will be approached historically from the Greeks to the present and how they have understood justice. The focus here will be not only on explaining and critically analyzing different general theories of justice, but especially upon determining how these theories articulate the specific relation (or lack of relation) between justice and law. The course will then put these ideas to work through a consideration of a number of contemporary problems concerning law and justice which have arisen due to globalization.

### **Syllabus:**

#### **1. Introduction to law and Justice**

- 1.1 The concept of law as conceived by Plato
- 1.2 Aristotle’s concept of justice
- 1.3 Law and Morals
- 1.4 Relation between Law and Ethics

#### **2. Legal Theory**

##### **2.1 Law and Justice as per Natural law**

- 2.1.1 Greek origins of Natural Law
- 2.1.2 Role of Natural Law in Roman Law
- 2.1.3 Natural law and Thomas Aquinas
- 2.1.4 Natural Law and Social Contract
- 2.1.5 Revival of Natural law- Fuller, Hart, Finnis

##### **2.2 Positivist Approach to Law**

- 2.2.1 John Austin
- 2.2.2 Hans Kelsen

##### **2.3 Sociological Jurisprudence**

- 2.3.1** Prof. Roscoe Pound

##### **2.4 American Realism**

- 2.4.1 Jerome Frank

2.4.2 Karl Lewellyn

### **3. The Concept of Justice**

- 3.1 The concept of Justice
- 3.2 Norms or Material Contents of Justice
- 3.3 Types of Justice

### **4. Theories of Justice**

- 4.1 Justice by Utilitarianists
- 4.2 Marxist approach to justice
- 4.3 John Rawls theory of Justice
- 4.4 Ronald Dworkin's theory of Justice
- 4.5 Amartya Sen's theory of Justice
- 4.6 Feminist approach to Justice

### **5. Relation between Law and Justice**

- 5.1 Equivalence theories of Justice
- 5.2 Dependence theories of Justice
- 5.3 Independence of Justice theories

### **6. Effect of globalization on Law and justice**

#### **6.1 Core Legal issues of Globalization**

- 6.1.1 Transnational applicability and Enforceability of law
- 6.1.2 Limits on enforceability of National Law
- 6.1.3 International Models for Regulation

#### **6.2 Changing concepts of Property**

- 6.2.1 Different concepts of property
- 6.2.2 Position of Property in Modern Industrial Society
- 6.2.3 Importance Intellectual Property

#### **6.3 Changing function of contract**

#### **6.4 Criminal law in changing world**

- 6.4.1 Economic crimes against the community
- 6.4.2 Environmental Pollution and criminal law
- 6.4.3 Criminal liability of Corporations
- 6.4.4 Changing nature and purpose of punishment
- 6.4.5 Cyber crimes
- 6.4.6 Inquisitorial system
- 6.4.7 Plea Bargaining
- 6.4.8 Witness protection schemes

6.4.9 Compounding of offences

## **6.5 Changing foundations of family**

6.5.1 Changing concept of family

6.5.2 Husband wife equality

6.5.3 Indissolubility of marriage tie

## **6.6 Economic competition, Regulation and Public Interest**

## **6.7 The enlarging scope of International law.**

6.7.1 New dimensions of International law

6.7.2 International minimum standards of Justice

### **Recommended Books:**

1. Legal Theory by W. Friedmann, Universal Law Publishing Co., Delhi
2. Law in a changing society by W. Friedmann, Universal Law Publishing Co., Delhi
3. A Theory of Justice by John Rawls, Universal Law Publishing Co., Delhi
4. Human law and Human Justice by Julius Stone, Universal Law Publishing Co., Delhi
5. The Province and Function of Law, Universal Law Publishing Co., Delhi
6. Jurisprudence the Philosophy and Method of the Law, Bodenheimer, Universal Law Publishing Co., Delhi
7. Legal System and Lawyers' Reasoning by Julius Stone, Universal Law Publishing Co., Delhi
8. Concept of Law by HLA Hart, Oxford University Press
9. On Law and Justice by Alf Ross, University of California Press
10. Pure theory of Law by Hans Kelsen, University of California Press
11. Law's Empire by Ronald Dworkin, Harvard University press
12. Interpretation of Law in the Global World: From Particularism to a Universal Approach, Edited by Joanna Jemielniak & Przemyslaw Miklaszewicz, Springer Berlin Heidelberg
13. Law and Society in Modern India by Marc Galanter, Oxford

**OPTIONAL COURSES**  
**GROUP A: INTERNATIONAL & COMPARATIVE LAW**

**A04. INTERNATIONAL ORGANISATIONS**

**Objective of the Course:**

The prime duty of International Organizations is not only to maintain peace among independent sovereign states but also to create an atmosphere for mutual co-operation and to work towards amelioration of human conditions in respective countries. Hence various International organizations collectively work towards collective security and peaceful settlement of conflicts among the nation states.

This course highlights the origin, functions, socio-economic and political process and the role of International Organizations in restructuring and reshaping the socio-economic life of the countries. It provides a platform to the students to undertake an in depth analysis of International Organizations as well as non – governmental organizations.

**Syllabus:**

**1. Introduction:**

- 1.1. Historical Background
- 1.2. Definition of International organizations
- 1.3. Privileges and Immunities

**2. Classification of International Organizations:**

- 2.1. Membership
- 2.2. Universalism
- 2.3. Regionalism

**3. Role and Functions of International Organizations**

**4. League of Nations**

- 4.1. Origin & Foundation
- 4.2. Members and Constitution
- 4.3. Maintenance of World Peace
- 4.4. Weaknesses and Causes for failure

**5. United Nations**

- 5.1. Organs and Functions
- 5.2. General Assembly

- 5.3. Security Council
- 5.4. Economic Social Council
- 5.5. Concept of Collective Security

## **6. Other Organizations**

- 6.1. European Union
- 6.2. Commonwealth
- 6.3. SAARC

## **7. Special Agencies and NGO's**

- 7.1. Functions
- 7.2. Amnesty International
- 7.3. International Commission of Jurists

### **Recommended Books:**

1. International Organizations, Clive Archer, Routledge Publishers
2. Remedies Against International Organizations, Karel Wellens, Cambridge University Press
3. The Law of International Organizations, Nigel D. White, Manchester University Press
4. S.K.Kapoor, Public International Law, Central Law Agency.
5. J.G.Starke, Introduction to International law, Aditya Books, New Delhi.
6. S.K.Varma, An Introduction to International Law, Printice Hall of India, New Delhi
7. Bowett, International Institutions.
8. International Law; Sir Robert Jennings and Sir Arthur Watts (ed) Longma
9. M.P. Tandon, Public International Law, Allahabad Law Agency

## **A05. INTERNATIONAL ECONOMIC LAW**

### **Objective of the Course**

Global economic issues are always in news right from trade disputes between countries, investment claims by foreign investors against sovereign states, to countries facing a balance of payments crisis and seeking assistance from the International Monetary Fund (IMF).

This course examines the law governing global economic issues. It begins with a historical and theoretical background to the field before turning to focus on the law and practice of the World Trade Organization (WTO), including close analysis of the WTO dispute settlement system and the role of 'free' or preferential trade agreements within that system. It also provides a detailed understanding of international investment law, including bilateral investment treaties. Finally, the subject examines the lending policies and practices of international financial institutions, particularly the IMF and the World Bank.

### **Syllabus**

#### **1. Introduction**

1.1. Meaning & Nature

1.2. Subjects of International Economic Law- States, Multinational Enterprises and Individual

1.3. Codification of International Economic Law and role of International Organization

#### **2. Role of UNO in Evolving International Trade Law and NEW INTERNATIONAL ECONOMIC ORDER (NIEO)**

2.1. Meaning of NIEO.

2.2. UN and NIEO.

2.3. Program of action on the Establishment of NIEO.

2.4. Promotion of cooperation among Developing Countries

2.5. Charter of Economic Rights and Duties of states (CERDS)

2.6. Problems and prospects of the NIEO.

2.7. Significance of NIEO.

2.8. Implications of the NIEO for India.

#### **3. International Economic Agencies**

- 3.1. International Monetary Fund (IMF).
- 3.2. International Bank for Reconstruction and Development (IBRD)
- 3.3. The International Centre for Settlement of Investment Disputes (ICSID) 1965
- 3.4. World Bank
- 3.5. World Intellectual Property Organization- WIPO

#### **4. Relevance of GATT and WTO**

- 4.1. Globalization of Economic activity.
- 4.2. GATT negotiation Round - Procedures of GATT Negotiations, Tariff Barriers and Non-Tariff barriers, Bilateral and Multilateral Trade agreements of GATT, method of Multilateral Trade Negotiation under GATT.
- 4.3. Salient features of GATT 1994.
- 4.4. Final Act embodying the results of the Uruguay Round of multilateral Trade Negotiations.
- 4.5. Decision on measures in favor of least developed countries in GATT 1994.
- 4.6. List of developed, Developing and Least developed Countries.

#### **5. The World Trade Organization (WTO)**

- 5.1. Salient features, Objectives, Scope, Functions of WTO
- 5.2. Structure
- 5.3. The Secretariat, Budget and Contribution
- 5.4. Status of WTO
- 5.5. Decision making
- 5.6. Amendments
- 5.7. Membership and Withdrawal

#### **6. The United Nation's Commission for International Trade Law (UNCITRAL)**

- 6.1. Work Carried out by UNCITRAL
- 6.2. UNCITRAL Rules 1976 & 1980
- 6.3. UNCITRAL Model Law an International Commercial Arbitration, 1985.

#### **Reference Books:**

- 1. Comments on International Trade Law by Professor Rafiqul Islam
- 2. International Trade Law by Lord Templeman
- 3. Law of International Trade by Pamela Sellman
- 4. International Trade Law by Janette Charley



5. International Trade Law by S. C. Chhua
6. The WTO After Seattle by Jeffrey J. Schott (Editor)
7. An Introduction to the WTO Agreements by Bhagirat Lal Das
8. International Trade Law by Indira Carr,
9. Understanding International Trade Law by Simone Schnitzer,
10. Cases and Materials on International Trade Law by Paul Todd
11. Global, Political Economy: Understanding the International Economic Order, Robert Gilpin, Princeton University Press
12. Principles of International Economic Law, Matthias Herdgen, Oxford University Press

## **A06. INTERNATIONAL HUMAN RIGHTS**

### **Objective of the Course:**

Human Rights are inborn right of human beings having universal application. Human rights have acquired a new dimension with the adoption of Universal Declaration of Human Rights in 1948. Several regional organizations also play a very pivotal role to prevent and curb human rights violations at regional level. Role of these organizations assumes great significance to maintain human rights standards in respective countries.

This course analyses human rights, their international standards, role of organizations and mechanism of protection agencies. The course thus inculcates awareness amongst the students about the significance of human rights in today's scenario.

### **Syllabus:**

#### **1. Introduction**

- 1.1. Historical View
- 1.2. Philosophical and Legal Foundations
- 1.3. Classification of Human Rights

#### **2. International Human Rights Standards**

- 2.1. United Nations Charter
- 2.2. Universal Declaration of Human Rights
- 2.3. Covenant on civil and political rights
- 2.4. Covenant on economic social and cultural rights
- 2.5. CEDAW

#### **3. Role of Regional Organizations**

- 3.1. European convention on Human Rights/Court of human Rights
- 3.2. American convention on Human Rights/Courts
- 3.3. African convention on Human Rights

#### **4. Protection agencies and mechanism**

- 4.1. Non - governmental organizations (NGOs)
- 4.2. UNICEF
- 4.3. UNESCO
- 4.4. International Commission of Human Rights
- 4.5. ILO International Labor Organization

## **5. Enforcement of International Human Rights**

### **Recommended Books:**

1. International Human Rights in Context of Law, Politics and Morals, Henry Steiner and Philip Alston, Oxford University press
2. Textbook on International human Rights, Rhona Smith, Oxford University Press
3. International Human Rights: Law and Practice, Francisco Forrest Martin, 1997
4. Perspectives in Human Rights Development, R.S. Sharma and R.K. Sinha, 1997
5. The United nations and Human Rights: A Critical Appraisal, Philip Alston, 1992
6. Human Rights in International Relations, David.P. Forsythe

## **A07. AIR AND SPACE**

### **Objective of the course:**

The scientific and technical developments in the field of air and space have posed challenges to the legal fraternity. The legal response to air and space technology has been both at municipal and international level.

The course is designed to provide an in-depth understanding of air and space law along with fundamental principles of Public International Law concerning air and space.

### **Syllabus:**

#### **1. Introduction**

- 1.1. Meaning ,Nature ,Scope of Air and space law
- 1.2. Source of Air and Space Law

#### **2. Air Law**

- 2.1. Basic Principles of international Air Law
- 2.2. Regulation of international Air Transportation
- 2.3. Civil aviation
  - 2.3.1. Crimes - hijacking- sabotage - air terrorism
  - 2.3.2. Safety and security
    - 2.3.2.1. International norms
    - 2.3.2.2. State obligation
  - 2.3.3. Liability in civil aviation

#### **3. Air Law-Indian Perspective**

- 3.1. Airport leasing and privatization –Legal issues
- 3.2. Rights and privileges of Air passengers
- 3.3. Third party liability for surface damages
- 3.4. Civil aviation:
  - 3.4.1. Technology development- legal problems
  - 3.4.2. Consumer protection
- 3.5. Air carriage

#### **4. Law of Outer space**

- 4.1. Freedom and regulation regarding outer space
- 4.2. International conventions
  - 4.2.1. The Outer Space Treaty, 1967

4.2.2. The Moon Treaty, 1969

4.2.3. UN Convention, 1972

## **5. Regulations of commercial space activities in India**

5.1. Constitutional and International obligations

5.2. Launch services

5.3. Satellite telecommunication and broadcasting

5.4. IPR and technology transfer

## **6. Changing global trends**

6.1. Use of space technology-peaceful and non-peaceful

6.2. Space communication

6.3. Satellite navigation and location

6.4. Disaster prediction

## **Recommended Books:**

1. The orbit of Space Law, Wedeagokar
2. Space Law, Christol
3. Law of outer space, M.Lach
4. Space Law in the era of commercialization, Dr.S.Bhatt
5. Recent trends in International space and Policy, V.S.Mani
6. Legal and regulatory issues in international aviation, Azbeyratne
7. The new aviation policy in India, S.Bhatt
8. Aviation law and recommendation, Carole Blackshow
9. Aviation Law: cases and materials, LowenField
10. Aircraft hijacking and international law, S.K.Agarwal
11. Law of carriage- Air, Land and Sea, Avtar Singh, Eastern Book Company

## **A08. PUBLIC INTERNATIONAL LAW**

### **Objective of the Course:**

The post Second World War has witnessed phenomenal growth in International law. The United Nation has emerged as a powerful organization in regulating international relations amongst the States. For achieving peace and progress around the world regulating and adhering to the international legal order has become a necessary condition.

This course focuses upon the nature, sources and different dimensions of International law. Its object is to develop greater acquaintance among the students about the role and significance of International law under changing circumstances.

### **Syllabus:**

#### **1. Basic Aspects of International Law:**

- 1.1. Origin and Definition
- 1.2. Nature and basis
- 1.3. Is International law a true law?
- 1.4. Schools of International Law

#### **2. Sources of International Law**

- 2.1. Custom
- 2.2. Treaties
- 2.3. General Principles of Law
- 2.4. Judicial Decisions

#### **3. Relationship between Municipal Law and International Law**

- 3.1. Monistic Theory
- 3.2. Dualistic Theory

#### **4. State- subject of International Law**

- 4.1. Essentials of statehood
- 4.2. Concept of recognition, theories, kinds and consequences of recognition
- 4.3. State Jurisdiction- Diplomatic Privileges and Immunities
- 4.4. State responsibility

#### **5. State Territory**

- 5.1. Extent of State Territory
- 5.2. Acquisition and Loss of State Territory

- 6. State Succession:**
  - 6.1. Meaning and Kinds
  - 6.2. Consequences
  - 6.3. Succession on Suppression of revolt
  - 6.4. Succession in International Organization
- 7. Intervention:**
  - 7.1. Need, Kinds of Intervention
  - 7.2. Grounds
  - 7.3. Prohibition
- 8. Individual and International Law:**
  - 8.1. Nationality
  - 8.2. Aliens
  - 8.3. Extradition
  - 8.4. Diplomatic agents - Immunities and Privileges
- 9. Treaties:**
  - 9.1. Making of Treaty
  - 9.2. Reservations to treaty
  - 9.3. Pacta sunt servanda
  - 9.4. Modes of termination of treaty

**Recommended Books:**

- 1. Oppenheim, International Law
- 2. Ian Bronnlie, Principles of Public Internal Law Oxford University Press,
- 3. Malcom N Shaw, International Law, Cambridge Publication.
- 4. H.O Agarwal, International Law and Human Rights, Central Law Publications Allahabad.
- 5. S.K.Kapoor, Public International Law, Central Law Agency.
- 6. J.G.Starke, Introduction to International law, Aditya Books, New Delhi.
- 7. S.K.Varma, An Introduction to International Law, Printice Hall of India, New Delhi
- 8. Bowett, International Institutions.
- 9. International Law; Sir Robert Jennings and Sir Arthur Watts (ed) Longma
- 10. M.P. Tandon, Public International Law, Allahabad Law Agency

## **A09. INTERNATIONAL DISPUTES SETTLEMENT**

### **Objective of the Course**

International dispute settlement is a relatively new field of academic study that increasingly combines private and public international law and raises enduring issues of global importance.

The course primarily addresses fundamental and lasting issues of international dispute settlement and provides an in depth study of the growth of the field of international dispute settlement in practice, the novelty and significance of the issues posed, and the originality of the academic angle from which such issues need to be addressed.

### **Syllabus:**

#### **1. Introduction to International Courts and Tribunals**

- 1.1. History and development of international adjudication and arbitration
- 1.2. The modern 'system' of international courts and tribunals
  - 1.2.1. The International Court of Justice
  - 1.2.2. The International Tribunal for the Law of the Sea
  - 1.2.3. The Permanent Court of Arbitration
  - 1.2.4. Human rights courts and commissions
  - 1.2.5. Other tribunals
  - 1.2.6. The International Criminal Court (and other criminal tribunals)

#### **2. Jurisdiction**

- 2.1. General principles: competence-competence; forum prorogatum; separability of dispute resolution clauses; jurisdiction *ratione materiae*, *ratione personae* and *ratione temporis*
- 2.2. Specific issues for the vesting of jurisdiction: reliance upon the optional clause (ICJ); existence of an investment (investment treaties & ICSID); reliance on an MFN clause to expand jurisdiction (investment treaties). Incidental jurisdiction.

#### **3. Admissibility**

- 3.1. Distinction between jurisdiction and admissibility
- 3.2. Absence of a necessary third party
- 3.3. Diplomatic protection: nationality of claims and exhaustion of local remedies
- 3.4. Investment treaty arbitration: contracts claims versus treaty claims; derivative claims by shareholders



#### **4. Justiciability and Arbitrability**

- 4.1. The doctrine of non-justiciability of political disputes
- 4.2. The subject matter of disputes that can be submitted to arbitration (arbitrability): the problem of illegal transactions

#### **5. Relations between Jurisdiction of International Courts**

- 5.1. Overlapping jurisdictions and resolving jurisdictional conflicts
- 5.2. Proliferation of international courts and tribunals - fragmentation of international law

#### **6. Applicable Law**

- 6.1. Law applicable to substantive issues, arbitration clause, procedure, capacity of parties, issues of state responsibility.
- 6.2. The doctrine of municipal laws as facts before international courts and tribunals
- 6.3. International public policy
- 6.4. Problems of treaty interpretation

#### **7. Denial of Justice**

- 7.1. The modern conception of denial of justice in international law
- 7.2. Exhaustion of remedies as a substantive requirement

#### **8. Remedies in International Adjudication**

- 8.1. The three forms of reparation: restitution, compensation, declaratory judgments
- 8.2. Problems of restitution
- 8.3. Problems of compensation: differentiating between the remedial consequences following from a breach of different substantive obligations

#### **9. Challenges to International Decisions; Recognition and Enforcement of International Decisions**

- 9.1. Interpretation and revision
- 9.2. Challenge before the ICJ
- 9.3. Challenge before the municipal courts at the seat of the arbitration

#### **Recommended Books:**

- 1. Brown, A Common Law of International Adjudication (2007)
- 2. Crawford, Brownlie's Principles of Public International Law (8th ed 2012)
- 3. Eiriksson, The International Tribunal for the Law of the Sea (2000)
- 4. Fitzmaurice, The Law and Procedure of the International Court of Justice (1986)
- 5. Gaillard et al, Fouchard, Gaillard & Goldman on International Commercial Arbitration (1999)

6. Gray, *Judicial Remedies in International Law* (1987)
7. McLachlan et al, *Investment Treaty Arbitration: Substantive Principles* (2007)
8. Rigo Sureda, *Investment Treaty Arbitration* (2012)
9. Rosenne, *The Law and Practice of the International Court, 1920-2005* (2006)
10. Sands et al, *Manual on International Courts and Tribunals* (2010)
11. Shany, *The Competing Jurisdictions of International Courts and Tribunals* (2003)
12. Zimmermann et al, *The Statute of the International Court of Justice: A Commentary* (2006)

## GROUP B: CONSTITUTIONAL & ADMINISTRATIVE LAW

### B04. CENTRE – STATE RELATIONS AND CONSTITUTIONAL GOVERNANCE

#### Objective of the course:

Nature of the Indian Constitution though not being strictly federal still makes a division of governmental powers between the Union and States. The changed political, social and economic conditions of our polity have tremendously influenced the content and operation of Centre-State relations.

This course aims at making the students aware of the nature of the Indian federation through a deep study of legislative, administrative and financial relations between the Centre and the states. It further provides a platform to analyse, examine and evaluate the centre state relations in the current scenario.

#### Syllabus:

##### 1. Introduction

- 1.1. Nature of Indian Federation
- 1.2. Position of States-Indian Federation
- 1.3. Nature of Indian Polity
- 1.4. Central Bias

##### 2. Legislative Relations

- 2.1. Theory or territorial nexus
- 2.2. Distribution of Legislative powers
- 2.3. Interpretation of lists
  - 2.3.1. Pith and Substance
  - 2.3.2. Colourable Legislation
  - 2.3.3. Ancillary Powers
  - 2.3.4. Occupied Field
  - 2.3.5. *Non-obstante* Clause
  - 2.3.6. Laws of Taxation
- 2.4. Repugnancy between Central and State Laws
- 2.5. Residuary powers
- 2.6. Centre's power
  - 2.6.1. legislate on state subjects
  - 2.6.2. control state legislation

### **3. Administrative Relations**

- 3.1. Distribution of Administrative Power
- 3.2. Delegation of Union's function to States
- 3.3. Administrative co-ordination
- 3.4. All India Services
- 3.5. Full faith and Credit Clause

### **4. Financial Relations**

- 4.1. Imposition of tax-authority of law
- 4.2. Fees
- 4.3. Allocation of taxing powers
- 4.4. Restriction on taxing powers
- 4.5. Financial Equilibrium
- 4.6. Borrowing powers
- 4.7. Finance commission

### **5. Impact of Emergency on centre state relations**

### **6. Centre-state relations-Critical Evaluation**

- 6.1. Sarkaria Commission

### **Reference Books:**

1. Centre – State Relations in India, Anirudh Prasad, Deep & Deep Publications
2. Centre State Relations in India: Major Irritants and Post- Sarkaria Review, Shubh Narayan Singh, H.K. Publishers & Distributors
3. Party Politics and Centre State Relations in India, S.K. Jain, Shakti Malik Abhinav Publications
4. Federalism and Centre State Relations in India, O.P. Tiwari, Deep and Deep Publications
5. Current Issues and Trends in Centre- State Relations: A Global View, S.C. Arora, Mittal Publications
6. Socio-Legal Perspective of Centre-State Relations in India, Mohd. Aftab Hussain, Deep & Deep Publications
7. Federalism and Frictions in Centre – State Relations: A Comparative Review of Indian and German Constitutions, K.L. Bhatia, Deep & Deep Publications
8. Constitutional Law of India: H. M. Seervai, Universal Law Publishing Co. Ltd., Hardcover-April 30, 2005.
9. Indian Constitutional law, M.P. Jain, LexisNesxis, 2010

10. Constitution of India, Dr. Durga Das Basu, LexisNexis, 2009
11. The Indian Constitution: Cornerstone of a Nation (Law in India S.): Granville Austin, OUP India, And Paperback-October 1999.
12. The Constitution of India: V. Grover, Deep & Deep Publications, Hardcover-September 1, 2002. Law
13. Reconstitution of the Constitution of India, Kanhaiyalal Sharma, Kanahaiyalal Sharma, Deep & Deep Publications, Hardcover-October, 2002.
14. Legal and Constitutional History of India: Ancient, Judicial and Constitutional System: Rama Jois, M. Justice, Universal Law Publishing Co. Ltd., paperback- April 30, 2004.
15. Constituent Assembly of India: Springboard of Revolution: Shibankinkar Chaube, Manohar Publishers and Distributors, Hardcover-November 22, 2000.

## **B05. FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES**

### **Objective of the course:**

The course aims at giving a comprehensive idea of the juristic basis, scope and content of each Fundamental Right as enshrined in the Indian Constitution, the restrictions placed on the right, and an evaluation of the judicial approach towards balancing Individual Fundamental Rights and Public interest.

It further makes the student understand the importance of directives principles of State Policy, its role in achieving good governance and their relationship to fundamental rights.

### **Syllabus:**

#### **1. Fundamental Rights: Introduction**

- 1.1. Origin and Evolution
- 1.2. Fundamental rights in India

#### **2. Enforceability of fundamental Rights**

- 2.1. Scope & Definition of State-Art.12
- 2.2. Art.13
  - 2.2.1. Definition of Law, Personal Laws, Customs
  - 2.2.2. Doctrines

#### **3. Right of Equality**

- 3.1. Fundamental principles of Equality (Art. 14).
- 3.2. Doctrine of reasonable classification
- 3.3. Absence of Arbitrariness
- 3.4. Protective Discrimination (Art.15)
- 3.5. Discrimination in Public employment
  - 3.5.1. Reservations
    - 3.5.1.1. Pre-mandal Era
    - 3.5.1.2. Mandal Commission case
    - 3.5.1.3. Post Mandal scenario
    - 3.5.1.4. Test of backwardness
    - 3.5.1.5. Doctrine of creamy Layer
    - 3.5.1.6. Kalelkar Commission and Mandal Commission
  - 3.6. Inter –relation between Art.14,15 & 16

#### **4. Fundamental Freedoms(Art.19)**

- 4.1. Scope
- 4.2. Freedom of Speech and Expression
  - 4.2.1. Right to Silence
  - 4.2.2. Freedom of Press
  - 4.2.3. Right to Information
  - 4.2.4. Censorship of films
  - 4.2.5. Restrictions
- 4.3. Freedom to assemble
- 4.4. Freedom to form association
- 4.5. Freedom of movement and residence
- 4.6. Freedom to carry trade and commerce
- 4.7. Right to property

## **5. Art. 21-Right to life and Liberty**

- 5.1. Principle of due process of Law
  - 5.1.1. Traditional Approach - A.K.Gopalan
  - 5.1.2. Modern Approach - Maneka Gandhi
- 5.2. Extended Scope of the Term 'life'
- 5.3. Widened Scope of the Term 'Liberty'
- 5.4. Third generation of rights.
- 5.5. Criminal Justice
- 5.6. Right to Education Art- 21A
- 5.7. Compensatory Jurisprudence

## **6. Prevention of abuse of criminal law (Article 20 &22)**

- 6.1. Protection against self-incrimination
- 6.2. Protection against double jeopardy
- 6.3. Protection against retrospective operation of criminal law
- 6.4. Safeguards against arrest & preventive detention

## **7. Right against exploitation (Art. 23 & 24)**

## **8. Freedom of Religion**

- 8.1. Secularism
- 8.2. Profess and Practice religion (Art. 25)
- 8.3. Manage religious affairs (Art. 26)
- 8.4. Religious Denominations
- 8.5. Taxation to promote religion
- 8.6. Right of conversion

## **9. Minority Rights**

- 9.1. Protection of interest of minorities
- 9.2. Establishment of educational institutions
- 9.3. Regulation of minority educational institutions

## **10. Right to Constitutional Remedies (Art. 32)**

- 10.1. Relation between 32 and 226
- 10.2. Writs
- 10.3. Public Interest Litigation
- 10.4. Judicial Activism

## **11. Parliament's Power to limit application of fundamental Rights**

- 11.1. Article 31 A, 31 B, 31 C.
- 11.2. IX the Schedule.
- 11.3. Amenability of fundamental Rights - Basic features doctrine.

## **12. Directive Principles of State Policy**

- 12.1. Nature
- 12.2. Justiciability
- 12.3. Inter- relationship between fundamental rights and directive principles-a  
Judicial Approach
- 12.4. Directive Principles (Art. 36 to 51)

## **Recommended Books:**

1. Constitutional Law of India: H. M. Seervai, Universal Law Publishing Co. Ltd., Hardcover-April 30, 2005.
2. Indian Constitutional law, M.P. Jain, LexisNexis, 2010
3. Constitution of India, Dr. Durga Das Basu, LexisNexis, 2009
4. The Indian Constitution: Cornerstone of a Nation (Law in India S.): Granville Austin, OUP India, And Paperback-October 1999.
5. Justice V. R. Krishna Iyer on Fundamental Rights and Directive Principles: S. Chander, Deep & Deep Publications. Hardcover-September 1, 2002.
6. The Constitution of India: V. Grover, Deep & Deep Publications, Hardcover-September 1, 2002. Law
7. Reconstitution of the Constitution of India, Kanhaiyalal Sharma, Kanahaiyalal Sharma, Deep & Deep Publications, Hardcover-October, 2002.
8. Legal and Constitutional History of India: Ancient, Judicial and Constitutional System: Rama Jois, M. Justice, Universal Law Publishing Co. Ltd., paperback- April



30, 2004.

9. Fifty Years of the Supreme Court of India: It's Grasp and Reach: Indian Law Institute (Editor), OUP India, Hardcover-November 2000.
10. Rules, Laws, Constitutions: Satish Saberwal (Editor), Heiko Sievers (Editor), Sage Publications Ltd., Hardcover-January 1998.
11. Human Rights in India: Historical, Social and Political Perspective (Law in India S.) Chiranjivi J. Nirmal, OUP India, Paperback-May 31, 2003.
12. The Citizen and Judicial Reforms: Kashyap C. Subhash, Universal Law Publishing Co. Ltd., hardcover- June 15, 2004.
13. People, Law and Justice: Casebook of Public Interest Litigation: Sangeeta Ahuja, Sangam Books, And Hardcover-July 1997.
14. Constituent Assembly of India: Springboard of Revolution: Shibani Kinkar Chaube, Manohar Publishers and Distributors, Hardcover-November 22, 2000.

## **B06. LOCAL SELF GOVERNMENT AND FEDERAL GOVERNANCE**

### **Objective:**

The object of the study of Local Self-Government is to throw light on the third tier of our governmental system, which is the basis of our democracy. The Panchayati Raj system plays a unique role in this 21st century, in achieving the principals of Mahatma Gandhi assured by the Indian Constitution to the citizens. The provision for introduction of these principles has been made by the framers in the Constitution itself.

The course aims at giving an understanding to the students about the functioning of the Indian democracy at the grass root level, its strengths, weaknesses, problems and solutions to the same.

### **Syllabus:**

#### **1. Introduction:**

- 1.1. Meaning and Nature
- 1.2. Origin & Evolution of Local-Self Government in India
- 1.3. Significance of Local-self Government in Modern State

#### **2. Constitutional Basis - 73<sup>rd</sup> and 74<sup>th</sup> Amendment**

#### **3. Organizational Structure**

- 3.1. Composition
- 3.2. Functions, Powers and Role of Local bodies
- 3.3. Administration of the Metropolitan Towns and Municipal Corporations
- 3.4. Problems of Autonomy and Accountability

#### **4. Democratic Decentralization in Rural India**

- 4.1. Village Panchayats and Gram Sabha
- 4.2. Panchayat Samiti
- 4.3. Zila Parishad

#### **5. Democratic Decentralization in Urban India**

- 5.1. Municipal Council
- 5.2. Municipal Corporation

#### **6. Financial Administration of local bodies in India**

- 6.1. Funding to local bodies
- 6.2. Strengthening of local resources

#### **7. State control over local bodies-Urban and Rural**

#### **8. Need for Reforms in local self governance system in India**

### **BOOKS RECOMMENDED**

1. Argal, K.: Municipal Government in India
2. Maheshwari, S.R.: Local Government in India
3. Mathur, M.V.: Panchayat Raj in Rajasthan
4. Khanna, R.K.: Municipal Government and Administration in India
5. Bhogle, S.K.: Local Government in India
6. Pai Panandikar, V.A. : Personnel System for Development Administration
7. Bhattacharya, Mohit: Municipal Government and Problems
8. Tinker: Local Self Government in India

## **B07. ADMINISTRATIVE LAW**

### **Objective of the Course:**

Since independence, the administrative process has gathered momentum in India. The transformation of Police-State to Welfare-State has tremendously increased the functions of administration. Majority of the litigations involve the principles of Administrative Law. Administrative Law deals with powers of the government and control thereof.

Hence this course seeks to provide the students with a clear understanding of the structure, organization, processes and powers of the public functionaries. Further the course also aims at enlightening the students with the problems besetting the area.

### **Syllabus:**

#### **1. Introduction**

- 1.1. Nature and Scope of Administrative Law
- 1.2. Functions of Administration

#### **2. Rule of Law**

#### **3. Separation of Powers**

#### **4. Delegated Legislation**

- 4.1. Concept, growth & need of delegated legislation
- 4.2. Control of delegated legislation
  - 4.2.1. Parliamentary
  - 4.2.2. Procedural
  - 4.2.3. Judicial
- 4.3. Doctrine of excessive delegation

#### **5. Administrative discretion**

- 5.1. Scope
- 5.2. Fundamental rights and administrative discretion
- 5.3. Judicial control

#### **6. Natural justice**

- 6.1. Applicability to administrative decisions
- 6.2. Principles of natural justice
- 6.3. Failure of natural Justice-effect

#### **7. Judicial review of administrative action**

##### **7.1. Writ jurisdiction**

- 7.1.1. Scope
- 7.1.2. Grounds

7.2. Statutory remedies

**8. Contractual and tortious liability**

**9. Ombudsman**

**Recommended Books:**

1. D.D. Basu-Comparative Administrative Law
2. M.P. Jain, S.N. Jain-Principles of Administrative Law
3. M.P. Jain-Cases and materials on Administrative Law
4. M.P. Jain-The evolving Indian Administrative Law.
5. Dicey-Introduction to Law of the Constitution.
6. Garner-Administrative Law
7. H.W. Wade-Administrative Law.
8. Wade & Philips-Constitutional Law.
9. Hood Philips-Constitutional Law & Administrative Law.
10. DeSmith-Judicial Review of Administrative Action
11. K.S. Shukla & S.S. Singh-Lokayukta-A socio legal study.
12. Ivor Jennings-Law and the Constitution.
13. K.C. Davis-Discretionary justice.
14. P.P. Craig - Administrative Law
15. Neil Hawke & Neil Papworth - Introduction to Administrative Law.
16. Jaffe-Judicial Control of Administrative Law.

## **B08. MEDIA LAW**

### **Objective of the Course:**

Mass Media play a significant role in shaping public opinion through the information that is dispensed through them and the interpretation placed upon this information.

This course seeks to familiarize the students about the concepts and structure of Media law by understanding its political, social and international context. The course will concentrate on more specific issues like defamation, contempt of court, privacy, copyrights and media trials.

### **Syllabus:**

#### **1. Introduction**

- 1.1. Evolution of Media
- 1.2. Forms of Media
- 1.3. Democracy and Media
- 1.4. Constitutional framework
  - 1.4.1. Freedom of Press
  - 1.4.2. Limitations

#### **2. Media Laws in India**

- 2.1. Print media
  - 2.1.1. Press council Act,1978
  - 2.1.2. The Newspaper (prize and pages)Act,1958
  - 2.1.3. Regulatory body-Press council of India
- 2.2. Electronic Media
  - 2.2.1. Indian Telegraphy Act,1885
  - 2.2.2. The Cinematograph Act,1952
  - 2.2.3. The Cable Television Networks Act,1955
  - 2.2.4. The Prasar Bharati(Broadcasting Corporation of India)Act,1990
  - 2.2.5. Broadcasting Service Regulating Act,2007

#### **3. Accountability of media**

- 3.1. Media and Social Responsibility
- 3.2. Media and Terrorism
- 3.3. Relevant Cases
- 3.4. Media and Ethics

3.5. Self regulation

#### **4. Media trials**

4.1. Nature and Concept

4.2. Impact on administration of Justice

4.2.1. Priyadarshani Mattu Case

4.2.2. Arushi Murder case

4.2.3. Jessica Lal Murder Case

4.2.4. Shiney Ahuja Case

#### **5. Other issues**

5.1. Contempt of court

5.2. Copyright

5.3. String operations

5.4. Effect of Emergency

#### **Recommended Books:**

1. Indian Constitutional Law, M.P. Jain, LexisNexis
2. Law of Press, Dr. Durga Das Basu
3. Press and Media, Vidisha Barua
4. Cases and Materials on Media Law, Dev Chopra & Ram Jethmalani, Thomson Reuters
5. Mass Media and Regulations by C.S.Rayadu and Nageshwar Rao
6. Facets of Media Law, Madhavi Goradia Divan
7. Media and Society, Graeme Burton
8. Law Relating to Press, Rai Bahadur and G.K.Roy
9. Freedom of Press: Some Secrets Trends by Justice S. Venkataramiah

## **B09. HEALTH LAW**

### **Objective:**

In modern times, particularly after the beginning of globalization and liberalization, science and technology are having impact on the community. Along with traditional legal subjects, there is a need to incorporate emerging sectors in legal education. Health Law is one such subject. This subject should be viewed as one of the measures of welfare legislation. At the same time the control and regulation of medicines and drugs is vital.

Therefore this course gives a comprehensive knowledge about different dimensions of medical including state's liability in protecting standards of health in the country

### **Syllabus**

#### **1. Introduction to Public Health:**

- 1.1. State responsibilities for community health in a welfare state
- 1.2. The right to health under the Constitution
- 1.3. Right to Die, Euthnesia
- 1.4. Allopathic and Alternative Medical Systems
- 1.5. National Health Policy

#### **2. Environment and Health**

- 2.1. Environmental Jurisprudence under Article 21
- 2.2. Factors affecting Public Health: Sanitation, waste management, water management, rural sanitation, causes for ill health in rural India.

#### **3. Liability for Injuries to health**

- 3.1. Major Industrial Accidents causing health hazards
- 3.2. Epidemics and control
- 3.3. Natural calamities
- 3.4. Disablement and health care
- 3.5. National Disasters Management Authority
- 3.6. Medical Negligence
  - 3.6.1. Meaning
  - 3.6.2. Scope
  - 3.6.3. Remedies

#### **4. Access to Medicines**

- 4.1. The Regulation of Pharmaceutical Industry
- 4.2. Drugs and Cosmetics Act



- 4.3. Patenting of Drugs and Medicines
- 4.4. Regulation of drug testing procedures in India
- 4.5. Multinational drug industry in India
- 4.6. Dumping of unsafe drugs
- 4.7. Advertising and Consumer protection

## **5. Public Hospitals**

- 5.1. Need, organization of Public hospitals
- 5.2. Medico - legal cases and duties of hospitals
- 5.3. Liability for medical negligence in public hospitals
- 5.4. Mental health care in public hospitals: duties and liabilities
- 5.5. Rural health care: Primary health centre
- 5.6. The model of National Health Service (NHS) in Great Britain

## **6. Initiatives of Government**

- 6.1. Important projects and schemes of State and Central Government
- 6.2. Health Care and Weaker Sections of Society
- 6.3. Health Care and Women: Amniocentesis, etc.

## **7. International health hazards and control programmes**

- 7.1. Role of WHO
- 7.2. Initiatives taken to control AIDS, Bird Flu, H1N1 Influenza, etc.

## **Reference Books:**

1. Reforming India's Social Sector: Poverty, Nutrition, Health and Education by Seeta Prabhu and R. Sudarshan, D.K. Publishers
2. The Indian Pharmaceutical Sector: Issues and Options for Health Sector Reform by Ramesh Govindraj and Gnanaraj Chellaraj, The World Bank
3. Modi's Medical Jurisprudence.
4. Disputes and Dilemmas in Health Law, by Ian Freckelton & Kerry Petersen, the Federation Press
5. Environmental Jurisprudence in India, C.M. Abraham, Kluwer Law International
6. Right to Health of Women and Children in India, Thorsten Volberg
7. Better Health Systems for India's Poor, Findings, Analysis and Options by Dvid Peters etc., World Bank
8. India's Public Health System: How well does it function at the National Level, by Manju Rani and Monica Das Gupta, World Bank Research Working Paper No. 3447, November 2004

9. Comparative Health Systems: Global perspectives, by James Johnson and Carlien Harriet
10. Caring and Curing: A History of Indian Health Service, by James Rife, PHS Commissioners Officers Foundation for Advancement of Public Health
11. Indian Health Report, 2010
12. India: Health Care Patterns and Planning, by Rais Akhtar, A.P.H publishing Corporation

**BHARATI VIDYAPEETH DEEMED UNIVERSITY  
NEW LAW COLLEGE, PUNE**

# **REVISED REGULATIONS**

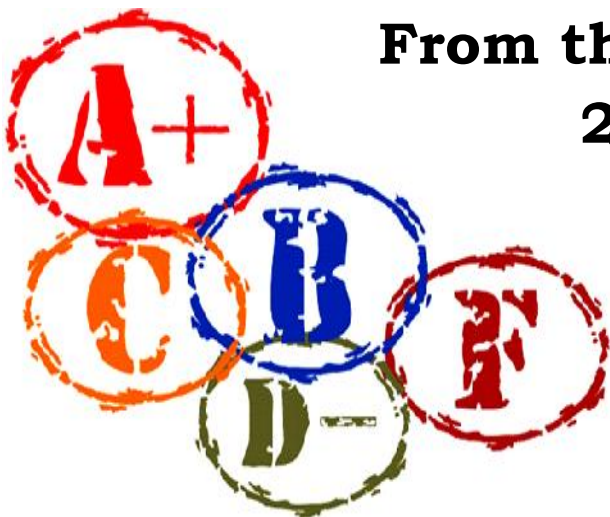
**RELATING TO THE TEN SEMESTERS**

**PATTERN OF BA. LL.B 5 YEAR DEGREE  
PROGRAMME**



**CHOICE BASED CREDIT SYSTEM  
(CBCS)**

**From the Academic Year  
2015-2016**



## **BHARATI VIDYAPEETH**

Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established in May, 1964 by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and all sided development of the people of our country through education.

Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing within a short span of 50 years or so 180 educational institutions imparting education from the pre-primary stage to post graduate stage. Our colleges and institutions of higher education impart education in different disciplines including Medicine, Dentistry, Ayurved, Homoeopathy, Nursing, Arts, Science, Commerce, Engineering, Pharmacy, Management, Social Sciences, Law, Environmental Science, Architecture, Hotel Management and Catering Technology, Physical Education, Computer Science, Library Science, Information Technology, Biotechnology & Agriculture.

These educational institutions which have achieved an acclaimed academic excellence cater to the educational needs of thousands of students coming from different parts of India and also abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational institutions are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Sangli, Karad, Panchagani, Jawhar and New Delhi. The spectacular success achieved by Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavor to impart high quality education and training to our students and so, no wonder that our institutions have become nationally known for their academic excellence. In recognition of the academic merit achieved by these institutions and potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to Bharati Vidyapeeth with its twenty nine constituent units.

Besides these 180 educational institutions, Bharati Vidyapeeth has also been successfully running a Co-operative Bank, Co-operative Consumer Stores, a Co-operative Poultry, a Co-operative Sugar Factory, Charitable Hospitals and Medical Research Centre and the like.

## **BHARATI VIDYAPEETH UNIVERSITY, PUNE**

As mentioned earlier, the Department of Human Resource Development, Government of India on the recommendation of University Grants Commission accorded the status of Deemed University to twelve units of Bharati Vidyapeeth (vide their notification No. F.9-15/95-U.3 dated 26/4/96 under the Section 3 of the University Grants Commission Act. of 1956).

Subsequently, the Govt. of India on the recommendations of the UGC and AICTE brought some more institutions of Bharati Vidyapeeth within the ambit of Bharati Vidyapeeth University. At present there are 29 Constituent Unites.

- 1) BVDU Medical College, Pune
- 2) BVDU Dental College & Hospital, Pune
- 3) BVDU College of Ayurved, Pune
- 4) BVDU Homoeopathic Medical College, Pune
- 5) BVDU College of Nursing, Pune
- 6) BVDU Yashwantrao Mohite College of Arts, Science and Commerce, Pune
- 7) BVDU New Law College, Pune
- 8) BVDU Social Sciences Centre (M.S.W.), Pune
- 9) BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune
- 10) BVDU Center for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
- 11) BVDU College of Physical Education, Pune
- 12) BVDU Institute of Environment Education & Research, Pune
- 13) BVDU Institute of Management and Entrepreneurship Development, Pune
- 14) BVDU Poona College of Pharmacy, Pune
- 15) BVDU College of Engineering, Pune
- 16) BVDU Interactive Research School in Health Affairs (IRSHA), Pune
- 17) BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
- 18) BVDU College of Architecture, Pune
- 19) BVDU Abhijit Kadam Institute of Management and Social Sciences, Solapur
- 20) BVDU Institute of Management, Kolhapur
- 21) BVDU Institute of Management & Rural Development Administration, Sangli
- 22) BVDU Institute of Management & Research, New Delhi
- 23) BVDU Institute of Hotel Management & Catering Technology, Pune
- 24) BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
- 25) BVDU Medical College & Hospital Sangli
- 26) BVDU Dental College and Hospital, Mumbai
- 27) BVDU Dental College and Hospital, Sangli
- 28) BVDU College of Nursing, Sangli
- 29) BVDU College of Nursing, Navi Mumbai

## **BHARATI VIDYAPEETH DEEMED UNIVERSITY NEW LAW COLLEGE, PUNE**

The Bharati Vidyapeeth's New Law College, Pune, having the recognition from Bar Council of India, New Delhi, came into existence on 1st August, 1978 as a permanently affiliated college of the University of Pune, Pune. This college had a privilege of being inaugurated at the hands of Hon'ble Shri.Y.V.Chandrachud, former Chief Justice of India. **When Bharati Vidyapeeth became a Deemed University in 1996, the New Law College became a constituent unit of the BHARATI VIDYAPEETH UNIVERSITY.** It was then resolved by the University authorities to shape the college as a centre of excellence in the field of legal education at national level. **The College has celebrated its Silver Jubilee during the academic year 2002-2003.**

### **Recognition of LL.B. Degree from Bar Council of India**

The Bar Council of India has given the recognition to the **Bachelor Degree of LL.B.** offered by Bharati Vidyapeeth University, for LL.B. 5 Year and 3 Year Courses by vide letter No.BCI.D.699.1999 (LE/Mtg) dated 6th August, 1999. The college affiliation is approved by the Bar Council of India by vide letter No.BCI:D:1029/2009 (LE/M/G) dt. 07/07/2009.

### **LEGAL EDUCATION AND BHARATI VIDYAPEETH UNIVERSITY**

The Bharati Vidyapeeth University, New Law College, has kept before itself the goals of advancement and dissemination of knowledge of law and legal processes in the context of national development. In accordance with these basic expectations the College is striving to achieve excellence in the field of legal education and research. The College while imparting the legal education has kept a goal in view that a professional lawyer must be well equipped to perform the various roles which lawyers are expected to play in our society. The lawyer is not to be merely a craftsman, manipulating advocacy skills in the traditional role of conflict resolution in courts. There are other concurrent curricular goals and roles for legal education, some of which may be more important than litigation in the context of our society.

In pursuance of Bar Council of India's Directive through Rule of Legal Education 2008, the Law Faculty of Bharati Vidyapeeth University has revised the entire syllabi of LL.B. of Three Year & Five Year Courses. The revised syllabi incorporate the theme of UGC Curriculum Report. The University has also introduced the semester programme (As per the Circular No.2/99 of Bar Council of India) for LL.B Three Year & Five Year Course from the academic year 2000-2001.

# **REGULATIONS RELATING TO THE SEMESTER PATTERN OF BA LL.B 5 YEAR DEGREE PROGRAMME**

**{10 SEMESTER PROGRAMME WITH CHOICE BASED CREDIT SYSTEM (CBCS)}**

1. The Five Year BA LL.B. Degree Programme approved by BCI is a **Ten Semester Programme**.
2. The duration of each semester shall be of six months.
3. There shall be an Examination at the end of each semester which shall be conducted by the University
4. Admission to the Programme is by Merit only through **All India Law Entrance Test** conducted by Bharati Vidyapeeth University.
5. **Eligibility for Admission to BA LL.B. First Semester** - The applicant shall have passed the H.S.C. Examination (10+2) in English or equivalent from recognized Board / University and have obtained minimum 45% marks in aggregate.
6. **Provisional Admission:** Every admission given shall be provisional. Provisional admission is for a limited period. Its confirmation depends upon the clearance of eligibility as per rules of admission/ examination. In case of non-clearance of eligibility within the period of first term, it stands cancelled automatically without any notice. In case of any doubt, the student shall contact the Principal immediately and shall clarify the doubts in writing.
7. BA. LL.B 5 year programme **shall have 280 credits in Ten Semesters** as prescribed in the table below.
8. The medium of instruction and of the examination shall be **English**.
9. The scope of the subjects shall be as indicated in the prescribed syllabus.
10. Each paper from Sem- I to Sem- X shall be of 100 marks.
11. In each paper out of 100 marks – 40 marks will be for Internal Examination and 60 marks for University Examination. This rule shall not be applicable for Practical Papers.
12. The student will be awarded LL.B. degree after passing in all the papers from I semester to X semester in LL.B. 5 Year Programme.
13. A person has already obtained BA LL.B. or equivalent degree from any other statutory University will not be eligible for the admission to the BA LL.B. Programme of this University.

## THE GENERAL STRUCTURE

1. B.A. LL.B. 5 Year Degree shall be awarded to candidates on successful completion of a Ten semester programme of study.
2. Curriculum, studies, examinations, and continuance from semester to semester, promotion and declaration of results are given in this infolet.
3. B.A LL.B. Programme will have courses of 280 credits in Ten semesters, as given below:

<b><u>I-Semester</u></b>			
<b>Course Category</b>	<b>Credits</b>	<b>No. of Courses</b>	<b>Total Credits</b>
Core Courses (Theory)	5	5	25
<b>Total Credits in I-Semester</b>			<b>25</b>
<b><u>II-Semester</u></b>			
Core Courses (Theory)	5	6	30
<b>Total Credits in II-Semester</b>			<b>30</b>
<b><u>III-Semester</u></b>			
Core Courses (Theory)	5	5	25
<b>Total Credits in III-Semester</b>			<b>25</b>
<b><u>IV-Semester</u></b>			
Core Courses (Theory)	5	6	30
<b>Total Credits in IV-Semester</b>			<b>30</b>
<b><u>V-Semester</u></b>			
Core Courses (Theory)	5	4	20
Core Elective	5	1	5
<b>Total Credits in V-Semester</b>			<b>25</b>
<b><u>VI-Semester</u></b>			
Core Courses (Theory)	5	4	20
Core Elective	5	1	5
Practical Paper- I	6	1	6
<b>Total Credits in VI-Semester</b>			<b>31</b>
<b><u>VII-Semester</u></b>			
Core Courses (Theory)	5	4	20
Core Elective	5	1	5
<b>Total Credits in VII-Semester</b>			<b>25</b>
<b><u>VIII-Semester</u></b>			
Core Courses (Theory)	5	5	25
Core Elective	5	1	5
Practical paper-II	6	1	6
<b>Total Credits in VIII-Semester</b>			<b>31</b>
<b><u>IX-Semester</u></b>			
Core Courses (Theory)	5	3	15
Core Elective	5	1	5
Practical Paper- III	6	1	6
<b>Total Credits in IX-Semester</b>			<b>26</b>
<b><u>X-Semester</u></b>			
Core Courses (Theory)	5	4	20
Core Elective	5	1	5
Practical Paper- IV	7	1	7
<b>Total Credits in X-Semester</b>			<b>32</b>
<b>Total Credit requirement for BA. LL.B 5 Year Course</b>			<b>280</b>



## **B.A. LL.B. (5 Year Degree Programme-10 Semester Programme)**

<b>I. B.A LL.B First Semester</b>	<b>Credits</b>
1. General English – I	5
2. Political Science – I	5
3. Sociology – I (General Principles)	5
4. Economics – I (General Principles)	5
5. Law of Torts including Motor Vehicle Accident and Consumer Protection Act	5
<b>Total Credits= 25</b>	
<b>II. B.A LL.B Second Semester</b>	<b>Credits</b>
1. General English – II	5
2. Political Science – II	5
3. Sociology – II (Sociology of India)	5
4. Economics – II (Indian Economics)	5
5. Law of Contract	5
6. International Human Rights	5
<b>Total Credits= 30</b>	
<b>III. B.A Law Third Semester</b>	<b>Credits</b>
1. General English – III (Including Legal Writing)	5
2. Political Science – III (Concepts & Ideology)	5
3. Sociology & Law – III	5
4. ICT & Legal Research (Soft Skills)	5
5. Constitutional Law – I	5
<b>Total Credits= 25</b>	
<b>IV. B.A LL.B Fourth Semester</b>	<b>Credits</b>
1. English – IV (Legal Language)	5
2. Political Science – IV (International Relations)	5
3. Economics and Law III	5
4. Family Law – I (Marriage, Divorce and Matrimonial Disputes)	5
5. Constitutional Law – II	5
6. Private International Law	5
<b>Total Credits= 30</b>	
<b>V. B.A LL.B Fifth Semester</b>	<b>Credits</b>
1. Political Science – V (Politics & Foreign Policy in India)	5
2. Law of Crimes	5
3. Jurisprudence	5
4. Family Law – II (Matrimonial Property, Guardianship & Adoption)	5
5. Optional – I	5
<b>A. Business Law Group –</b> Banking law including Negotiable Instrument Act	
<b>B. Constitutional Law Group –</b> Media and Law	
<b>Total Credits= 25</b>	

<b>VI. B.A LL.B Sixth Semester</b>	<b>Credits</b>
1. Political Science – VI (Public Administration)	5
2. Cyber Law	5
3. Special Contract	5
4. Practical Paper – I (Professional Ethics, Accountancy for Lawyers and Bar Bench Relations)	6
5. International Dispute Resolution Bodies	5
6. Optional – II	5
<b>A Business Law Group –</b> Insurance Law	
<b>B. Constitutional Law Group –</b> Health Law	

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**Total Credits= 31**

<b>VII. B.A LL.B Seventh Semester</b>	<b>Credits</b>
1. Civil Procedure Code & Limitation Act	5
2. Interpretation of Statutes	5
3. Company Law	5
4. Property Law Including Transfer of Property Act and Easement Act	5
5. Optional – III	5
<b>A Business Law Group –</b> Merger and Acquisition	
<b>B. Constitutional Law Group –</b> Right to Information	

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**Total Credits= 25**

<b>VIII. B.A LL.B Eighth Semester</b>	<b>Credits</b>
1. Labour Laws	5
2. Law of Evidence	5
3. Criminal Procedure Code, Juvenile Justice Act & Probation of Offenders Act	5
4. Practical Paper-II (Drafting, Pleading & Conveyancing)	6
5. Maritime Law	5
6. Optional –IV	5
<b>A. Business Law Group –</b> Competition Law & Practice	
<b>B. Constitutional Law Group –</b> Gender Justice and Feminist Jurisprudence	

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**Total Credits= 31**

## **IX. B.A LL.B Ninth Semester**

### **Credits**

1. Administrative Law	5
2. Environmental Law	5
3. Law on Infrastructure Development	5
4. Practical Paper-III (Moot Court, Pre-trial Preparations and Participation in trial proceedings)	6
5. Optional – V	5
<b>A. Business Law Group –</b> Direct Tax	
<b>B. Constitutional Law Group –</b> Law on Education	

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**Total Credits = 26**

## **X. B.A LL.B Tenth Semester**

### **Credits**

1. Public International Law	5
2. Intellectual Property Laws	5
3. Court Management	5
4. Practical Paper-IV (Arbitration, Conciliation and Alternative Dispute Resolution Systems)	7
5. International Environmental Law	5
6. Optional – VI	5
<b>A Business Law Group –</b> Indirect Tax	
<b>B. Constitutional Law Group –</b> Human Rights Law & Practice	

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**Total Credits=32**

**Total Requirement of Credits for B.A. LL.B 5 years Programme= 280 Credits**

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## COURSE DESIGN OF B.A. LL.B 5 YEAR PROGRAMME

The Scope of the Subjects shall be as indicated in the prescribed syllabus.

Semester	Foundational/ Compulsory Courses	Practical Papers	Electives/ Optionals	Total number of Papers	Total Marks Allotted	Total Credits
I	5	-	-	5	500	25
II	6	-	-	6	600	30
III	5	-	-	5	500	25
IV	6	-	-	6	600	30
V	4	-	1	5	500	25
VI	4	1	1	6	600	31
VII	4	-	1	5	500	25
VIII	4	1	1	6	600	31
IX	3	1	1	5	500	26
X	4	1	1	6	600	32
Total Number of Compulsory / Foundational Courses <b>=45</b>		Total Practical papers <b>= 04</b>	Total Number of Electives <b>= 06</b>	Total Number of papers <b>= 55</b>	Total Marks <b>= 5500</b>	Total number of Credits for BA. LL.B 5 Years Programme <b>= 280</b>

## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

- **Class/ Home Assignments & Research Paper** - 10 Marks
- **Unit Tests / Moot Courts/ Legal Aid** - 20 Marks
- **Tutorials Based On Case Studies & Legislative Analysis** - 05 Marks
- **Attendance** - 05 Marks

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**Total = 40 Marks**

## GUIDELINES FOR INTERNAL ASSESSMENT SYSTEM

### (Rules & Regulations)

#### 1. CLASS/ HOME ASSIGNMENTS & RESEARCH PAPER :-

Long Term Paper - 05 Marks

2 research papers - 05 Marks (2.5 Marks Each)

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**Total = 10 Marks**

#### EXPLANATION:-

In the Class/Home Assignments, the students are required to prepare a compulsory **Long Term Paper**. Besides this, the students shall also submit a minimum of **two compulsory Research papers** on any of the themes relating to the subject. The Submissions must be **free from plagiarism** and must meet international standards of modes of citation (except at places where only Indian Citation applies).

#### 2. UNIT TESTS:-

Unit test I - 10 Marks

Unit test II - 10 Marks

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**Total = 20 Marks**

#### EXPLANATION:-

There shall be a minimum of two compulsory Unit written tests to be appeared by the students which shall consist of 10 Marks for each paper. The Topics for each paper shall be notified by the concerned subject teacher well in advance. Similarly, a student can participate in the moot court/ legal aid and related activities.

### **3. TUTORIALS BASED ON CASE STUDIES & LEGISLATIVE ANALYSIS:-**

Tutorial 1 (Case Study-I)	- 02 Marks
Tutorial 2 (Case Study-II)	- 02 Marks
Tutorial 3 (Legislative Analysis)	- 01 Marks

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**Total = 05 Marks**

#### **EXPLANATION:-**

There shall be a minimum number of 3 Tutorials out of which 2 tutorials shall be based on the recent case studies while 1 tutorial shall be based on analysis of recent or landmark legislation relating to the subject to be appeared by the students in the Class.

### **4. ATTENDANCE:-**

**Attendance = 05 Marks**

#### **EXPLANATION:-**

As per the norms of Bar Council of India, it shall be compulsory for all students to have a minimum of 75% of attendance per semester.

#### **SPECIAL CLAUSE**

The students who participate at the following activities with the prior permission of the Principal may be exempted from the above rules as a Special case:

- a) *A Student Who participated at Various national and International Moot Court Competitions in India or abroad; or*
- b) *A Student Who participated in Mock Trials, Debate, Essay or any other kind of competitions*
- c) *A Student who participated in any Model United Nations, Model Parliamentary Debate Competitions in India or abroad; or*
- d) *A Student Who actively volunteered in the College organized or any national NSS activity or any other extra-curricular activities; or*
- e) *A Student Who participated in assisting NLC's Free Legal Aid Clinic or other legal aid services, Legal Awareness camps etc. ; or*
- f) *A Student who participated in any cultural or sports activities held at national or international level; or*
- g) *A Student who is suffering from prolonged illness duly certified by the Registered medical practitioner*

Provided, the students who participated in the abovementioned activities, have sought prior permission, in writing, of the Principal, Law College to represent the institute at national and international level. The exemption granted under this rule shall solely be subject to the discretion of the Principal, Law College and no Student can claim the exemption as a

matter of his/her right.

## **SYSTEM OF EXAMINATION**

Each paper shall be of 100 Marks out of which 40 Marks shall be for Internal Assessment (IA) and 60 Marks shall be for University Examination (UE). Internal Assessment (IA) and University Examination (UE) shall be conducted by the University for each paper.

## **THE CREDIT SYSTEM:**

The credits specified for B.A. LL.B. 5 years programme describe the weight ages of various courses of the programme. The number of credits along with grade points that the student has satisfactorily completed measures the performance of the student. Satisfactory progress of a student is subject to his/ her maintaining a minimum Cumulative Grade Point Average (CGPA), as well as minimum grades in different courses of the programme. A certain number of credits must be earned by the student to qualify for the degree. Description of credit distribution for core Courses, elective Courses, and language course has already been shown.

There shall be a 10-Point Absolute Grading System for grading in each head of passing. The system shall have seven, the highest being 10.

The performance indicators **O, A+, A, B+, B, and F** shall respectively mean:

O	Outstanding
A+	Excellent
A	Very Good
B+	Good
B	Satisfactory
F	Fail

## **THE GRADING SYSTEM UNDER CBCS**

### **Point Scale for Grading**

<b>Marks Range of marks (Out of 100)</b>	<b>Grade Point</b>	<b>Grade</b>
80 ≤ Marks ≤ 100	10	O
70 ≤ Marks ≤ 80	9	A+
60 ≤ Marks ≤ 70	8	A
55 ≤ Marks ≤ 60	7	B+
50 ≤ Marks ≤ 55	6	B
Marks below < 50	0	F

## **EVALUATION AND COMPUTATION OF THE GRADE POINT AVERAGES:**

Cumulative performance indicators such as GPA, SGPA or CGPA shall be calculated as described and illustrated below.

- A) The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the Course/ Paper.
- B) The Weights for performance at UE and IA shall respectively be **60% and 40%**.
- C) The Grade Point Average (GPA) for a Course/ Paper shall be calculated by first finding the total marks out of 100 for the Course/ Paper.
- D) Two kinds of performance indicators, namely, the Semester Grade point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the Courses/ Paper in a particular Semester, while CGPA measures the cumulative performance in all courses/ papers since his/her enrollment. The CGPA of a learner when he/she completes the programme is the Final Result of the learner.

## **STANDARDS OF PASSING**

- A) In order to pass in a Semester, a Student must obtain a minimum grade point of 6.00 (50%) both at the UE and IA.
- B) A Student who passes in a Course/ Paper is said to have completed the Credits assigned to the Course/ Paper.
- C) A Student who completed the minimum Credits required for a programme will be declared to have completed the programme.
- D) **Minimum passing grade** shall be Grade 'B' for each course/ Paper.

## **RULES OF PROMOTION FOR B.A LL.B 5 YEARS PROGRAMME**

In a 5 year LL.B programme, a Student who is admitted in 1st year, subject to the clearance of eligibility and after securing required credits for that year, shall automatically be promoted to next year. However, a Candidate who has not put minimum credits shall not be promoted to next year of the programme. In order to get promotion in 3rd year, the Candidate has to pass in all the papers of 1st year with minimum 6.00 grade points in each paper at both University Examination and Internal Examination. Similarly, in order to get promotion to 4th Year, a Candidate has to pass in all the papers of 1st year and 2nd year. In order to get promotion in last year, a Candidate has to pass in all the papers of 1st year, 2nd year and 3rd year of the programme.



**SINGLE DEGREE:**

As per the UGC rules, a Candidate admitted in **B.A. LL.B 5 Years Programme** is entitled for Single Degree only (**B.A. LL.B**) that too after the successful completion of 5 years programme. They shall not be entitled for Dual Degree as the duration of the Programme is only five years.

**AWARD OF HONOURS:**

A Student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The Final result will be in terms of letter grade only and is based on the CGPA of all Courses studied and passed. The Criteria for the award of honours is given below.

*The Criteria for the award of Degree are given as follows:*

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
9.50 < CGPA < 10.00	O	Outstanding	80 <Marks <100
9.00 < CGPA < 9.49	A+	Excellent	70 <Marks <80
8.00 < CGPA < 8.99	A	Very Good	60 <Marks <70
7.00 < CGPA < 7.99	B+	Good	55 <Marks <60
6.00 < CGPA < 6.99	B	Satisfactory	50 <Marks <55
CGPA Below 6.00	F	Fail	Marks below 50

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## **FIRST SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 - GENERAL ENGLISH - I**

#### **Part- A FUNCTIONAL GRAMMAR**

**Unit 1** The Article

**Unit 2** Parts of Speech (Comparison of Adjectives, Conjunctions)

#### **Part- B CORRECT USAGE AND VOCABULARY**

##### **Unit 3 Sentence**

a. Tense and Concord

b. Synthesis

##### **Unit 4 Verb Conditionals**

a. Probable

b. Improbable

c. Impossible

**Unit 5 Speech:** Direct, Reported.

**Unit 6 Voice :** Active and Passive

#### **Part- C APPLIED GRAMMAR:**

**Unit 7 Basic Transformation :** a)Voice b) Sentences

**Unit 8 Sentences:** Simple, Compound and Complex.

**Unit 9** Question tags and Short Responses

**Unit 10** Punctuation and Capital Letters

**Unit 11 Legal Terms**

**Unit 12 Improved Spelling**

**Unit 13 Comprehension Skills :** Listening, Speaking, Reading and Writing

#### **Part- D WRITING SKILLS:**

**Unit 14 Paragraph Writing** ( Legal topic)

**Unit 15 Correspondence:** Note-making, Letter, Message, Report.

**Unit 16** Translation from Hindi/ Marathi language into English and vice versa.

**SUGGESTED READINGS:**

1. L. A. Hill & Others - English Language Course For Colleges, Book I, (Oxford University Press).
2. Exercises In English Composition, (Oxford University Press).
3. A. S. Hornby & Others, An Advanced Learners Dictionary of Current English Usage, (Oxford University Press).
4. Black's Law Dictionary, (St. Paul Minn, West Publishing Co).
5. Mitra, Legal & Commercial Dictionary, (Eastern Law House, Calcutta.)
6. Stround, Judicial Dictionary of Words & Phrases (In 5 Vols.), (Sweet & Maxwell Ltd, London.)

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## PAPER 2 POLITICAL SCIENCE I

### **Part- A. Introduction to Political Science:**

**Unit- 1 Political Science:** Meaning, Nature, Scope and Importance.

- 1) State- Meaning and Theories Of Origin Of State.
- 2) Elements of State-Population, Territory, Government, And Sovereignty (Austin's Theory).
- 3) Organs Of Government- Legislature, Executive, Judiciary (With Special Reference To-Independence Of Judiciary, Judicial Activism And Judicial Review)
- 4) Organization of Government- Unitary, Federal, Confederal.

### **Part B**

- 1) Liberty and Equality.
- 2) Justice (Rawlsian Notion of Distributive Justice) and Rights.
- 3) Secularism.
- 4) Power, Authority, Legitimacy.
- 5) Political Obligation.

### **Reference Books**

- i. Eddy Asirvatham – Political Theory.
- ii. B. K Gokhale – Political Science (Theory and Governmental Machinery).
- iii. O.P Gauba – Political Theory.
- iv. Rajeev Bhargava – Political Theory (An Introduction)
- v. Andrew Heywood – Key Concepts in Politics.

### **PAPER – 3 SOCIOLOGY-I (GENERAL PRINCIPLES)**

- Unit 1 Introduction:** Definition, Nature and Scope of Sociology
- Unit 2 Basic Concepts in Sociology:** Society, Community, Institution, Association, Organization, Social Structure and Social System, Status and Role, Norms and Values.
- Unit 3 Society:** Types of Society
- Unit 4 The Methods of Sociology**  
Sociology of Law – Significance of the Study of Sociology for Law Students, Sociology of Legal Profession, Sociology and Jurisprudence.
- Unit 5 Social Control** – Means of Social Control, Need of Social Control, Law as A Means of Social Control.
- Unit 6 Society and Law** – Problem of Social Order In Modern Society, Deviance – Its Causes and Implications.
- Unit 7 Social Change** - Theories of Social Change, Factors of Social Change, Law as Means of Social Change.
- Unit 8 Social Groups** - Different Groups - Primary & Secondary.

#### **SUGGESTED READINGS:**

1. M. Haralambos - Sociology Themes and Perspectives. (Oxford Univ. Press Delhi.)
2. Vidya Bhushan & Sachdeva - Introduction to Sociology. (Kitab Mahal Allahabad).
3. Roscoe Pound - Social Control through Law.
4. Cardozo - The Growth of Law.
5. Henry Maine - Ancient Law.
6. T.B. Bottomore, Sociology, (London: Allen & Unwin).

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## **PAPER – 4 ECONOMICS-I (GENERAL PRINCIPLES)**

### **Unit 1 Introduction to Economics**

- a. Definition and Subject Matter of Economics
- b. Economic Problems
- c. Economic Systems- Free Enterprise, Planned Economics and Mixed Economy.

### **Unit 2 Unit 2 General Principles of Economics**

- a. Demand and Supply
- b. Markets, Determination of Prices
- c. Types of Business Organizations

### **Unit 3 Unit 3 Money and Banking**

- a. Features and Functions of Capital
- b. Functions of Money
- c. M1, M2, M3 (Concepts of Money/High Powered Money)
- d. Commercial Banks-(Functions)
- e. Role of Credit (Credit Creation-Multiply)

### **Unit 4 Unit 4 Central Banking Institution (RBI)**

- a. Functions of Central Banking Institution
- b. Credit- Control (tools)- Qualitative and Quantitative
- c. Monetary Policy- Scope, Objectives & Limitations

### **Unit 5 Unit 5 Public Finance**

- a. Sources of Public Finance
- b. Taxation
- c. Deficit Financing
- d. Fiscal Policy- Aim and Objectives

### **Unit 6 Unit 6 International Financial Institutions**

- a. International Monetary Fund (IMF)
- b. World Bank (IBRD)

**SUGGESTED READINGS:**

1. Paul Samuelson - Economics - An Introductory Analysis (International Student Edition, Mc-Graw-Hill Book Company)
2. Fredrthuc Lewis - Theory of Economic Growth (Unwin University Book, London)
3. C. T. Kurien - Planning, Poverty and Social Transformation (Allied Publication, Mumbai)
4. Myrdal, Gunnar - The Challenge of World Poverty (Penguin Books, London)
5. Mahbub Ul Haq - The Poverty : Certain Choice For The Third World (Oxford University Press, Delhi)
6. Stonier and Hague - The Essentials of Economics (Longmans, London).

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**PAPER – 5 LAW OF TORTS INCLUDING MOTOR VEHICLE ACCIDENT  
AND CONSUMER PROTECTION ACT**

**Part- A**

**Unit 1 Nature and Definition of Tort :**

- a. Definition of tort, Essentials of tort, tort Compared, Maxims Damnum Sine Injuria and Injuria Sine Damno
- b. Foundation of Tortious Liability- Malice, Motive, Intention and Fault in Law of torts

**Unit 2 General Defenses :**

- a. Maxim Volenti Non Fit Injuria, Act of God, Inevitable accident, Mistake, Necessity
- b. Private defense, Statutory authority, Judicial Acts, Act of State, Officers of the Court

**Unit 3 Capacity to Sue and Be Sued :**

- a. Who cannot sue
- b. Who cannot be sued

**Unit 4 Trespass :** Trespass to Person- Assault, Battery and False Imprisonment, Trespass to Land, Trespass to Goods

**Unit 5 Negligence and Contributory Negligence :**

- a. Meaning, essentials, defenses, Res Ipsa loquitur
- b. Contributory negligence- apportionment of damages, Doctrine of alternative danger, Doctrine of identification

**Unit 6 Nervous Shock :** Meaning and Principles

**Unit 7 Vicarious Liability :**

- a. Vicarious Liability of The State

**Unit 8 Defamation :**

- a. Libel and slander
- b. Essentials of defamation- defenses

**Unit 9 Nuisance :** Public and private, defenses and remedies

**Unit 10 Malicious Prosecution :** Essential conditions, difference between false imprisonments and Malicious Prosecution

**Unit 11 Strict Liability and Absolute Liability**

**Unit 12 Remedies :** Kinds of damages, Injunction, Specific restitution of properties



**Unit 13 Discharge of torts**

**Part- B**

**Unit 14 Consumer Protection Act**

- a. Objects, Reasons and Definitions, Consumer Protection Councils, Consumer Disputes Redressal Agencies
- b. E-Commerce and Consumer Protection

**Unit 15 The Motor Vehicle Act**

- a. Objects and Definitions, Compensation
- b. Liability Without Fault in Certain Cases

**SUGGESTED READINGS:**

1. S.P.Singh – Law of Torts (Universal Law Publishing Co.)
2. Dr. N. V. Paranjape -Law of Torts, Consumer Protection Law and Motor Vehicle Act (Central Law Agency)
3. Ratanlal & Dhirajlal- Law of Torts (Wadhwa & Co.)
4. Avtar Singh- Consumer Protection Act (Eastern Book Company)
5. R. K. Bangia- Law of Torts, Alhabad Law Agency

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## **SECOND SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 - GENERAL ENGLISH - II**

#### **Part- A VOCABULARY:**

**Unit 1** Idiomatic expressions and Phrases

**Unit 2**

- a. Legal Terms and Phrases ( Latin and English)
- b. Use of Affixes

**Unit 3** One-word substitution

**Unit 4** Words : Synonyms, Antonyms, Homonyms

#### **Part- B COMPREHENSION SKILLS:**

**Unit 5** Common Logical Fallacies

**Unit 6** Comprehension of Legal Texts

#### **Part- C WRITING SKILLS AND SPEECH TRAINING:**

**Unit 7** Précis Writing

**Unit 8** Use of Cohesive Devices (Conjunctions) in Legal Drafting

**Unit 9** Essay Writing on topics related with Law

**Unit 10** Sentence Structure and Verb Patterns

**Unit 11** Translation from Hindi/ Marathi language into English and vice versa

**Unit 12** Reading Aloud (tone, stress, intonation, pause, pronunciation)

**Unit 13** Key Sounds, their discrimination and accent

**Unit 14** Consulting a Dictionary for meaning and pronunciation

**Unit 15** Conversations in everyday situations

**Unit 16** Speech and Debate exercises

#### **SUGGESTED READINGS:**

1. L. A. Hill & Others - English Language Course for College, Books ii & iii (Oxford University Press).
2. N.S. Prabhu & Bhaskar - English through reading (Macmillan,India).
3. M.K. Gandhi - The Law and The Lawyers, (Navjivan Publications, Ahmedabad.)
4. Ishtiaque Abidi - Law and Language, (University Publishers, Aligarh,)
5. Lewis - The New Roget's Thesaurus in Dictionary Form.
6. M.C. Chagla - Roses in December, (Bharatiya Vidya Bhavan, Bombay)
7. Edmund Burke - Impeachment of Warren Hastings, (G. Well,London.)

8. Hindi - English Glossary. (Vidhi Sahita Prakashan, Ministry of Law, New Delhi.)
9. M. C. Setalvad - My Life, Law & Other Things (N.M. Tripathi, Mumbai)
10. Bansal & Harrison- Spoken English in india

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## **PAPER 2 POLITICAL SCIENCE II**

### **Unit- 1 Western Political Thought**

- a. Ancient Political Philosophers – Plato – Idea of Justice and The Ideal State.
- b. Aristotle – Idea of Citizenship and Classification of Governments.
- c. Machiavelli – Beginning Of Modern Era.
- d. Social Contractualists - Hobbes, Locke, Rousseau.
- e. J.S Mill as a Modern Liberal.
- f. Theories of Karl Marx.

### **Unit-2 Indian Political Thought**

- a. Chanakya Niti.
- b. Indian Renaissance (Roy, Ranade, Gokhale Traditions)
- c. Ambedkar And His Theory Of Social Democracy.
- d. Gandhi-State, Swaraj, Sarvodaya.

### **SUGGESTED READINGS:**

1. George Sabine – A History of Political Theory.
2. Mukherjee & Ramaswamy – A History of Political Thought – From Plato To Marx.
3. Thomas Pantham – Indian Political Thought.
4. V. R. Mehta – Indian Political Thought.

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### **Paper 3 Sociology II (Sociology of India)**

- Unit 1 Marriage Institutions:** Definitions, Types of Marriage, Divorce.
- Unit 2 Family Institutions:** Definition, Types of Family, Functions of Family.
- Unit 3 Political Institution:** Meaning, Function and Forms of the State, Government, Power, Authority - Sources, Sanction and Kinds, Legitimacy, Bureaucracy.
- Unit 4 Economic Institution:** Capitalism, Property, Private Property, Division of Labour. The Corporate Business Group and Occupational Groups.
- Unit 5 Social Stratification:** Social Stratification in India - Class and Caste. Marxian Concept of Class, Caste and Class in Contemporary India.
- Unit 6 Religion Institution :** Definition, Origin and Types of Religion
- Unit 7** The Backward Classes - Their Major Problems, Constitutional Provisions - Evaluation of Govt. Measures for Their Upliftment.
- Unit 8 Status of Women in India & Constitutional Provisions.**
- Unit 9 Indian as A Plural Society:** Unity and Diversity.

#### **SUGGESTED READINGS:**

1. N. K. Bose, The Structure of Hindu Society (New Delhi : Orient Longman)
2. David G. Mandelmaum, Society In India (Bombay, Popular Prakashan).
3. Romesh Thapper (Ed), Tribe, Caste and Religion In India: (New Delhi, Macmillan).
4. Andre Betelle, Inequality and Social Change (Delhi : Oxford University Press)
5. Andre Betelle, The Backward Classes and The New Social Order (Delhi: Oxford University Press).

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## **PAPER 4 - ECONOMICS II (INDIAN ECONOMICS)**

**Unit 1 Introduction to Indian Economy :** Current Challenges to Indian Economy

- a) Population
- b) Poverty
- c) Unemployment

**Unit 2 Economic Growth and Economic Development :**

- a) Concepts and Difference Between Economic Growth and Economic Development
- b) Factors Affecting Economic Development
- c) Characteristics of Developing Economies
- d) Need For Economic Planning In Development
- e) Human Development Index

**Unit 3 Role of Industry and Agriculture In Economic Development**

- a) Public Sector, Private Sector and Small Scale Industries
- b) Agricultural Productivity and Green Revolution
- c) Nabard

**Unit 4 National Income**

- a) Methods of Estimating National Income
- b) Difficulties In Estimation of National Income
- c) Curricular Flow of National Income

**Unit 5 International Trade**

- a) The Importance of International Trade
- b) The Basis and The Gains From Trade: Comparative Advantage
- c) Multinational Corporations (Benefits and Problems)

**Unit 6 Export Import Policy of India (Exim Policy)**

### **SUGGESTED READINGS:**

1. Livingstone, (Ed) - Economic Policy For Development (Penguin Books, London).
2. Rudra Datta and Sundram - Indian Economy. (Delhi, S. Chand & Co.)
3. A.N. Agrwala - Indian Economics, (New Delhi, Vikas Publication).
4. C.T. Kurien - Planning, Poverty and Social Transformation (Allied

Publication, Mumbai)

5. Myrdal, Gunnar - The Challenge of World Poverty (Penguin Books, London)
6. Mahbub Ul Haq - The Poverty : Certain Choice For The Third World (Oxford University Press, Delhi)
7. P.C. Joshi - Land Reforms In India (Allied Publication, Mumbai).

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## **PAPER 5 – LAW OF CONTRACT**

### **Part A - General Principles of Law of Contract:**

**Unit 1** Nature of Contractual Obligation and Historical Development In England & India - Nature of Contractual Obligation, Theories of Contract - Subjective Theory, Objective Theory, History of Contractual Obligation In English Law - The Medieval Actions, Such As Debt., Covenant, Assumption, Consideration Etc., Codification of The Law of Contract In India, Economic Justice and Freedom of Contract Under Indian Constitution.

### **Unit 2 General Principles As To Formation of Contract :**

- a. Tender – Public Contracts- Law Relating To Tenders, Article 299, No Unreasonableness, Judicial Review
- b. Offer, Acceptance and Revocation of Electronic Contracts (E-Mail)
- c. Agreement and Contract - Definitions, Elements and Different Kinds, Proposal and Acceptance - Their Various Forms, Essential Elements, Communication and Revocation - Proposal and Invitations For Proposals - Floating offers, Tenders, Principles As To Factors Tending To Defeat, Capacity To Contract, Incapacity Arising Out of Status and Medical Insanity - Minor's Position and Minor's Agreement.

**Unit 3 General Principles Regarding Free Consent:** Need and Definition - Factors Vitiating Free Consent - Coercion, Undue Influence, Misrepresentation, Fraud and Mistake.

**Unit 4 Doctrine of Consideration:** Meaning, Need, Kinds, Essential Elements, Adequacy of Consideration, Exceptions, Privity of Contract and Consideration and Its Effects, Views of The Indian Law Commission.

**Unit 5 General Principles As To Illegality of Objects of Contracts :** Unlawful Considerations and Objects, Void Agreement, Voidable Agreement, Uncertain Agreement, Wagering Agreements, Effects of Void, Voidable, Unlawful and Illegal Agreements.

### **Unit 6 General Principles As To Performance and Discharge of A Contract and Its Various Modes :**

- a. Performance, Conditions of Valid Tender of Performance - How? By Whom? Where? When? In What Manner? When Time Is a Essence of Contract?
- b. Breach - Anticipatory Breach and Present Breach, Period of Limitation, Impossibility of Performance - Grounds of Frustration, Theory of Frustration - Subsequent and Supervening



Impossibilities, Contracts Not Requiring Performance - Novation, Alteration - Recession, Their Effects - Remission, Waiver of Performance, Accord and Satisfaction.

**Unit 7 Quasi - Contracts** Or Certain Relations Resembling Those Created By Contract. - Kinds and Consequences

**Unit 8 General Principles As To Remedies For Breach of Contractual Relations** : Damages - Kinds, Ascertainment, Remoteness of Damages, Interest On Damages, Compensatory Nature of Damages, Injunction -Reasons, Specific Performance, Refund and Restitution, Laches.

**Unit 9 Recent Trend and Contemporary Aspects of Contract:** Standard Form Contract - Nature, Advantages, Exemption Clauses, Law Commission of India's Views - Standard Form Contract, Consumer Protection and Contractual Obligation - Consumer Protection Act.

**Part- B. Specific Relief Act :**

**Unit 10** Nature of Specific Relief and Recovering Possession of Property.

**Unit 11** Specific Performance of Contracts and Injunction.

**Unit 12** Rectification, Rescission, Cancellation and Declaration.

**SUGGESTED READINGS:**

1. Bipin Chandra - The Rise and Growth of Economic Nationalism In India (1966) (Especially For Unit I)
2. A.G. Guest (Ed.) - Anson's Law of Contract. (Oxford University Press)
3. P.S. Atiya - Introduction to The Law of Contract. (Oxford University Press)
4. Pollock and Mulla - Indian Contract Act and Specific Relief Act. (N.M.Tripathi, Mumbai)
5. Avtar Sing - Law of Contract. (Eastern Book Company, Lucknow).
6. B.M. Gandhi - Equity, Trusts and Specific Relief (Eastern Book Company, Lucknows)

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## **PAPER 6 INTERNATIONAL HUMAN RIGHTS**

### **Unit 1 Concept and Development of International Human Rights:**

- a. Historical Background Of Human Rights, Meaning, Kinds Of Human Rights And Evaluation Of Human Rights
- b. Concept Of International Human Rights, Nature And Development Of International Human Rights
- c. Classification Of Human Rights
- d. International Human Rights Standards -United Nations Charter

### **Unit 2 International Covenants On Human Rights:**

- a. Universal Declaration On Human Rights 1948
- b. Enforcement Of International Human Rights
- c. Role Of International Organization And Human Rights
- d. Covenant On Civil And Political Rights 1966
- e. Covenant On Economic, Social And Cultural Rights 1966

### **Unit 3 International Human Rights And Vulnerable Groups :**

- a. Women
- b. Child
- c. Migrant Workers
- d. Disabled Person
- e. Indigenous People
- f. Older People

### **Unit 4 International Human Rights and Regional Convention**

- a. European Convention On Human Rights
- b. European Commission On Human Rights
- c. American Convention On Human Rights
- d. African Convention On Human Rights
- e. Other Regional Conventions

### **Unit 5 International Human Rights Protection Agencies:**

- a. International Commission On Human Rights
- b. Non-Governmental Organizations (Ngo)
- c. Amnesty International
- d. International Labour Organization

- e. UNESCO
- f. UNICEF
- g. Voluntary Organizations
- h. Role Of International Court Of Justice

**Unit 6 International Convention on Inhuman Acts:**

- a. Genocide, Apartheid
- b. Torture And Other Cruel Inhuman Degrading Treatment
- c. Slavery And Slave Trade
- d. Elimination Of Rapid Dissemination
- e. Death Penalty

**Unit 7 International Humanitarian Law:**

- a. Application Of Humanitarian Law
- b. Historical Development, Nature And Scope Of Humanitarian Law
- c. Use Of Force By State And International Law
- d. War And Warfare: - Conventional - Biological – Nuclear- Prisoners Of War - Role Of Red-Cross - International Terrorism - International Criminal Court And Protection Of Human Rights
- e. International Law And Refugee: - Concept Of Refugee - Rights Of Refugee -Un Relief And Rehabilitation - International Refugee Organization - Convention On Refugee.

**Unit 8 International Conferences On Human Rights:**

- a. International Conferences On Human Rights (Tehran Conference)
- b. World Conferences On Human Rights (Vienna Conference)
- c. Follow Up To The World Conference On Human Rights

**SUGGESTED READINGS:**

1. Dr. H. O. Agarwal, International Law
2. Dr. Kapoor, International Law On Human Rights
3. Dr. V.K. Anand, Huamn Rights
4. M. K. Balchandran, Rose Varghese, Introduction To International Humanitarian Law (1997).
5. Nagendra Singh, International Maritime Law Conventions, Vol. Navigation.
6. Oppenheim, International Law, Vol. I.
7. R. P. Anand, Legal Regime Of The Sea Bed And The Developing Countries.

8. Nagendra Singh, India And International Law.
9. J. N. Singh, Use Of Force Under International Law.
10. G. Schwarzenbeyger, The Law Of Armed Conflicts (Vol. Ii).
11. R. P. Anand, Law Of The Sea, Caracas And Beyond. 15. D. W. Bowett, Law Of The Sea.
12. International Conventions On Human Rights

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## **PAPER 2 POLITICAL SCIENCE III- CONCEPTS & IDEOLOGIES**

- Unit 1** Democracy-  
Direct and Representative
- Unit 2** Constitutionalism
- Unit 3** Secularism  
Different Perspectives
- Unit 4** Socialism
- Unit 5** Communism
- Unit 6** Totalitarianism:  
Nazi and Fascist Tendencies.
- Unit 7** Feminism.
- Unit 8** Environmentalism.
- Unit 9** Terrorism.
- Unit 10** Human Rights.

### **SUGGESTED READINGS:**

1. Robert Eceleshall, (1984) Political Ideologies: An Introduction, Hutchison, London
2. Leon P Baradat, (2008) Political Ideologies: Their Origins And Impact, Pearson Prantice Hall, South Asia
3. Ray B N, (2006) Political Theory: Interrogations And Interventions, Authors Press, Delhi
4. Andrew Haywood, (1992) Political Concepts, Macmillan, London
5. Andrew Haywood, (1992) Political Ideologies, Macmillan, London
6. B.K.Gokhale – Political Science.
7. Asirvatham – Political Theory.
8. Rajeev Bhargava - Political Theory (An Introduction)
9. Baxi Upendra, 2002, The Future Of Human Rights, New Delhi, Oup

### **PAPER 3 - SOCIOLOGY & LAW - III**

#### **Unit 1 Social Disorganization and Law**

- a. Meaning of Social Disorganization
- b. Nature of Social Disorganization

#### **Unit 2 Social Problems In India**

- a. Student Unrest:  
Meaning, Causes, Consequences, Remedies
- b. Old Age:  
Meaning, Causes, Consequences, Remedies

#### **Unit 3 Family Disharmony and Law**

- a. Domestic Violence
- b. Dowry
- c. Divorce
- d. Sati System

#### **Unit 4 Issues Pertaining to Deviance**

- a. Juvenile Delinquency and Crime
- b. White Collar Crimes & Corruption
- c. Changing Profile of Crime and Criminals
- d. Drug Addiction
- e. Suicide

#### **Unit 5 Issues Pertaining to Nation Building :**

- a. Secularism
- b. Poverty
- c. Illiteracy
- d. Unemployment

#### **Unit 6 Gender and Law**

- a. Social Structure and Gender Inequality
- b. Effect of Development Policies On Gender Relations
- c. Women Empowerment
- d. Reservation For Women

#### **Unit 7 Contemporary Issues: Developmental**

- a. Population
- b. Regional Disparity

- c. Slums
- d. Ecological Degradation and Environmental Pollutions
- e. Health Problems

**Unit 8 Sociological Jurisprudence**

- a. Criminology
- b. Penology
- c. Human Rights
- d. Roscoe Pound: Theory of Social Engineering

**Unit 9 Sociology of Legal Profession**

- a. Legal Education
- b. Importance of Legal Education
- c. Concept of Legal Aid and Legal Literacy

**SUGGESTED READINGS:**

- |                      |   |   |
|----------------------|---|---|
| 1. G. R. Madan       | - | Indian Social Problems                          |
| 2. C. B. Mamoria     | - | Indian Social Disorganization & Social Problems |
| 3. C. B. Mamoria     | - | Population Problem In India                     |
| 4. Ram Ahuja         | - | Social Problem In India                         |
| 5. Datta and Sundram | - | Indian Economy                                  |
| 6. D. R. Saxena      | - | Law, Justice & Social Change                    |
| 7. W. Friedman       | - | Law In A Changing Society                       |
| 8. Bodenheimer       | - | Jurisprudence                                   |
| 9. Mallih & Rawat    | - | Law & Social Transformation                     |
| 10. S. K. Kapoor     | - | Human Rights & International Law                |
| 11. A. Siddique      | - | Criminology: Problems and Perspectives          |
| 12. S. Kaldate       | - | Society, Delinquents and Juvenile Courts        |
| 13. Upendra Bakshi   | - | Law and Poverty: Critical Essay.                |
| 14. Kumud Desai      | - | Marriage and Divorce In India                   |
| 15. Paras Diwan      | - | Family Law In India                             |

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## **PAPER 4 – ICT AND LEGAL RESEARCH (SOFT SKILLS) 100 MARKS**

### **Unit 1 Introduction to Information Technology**

- a. Information Technology and Legal Education, Challenges and Significance
- b. International Lawyering : A Look At Global Opportunities
- c. Significance of Soft Skills For Lawyers
- d. Relationship Building With Clients, Lawyers, Judges, and Other Citizens
- e. Approaches to Develop Better Communication Skills, Service Orientation, Communication, Verbal Non-Verbal Communication, Barriers In Communication.

### **Unit 2 Fundamentals of Computer**

- a. Introduction to Ms office, Word, PowerPoint, Excel, Access,
- b. Basic Concepts of IT, Data Processing: Data and Information.
- c. Introduction to Computers: Classification, History, Types of Computers.
- d. Introduction to Various Units. Hardware: CPU, Memory, Input and Output Devices, Auxiliary Storage Devices. Software: System and Application Software.
- e. The Binary Number System
- f. Computers and Communication: Introduction to Computer Networks, Internet and World Wide Web, Ftp, Electronic Mail.
- g. Front-page, Html, Primary Key and Secondary Key, Information Security and Integrity

### **Unit 3 Information Technology and Legal Education**

- a. Use and Significance of Information Technology In Legal Education
- b. Understanding Legal Data Bases, Use of Online Legal Databases and Its Significance In Legal Research
- c. Useful Legal Web-Portals For Lawyers, Useful Websites In Legal Education
- d. Data Basics and E-Library
- e. Other tools For Legal Research and Use of Search Engine
- f. Data Security, Document Management
- g. Open Access Journals and Its Importance in Legal Research

- h. Role of ICT in Courts. Application of ICT in Court Administration, E-Court, E-Litigation
- i. E-Governance In Court Procedure, E-Courts: Needs of The Present Era
- j. ICT Application In Teaching-Learning Purpose In Legal Education
- k. Merits of ICT Application In Legal Education
- l. National Policy For Implementation of ICT In Judiciary
- m. ICT Application In Justice Delivery System

**Unit 4 Information Technology and Legal Research**

- a. Information Technology and Research
- b. Legal Research- Nature and Scope, Objectives, Characteristics
- c. Basic Concepts In Research- Data Collection, Classification of Data, Analysis of Data, Research Methodology, Hypothesis, Research Design, Citation, Endnote, Footnote.
- d. Use of Information Technology In Legal Research, Significance
- e. Use of Search Engines In Collection of Data
- f. Using The Internet Explorer For Legal Information
- g. Different Modes of Communication Though Internet
- h. Bulletin Boards
- i. Retrieving Files
- j. Important Internet Sites On Law
- k. Advantages of Computer Organized Or Assisted Legal Research (COLR/CALR)
- l. Disadvantages or Problems Or Limitation of COLR

**Unit 5 Plagiarism**

- a. Introduction, Definition, Meaning and Concept of Plagiarism
- b. Types of Plagiarism
- c. Student Attitude towards Plagiarism, Plagiarism By Student
- d. Plagiarism and Research Ethics
- e. Plagiarism In Research: Problems and Solutions
- f. How to Detect Plagiarism
- g. Consequences of Plagiarism

**SUGGESTED READINGS:**

- Prof. Dr. Rattan Singh, Legal Research Methodology, Lexis Nexis, 2013.
- C.R. Kothari, Research Methodology, New Age International Publishers, 2004
- Dr. S.R. Myneni, Legal Research Methodology, Allahabad Law Agency, 2012.
- Dr. H.N. Tewari, Legal Research Methodology, Allahabad Law Agency, 2008.
- Raja Raman V., "Fundamental of Computers" (4th Edition.), Prentice Hall of India, New Delhi.
- Norton, Peter, "Introduction to Computers, Mc-Graw-Hill.
- B. Ram, "Computer Fundamentals", New Age International Pvt. Ltd
- S. Jaiswal, "Fundamental of Computer & It", Wiley Dreamtech India.

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**Unit 1 Nature and Scope of Fundamental Rights under Indian Constitutional Law :**

- a. Citizenship
- b. State- Art. 12

**Unit 2 Equality and Social Justice (Art. 14 to 18) :**

- a. Nature of the Doctrine of Equality under Art, 14, 15 and 16 - Old and New Doctrine.
- b. Test of Reasonable Classification - Basis of Classification, Protection against Discrimination.
- c. Equality and Reservation Policy - Judicial Decisions - Strategy for Compensatory and Ameliorative Justice - Supreme Court's Decisions.

**Unit 3 Freedom of Speech and Expression (Art 19 (1) (a) & (2)) :**

- a. Scope of the Freedom under Art. 19 (1) (a) - New Dimensions to Freedom of Speech and Expression, Freedom of Press - Prior Restraints on Publication, Film Censorship and Obscenity
- b. Reasonable Restrictions under Art. 19 (2) - Grounds and Instances.

**Unit 4 Freedoms:** Freedom of Assembly, Association Movement, Residence, Profession and Business under Art. 19 (1) (b) (c) (d) (e) and (g) Scope of the Freedoms Reasonable Restriction under Art. 19 (3)(4)(5) & (6) -Grounds and Instances of Reasonable and Unreasonable Restrictions.**Unit 5 Safeguards to the persons Accused of Crime (under Art.20 & 22) :**

- a. Protection from the operation of Ex Post Facto Laws [Art. 20 (1)].
- b. Protection from Double Jeopardy [Art. 20 (2)].
- c. Prohibition against Self-Incrimination [Art. 20 (3)].
- d. Rights of Arrested Person [Art. 22 (1) to (3)]
- e. Preventive Detention under [Art 22 (4) to (7)] - Constitutional Safeguards.
- f. Constitutional Validity of Preventive Detention Laws TADA, NSA, COFEPOSA, SAFEMA.

**Unit 6 Rights to Life and Persons Liberty :**

- a. Nature and Scope of Art. 21 - Meaning of Life and "Personal

Liberty", Pre and Post Maneka Gandhi Phase - American due process clause and procedure established by Law.

- b. Expanding Horizons of Art. 21 - Capital Punishment, Bonded Labour, Compensation, Medical Help, Education, Right to Live with Dignity, Right to Livelihood, Right to Privacy, Right to Die, Prisoner's Rights, Professional Obligation of Doctors, Free Legal Aid, Speedy Trial etc.

**Unit 7 Right against Exploitation (Art. 23 & 24) :** Prohibition of trafficking in Human Beings and Forced Labour (Art. 23)-POOR v Union of India (1982) and other cases, Prohibition of Employment of Children in Factories etc. (Art. 24) - Statutory Enactments.

**Unit 8 Right to Freedom of Religion (Art. 25-28) :**

- a. Nature and Scope of the idea of Freedom of Religion under Art. 25 & 26 – National Anthem and other Cases - limits of Freedom.
- b. Freedom to manage religions denomination and affairs.
- c. Concept of Secularism -constitutional Provisions, Historical Perspective Non- discriminatory State under Art, 14, 15, 16, 29(2) & 325.

**Unit 9 Cultural and Educational Rights of Minority Community (Art. 29-30) :**

- a. Protection of the interest of minorities (Art. 29).
- b. Rights of minorities to establish and administer educational institutions (Art. 30) – Frank Anthony Public School Case (1980), St. Stephen College Case (1992) and other cases.

**Unit 10 Right to Constitutional Remedies :**

- a. Nature and Scope of Art. 32 & 226, Nature of Review through writ Jurisdiction, Writ of Habeas Corpus and other writs, Powers & Jurisdiction of Supreme court and High court
- b. Locus Standi - Public Interest Litigation / Social Interest Litigation - use and abuse - guidelines as set out in M.C. Mehta Case (1987), Bandhua Mukti Morcha (1984), Guidelines for rehabilitation and compensation in Delhi Domestic working women Forum vs. Union (1995) and other cases.

**Unit 11 Right to Property :**

- a. History of Right to Property prior to 44th Constitutional Amendment.
- b. Meaning of Property and Doctrine of Eminent Domain.

- c. 44th Amendment and Art. 300 - A, of the Constitution.
- d. Social Control of Right to Property - Deprivation of Property, Concept of Public Purpose, Interest, Compensation, and Amount. Important Judicial Decisions.

**Unit 12 Nature and Scope of the Chapter on Fundamental Rights:** Relationship with Directive principles of State Policy.

**Unit 13 Fundamental Duties of the Citizens:** Historical Background and Sources of the Duties, Significance, Nature, Scope and Enforcement of Duties.

### **SUGGESTED READINGS:**

1. Granville Austin: Indian Constitution: Cornerstone of Nation.
2. Dr. Upendra Baxi: "The Little Done, the Vast Undone", JILL, (1969),323.
3. H.M. Seervai: Constitutional Law of India.
4. Dhawan and Jacob (ed): Indian Constitution: Trends and Issues (1978).
5. M.P. Jain: Constitutional Law of India.
6. M. Galanter: Competing Equalities: Law and the Backward Classes in India. (1984).
7. B. Shiva Rao: Framing the India's Constitution (Text).
8. A.L. Gandhi: Right to Property and its Changing Dimensions (1985).
9. C.L. Anand: Equality, Justice and Reverse Discrimination in India (1987).
10. V.N. Shukla: Constitutional Law of India, (Edited by M.P. Singh).

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## FOURTH SEMESTER OF B.A. LAW (5 YEAR)

### PAPER 1 GENERAL ENGLISH IV (LEGAL LANGUAGE)

100 MARKS

- Unit 1 Law as a Synthesis of Order and Justice:**  
Law and Fact – Meaning and Distinction with Practical Illustration.
- Unit 2 Interpretation:** Meaning of Interpretation or Construction Intention of the Legislature, Two kinds of Interpretation and Three Rules of Interpretation, Meaning of Statutes, Harmonious Construction and Purposive Construction- Practical Illustration, Legislative Material, Internal and External Aids.
- Unit 3 Reasoning:** Legal Reasoning, Logical Reasoning, Judicial Reasoning, Analytical and Dialectical Reasoning – Case Law and Illustration.
- Unit 4 The Techniques of the Judicial Process:** Meaning of Judicial Process, Judicial discretion how do judges exercise it, Doctrine of Precedent and rules of Precedent, Ratio decidendi and Obiter Dicta
- Unit 5 Maxims and Legal terms :**  
a. Selected Legal Maxims  
b. Selected Legal Terms.
- Unit 6 Judgment Writing:** Form and Nature, Role of value Judgement in Law.
- Unit 7 Drafts and essay:**  
a. A Exercise on writing documents such as Will, Gift-deed, Lease, Sale-deed, Power-of-Attorney.  
b. Essay writing on topics of interest to the legal profession.  
c. Expressing opinions on the given statements upholding or denying the contents in the statements.

### SUGGESTED READINGS:

1. Cohen and Nigel – Logic and Scientific Methods
2. B. Cardozo – Judicial Processes
3. Edgar Bodenheimer- Jurisprudence
4. Peter Clinch –Using a law library. (UBT Delhi 1995)
5. Maxwell –Introduction to Interpretation of Statutes
6. Mac Cornmik –Legal Reasoning and Legal Theory
7. Ishtiaq Abidi –Law and Language
8. Paul Rylance –Legal Writing and Drafting
9. Dr. Sen Amit –Legal Language, Legal Writing and Legal Drafting,- Karnal Law House, Calcutta.

## **PAPER 2 -POLITICAL SCIENCE IV-INTERNATIONAL RELATIONS**

**100 MARKS**

### **Part A- Concepts**

**Unit 1** Introduction -Different Schools and Approaches.

**Unit 2** Balance of Power, Collective Security and Alliances.

**Unit 3** Peaceful Settlements and Diplomacy

(Negotiation, Mediation, Conciliation, Arbitration and Judicial Settlement)

**Unit 4** Disarmament and Nuclear Policies and Treaties.

**Unit 5** National Power-Elements and Limitations.

### **Part B- Global Conflicts**

**Unit 6** Cold War Era.

**Unit 7** Post Cold War Era.

**Unit 8** Territorial Claims and Ethnic Clashes.

**Unit 9** International Terrorism.

### **Part C- International Organizations**

**Unit 10** IGOS

**Unit 11** United Nations

**Unit 12** Eu,Oas,Au,Asean,Brics.

### **SUGGESTED READINGS:**

1. Calvocoressi Peter World Politics since 1945 (London: Longman, 2000).
2. Baylis John And Smith Steve, The Globalisation Of World Politics: An Introduction To World Politics (Oxford: Oxford University Press, Latest Edition)
3. Palmer N.D. And Perkins H.C. International Relations (Calcutta: Scientific Book Agency)
4. Goldstein Joshua, International Relations (New York: Harper Collins College Publications 1994)
5. Jackson Robert And George Sorensen Introduction To International Relations (Oxford: Oxford University Press, 1999)
6. Kegley Charles W. Jr., And Whittkopf Eugene R, World Politics : Trends And Transformation (Hampshire: Mac Millan 1989)
7. Williams Mare (Ed) International Relations In The Twentieth Century: A Reader (London: Macmillan, 1989)

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**Unit 1 Introduction to Macro Economics :**

- a. Definition, Meaning, Nature, Scope, Importance and Limitations of Macro Economics.

**Unit 2 Law and Economics :**

- a. Why Students Need to Learn Law and Economics.
- b. Contradictories in Economics and Law.

**Unit 3 Business Cycles and Inflation - Deflation :**

- a. Nature and Characteristics of Business Cycles.
- b. Phases If Business Cycles.
- c. Inflation – Meaning, Causes, Effects and Controls of Inflation.
- d. Deflation – Meaning, Effects.
- e. Role of Government In Controlling Inflation and Business Cycles.

**Unit 4 New Economic Policy**

- a. Privatisation – Meaning, Need, Effects.
- b. Liberalization – Meaning, Need, Effects.
- c. Globalization – Meaning, Features, Relevance to India.

**Unit 5 Foreign Exchange**

- a. Functions, Exchange Markets, Foreign Exchange Rate Policies in India.
- b. Balance of Trade and Balance of Payment.
- c. Role of Law in Foreign Trade.

**Unit 6 Relevance of Law and Their Application In Economics.**

- a. Constitution and Economics
- b. Contract Laws
- c. Consumer Protection Act
- d. Minimum Wage Act
- e. MRTP
- f. Tax Avoidance and Evasion – Role of Administration.

**SUGGESTED READINGS:**

1. Indian Economics For Law Students – S.R. Myneni Allahabad Law Agency
2. Legal Economics (International Dimensions of Economics and Law) K.C. Gopalkrishnan, Eastern Book Company.
3. Indian Economy – S.K. Mishra, Himalaya Publication House.

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**PAPER 4 - FAMILY LAW – I (MARRIAGE, DIVORCE AND MATRIMONIAL DISPUTES)** **100 MARKS**

**Unit 1 Nature, Sources and Schools of :**

- A. Hindu Law
- B. Muslim Law

**Unit 2 Marriage :**

- A. Hindu law: Nature, Essential Conditions, Ceremonies & Registration of Marriage
- B. Muslim law: Nature, Essential Conditions, Ceremonies & Registration of Marriage
- C. Christian and Parsi Law: Nature, Essential Conditions, Ceremonies & Registration of Marriage
- D. Special Marriage Act 1954: Nature, Essential Conditions, Ceremonies & Registration of Marriage

**Unit 3 Dower and Dowry :**

- a. Dower: Origin, nature, importance, definition, quantum, classification of dower, its mode of enforcement & liabilities of the parties
- b. Dowry: Definition, offence of dowry, trials of dowry offences

**Unit 4 Matrimonial Disputes :**

- a. Nullity of marriage: Distinction between void and voidable marriages, its grounds and effects under Hindu Muslim Christian Parsi and Special Marriage Act
- b. Judicial Separation: Grounds, effects and distinction between judicial separation and divorce under Hindu Muslim Christian Parsi and Special Marriage Act
- c. Restitution of conjugal rights: Provision and constitutional validity under Hindu Muslim Christian Parsi and Special Marriage Act

**Unit 5 Divorce :**

- a. Theories of divorce: Fault theory, Consent theory, Breakdown theory(71st Law Commission Report)
- b. Hindu Law: Grounds of divorce available to Husband & Wife, Grounds of divorce available to wife only, legal effects on parties after divorce
- c. Muslim Law: Talak-Unilateral Divorce, different modes of

talak, grounds available under Dissolution of Muslim Marriage Act, 1939, legal effects on parties after divorce

d. Christian, Parsi Law & Special Marriage Act 1954: Grounds of divorce and its legal effects on parties after divorce

e. Divorce by Mutual Consent: Requirements and procedure under Hindu, Muslim Christian, Parsi Law and Special Marriage Act

**Unit 6    Miscellaneous :**

a. Barsto Matrimonial Relief-Doctrine of strict proof, taking advantage of one's wrong, accessory, connivance, condonation, collusion, delay and any other ground

b. Reconciliation: When necessary, duty of court, reconciliation machinery

c. Family Courts: Concept, status, jurisdiction and procedure

**SUGGESTED READINGS:**

1. Paras Diwan, Family Law of Marriage and Divorce in India ,Allahabad Law Agency
2. Mullas, Principles of Hindu Law, Butterworth co.
3. Diwan Paras, Modern Hindu Law, Allahabad Law agency, Faridabad.
4. Subbba Rao, G.C.V., Family Law in India, S. Gogia and Co.
5. Kumud Desai, Marriage and Divorce in India, N M Tripathi, Mumbai
6. Mullas, Mohamedan Law, N M Tripathi, Mumbai
7. Tahir Mahmood, Muslim Law, Universal Law Publishing co. New Delhi
8. Aqil Ahmad, Mohammedan Law, Central Law agency, Allahabad
9. Singh Jaspal, Hindu Law of Marriage & Divorce, pioneer publication.
10. Kusum, Cases and Materials on Family Law, Universal Law Publishing co. New Delhi

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**Unit 1 Federalism :**

- a. Meaning of Federalism
- b. Comparative study of other federalism

**Unit 2 Federal Relations :**

- a. Legislative relations between Centre and the States.
- b. Administrative Relations.
- c. Financial Relations. Parliamentary Government.

**Unit 3 President of India :**

- a. Position, Election, Qualifications, Impeachment etc.
- b. Council of Ministers, Prime Minister - Cabinet System - Collective responsibility - Individual responsibility, President & P.M. relationship, Legislative privileges.

**Unit 4 Governor:** Constitutional Relationships with State Government Powers of Governor.

**Unit 5 Party systems:** Anti Defection Law, Freedom of Member of Parliament and Legislatures.

**Unit 6 Emergency:** Need of the provision - Types of emergency Proclamation, conditions, Effect of emergency on Centre - State Relations. - Emergency and fundamental rights.

**Unit 7 Services under the Constitution:** Doctrine of pleasure, protection against Arbitrary Dismissal, Removal, or Reduction in Rank - Exceptions to Art. 311.

**Unit 8 Legislative processes:** Provisions as to introduction and passing of Bills, Money Bill - Procedure in financial matters.

**Unit 9 Method of Constitutional Amendments:** Limitations upon Constitutional Amendments - Basic structure doctrine as a limitation, Pre- Keshvananda and Post-Keshavanda Bharti cases.

**Unit 10 Tortious Liability of Government:** Sovereign Immunity, Statutory Function, Damages and Writs.

**Unit 11 Elections:** Election Commission, Legislative Power regarding Election, Election Dispute.

**SUGGESTED READINGS:**

1. T. K. Tope - Constitutional Law of India. (Eastern Book Com. Lucknow)
2. G. Austin - Indian Constitution : Corner-stone of a Nation. (Oxford)
3. M. P. Jain - Constitutional Law of India. (N.M. Tripathi, Mumbai)
4. V. N. Shukla -Constitutional of India, Edited by M. P. Singh (Eastern Book Com. Lucknow)
5. D. D. Basu - Introduction to the Constitution of India.(Prentice Hall)
6. H. M. Seervai - Constitutional Law of India (Vol. I, II & III). (N.M. Tripathi, Mumbai)
7. J.N. Pandey - Constitutional Law of India.(Central Law Agency, Alla.)

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**Unit 1 Private International Law :**

- a. Introduction- Definition, nature & scope of Private International Law
- b. Meaning of Foreign Law

**Unit 2 Classification:**

- a. Introduction
- b. Classification Of Cause Of Action
- c. Classification of a Role of Law.

**Unit 3 Incidental Question :**

- a. Meaning Of Incidental Questions.
- b. The Elements of An Incidental Question.
- c. The Problem Illustrated.

**Unit 4 Renvoi :**

- a. The Problem Stated.
- b. Possible Solutions
- c. Scope and Application Of Renvoi.

**Unit 5 The Proof Of Foreign Law :**

- a. Foreign Law: A Question Of Fact.
- b. How Foreign Law Is Proved.
- c. Witnesses Who Can Prove Foreign Law.
- d. The Role Of The Court.

**Unit 6 Domicile, Nationality And Residence :**

- a. Introduction, General Rules
- b. The Acquisition Of A Domicile Of Choice.
- c. Domicile Of Origin & Domicile Of Choice Contracted.
- d. Domicile Of Dependiant Persons & Married Women
- e. Domicile Of Nationality & Residence.

**Unit 7 Jurisdiction Of English Courts & Limitation On Jurisdiction.**

- a. Jurisdiction under Brussels Convention & Lugano Convention.
- b. Limitations – Jurisdiction In Respect Of Foreign Property and Over the Parties.

**Unit 8 The Law Of Obligations :**

- a. Contracts & Torts
- b. Restitution

**Unit 9 Family Law :**

- a. Marriage

- b. Matrimonial Causes
- c. Children, Legitimation & Adoption

**Unit 10 The Law Of Property :**

- a. The Distinction between Movables and Immovable.
- b. Transfer of Tangible Movables & Assignment Of Intangible Movables.

**SUGGESTED READINGS:**

1. Cheshire And North – Private International Law.
2. **Fawcett, James, Editor.** *Reform And Development Of Private International Law*. New York: Oxford University Press, 2003.
3. Anton. A.E, 'Private International Law', 2<sup>nd</sup> Ed, (1990)
4. N. Peter- 'Private InternatioOnal Law Problems In Common Law Jurisdiction'

**FIFTH SEMESTER OF B.A. LAW (5 YEAR)**



**PAPER 1 - POLITICAL SCIENCE V- POLITICS & FOREIGN POLICY  
IN INDIA**

**100 MARKS**

**Part A: Political Eras In India**

**Unit 1 Nehruvian Era.-**

- a. 1967-1980.
- b. 1980-1989.

**Unit 2 Coalition, Politics & Era after Globalization.**

**Part B: Issues In Indian Democracy**

**Unit 3** Caste And Anti-Caste Movements.

**Unit 4** Communalism

**Unit 5** Gender Issues And Feminist Movements.

**Unit 6** Regionalism And Secessionism.

**Unit 7** Naxalism.

**Unit 8** Social Movements (Farmers Movements, Trade Union Movements, New Social Movements)

**Part C: Foreign Policy**

**Unit 9** Historical Legacy.

**Unit 10** Non Alignment Movement.

**Unit 11** Pre Globalization Period.

**Unit 12** Post Globalization Period.

**Unit 13** Nuclear Policy.

**SUGGESTED READINGS:**

1. Chandra Bipan, Aditya Mukherjee And Mridula Mukherjee, 2009 (Second Revised Edition), India After Independence, New Delhi, Penguin Books
2. Brass Paul, 1990, Politics Of India Since Independence, New Delhi, Foundation Books ( Indian Edition).
3. Ray Raka And Mary Fainsod Katzenstein (Eds.), 2005, Social Movements In India: Poverty, Power And Politics, New Delhi, Oup
4. Shah Ghanshyam (Ed.), 2002, Social Movements And The State, New Delhi, Sage.
5. Hasan Zoya (Ed.), 2002, Parties And Party Politics In India, Delhi, Oup.
6. U.R.Ghai – India’s Foreign Policy.
7. Sharma, R.R., (Ed.), 2005, India And Emerging Asia, New Delhi, Sage

8. Chellaney Brahma, (Ed.), 1999, Securing India's Future In The New Millennium, New Delhi, Orient Longman
9. Perkovitch George, 2002, India's Nuclear Bomb-The Impact Of Global Proliferation, New Delhi, Oup
10. Cohen, Stephen.P., 2001, India: Emerging Power, New Delhi, Oup.

**Unit 1 Concept of Crime and Criminal Liability and Punishment Under The Criminal Law :**

Development of Criminal Law In India, Concept of Crime and Criminal Liability - Doctrine of Mens Rea - Elements of Criminal Liability, Stages In Crime - Guilty Intention, Preparation, Attempt and Commission of Crime.

**Unit 2 General Exceptions Under Penal Code :** Mental Incapacity - Minority - Insanity - Medical and Emotional Insanity, Intoxication, Private Defenses, Necessity, Mistake of Fact, Act Done In Good Faith, Act Done By Consent.

**Unit 3 Liability :** Vicarious Liability, Group Liability and Preliminary Crimes, Abetment and Criminal Conspiracy

**Unit 4 Offences against the State (Sec. 121 To 130). :** Waging War and Sedition.

**Unit 5 Offences against the Public Tranquility:** Unlawful Assembly, Rioting, Affray.

**Unit 6 Offences by or Relating To Public Servant :** Offences Committed By Public Servants - Relevant Provisions of The Prevention of Corruption Act.

**Unit 7 Offences Against Human Body :**

- a. Causing Death of Human Being – Culpable Homicide, Murder, Distinction Between Culpable Homicide and Murder, Specific Mental Element and Justifying Situations
- b. Hurt - Grievous and Simple.
- c. Assault and Criminal Force.
- d. Wrongful Restraint and Wrongful Confinements, Kidnapping and Abduction.

**Unit 8 Sexual offences and offences Relating To Marriage :**

- a. Insulting the Modesty of a Women and Assault or Criminal Force with Intent to Outrage The Modesty of a Women.
- b. Rape - Marital Rape, Immoral Traffic (Prevention) Act 1987 and Unnatural offences.
- c. Fraudulent Conduct in Marriage, Bigamy.
- d. Adultery

**Unit 9 Offences against Property and Documents :**

- a. Theft, Extortion, Robbery and Dacoity.

- b. Cheating, Criminal Misrepresentation and Criminal Breach of Trust, Mischief, Receiving of Stolen Property, Criminal Trespass.
- c. Forgery

**Unit 10 Offences Affecting Reputation :** Defamation (Sec. 499 To 502) and offences Relating To Intimidation, Insult and Annoyance (Sec.503 To 510)

**SUGGESTED READINGS:**

1. K.D. Gaur – Textbook on Indian Penal Code (Universal Law Publishing Company)
2. Ratanlal & Dhirajlal – The Indian Penal Code (34th Edition)(Lexis-Nexis)
3. Prof. S.N. Misra – Indian Penal Code (Central Law Publications)
4. Batuklal – Indian Penal Code (Central Law Agency)
5. B.M. Gandhi – Indian Penal Code (Third Edition)(Eastern Book Company)
6. Prof. N.V. Paranjape – Indian Penal Code (Central Law Publications)

\* \* \*

**Part- A Legal Theory and Sources of Law**

**Unit 1 Introductory :** Nature and meaning of Jurisprudence, Concept of Rules, Laws, Principles and precepts, significance of the study of legal theory.

**Unit 2 Natural Law Theories :** Ancient natural law, classical natural law, modern (20th century) natural law, some neo-naturalists- John Finnis, Fuller and Hart.

**Unit 3 Legal Positivism :**

- a. Bentham and John Austin's theory of positivism.
- b. Hart's concept of law.
- c. Kelsen's pure theory of law.
- d. Dworkin's right thesis.

**Unit 4 Sociological, Realist, Historical and Marxist School of Law :**

- a. Sociological school of law - Roscoe Pound.
- b. Realist school of law.
- c. Historical school of jurisprudence - Savigny and Maine.
- d. Marxist and Leninist approach to law.

**Unit 5** Legislation as a source of law

**Unit 6** Custom as a source of law

**Unit 7** Precedent as a source of law

**Part- B CONCEPTS OF LAW**

**Unit 8** Legal Right and Duties.

**Unit 9** Possession and Ownership.

**Unit 10** Obligation, Person and Liability.

**Unit 11 Concept and theories of justice :** Concept of justice, Theories of justice, Kinds of justice, distributive justice and Indian Constitution.

**SUGGESTED READINGS:**

1. Salmond - Jurisprudence. (N.M. Tripathi - Mumbai)
2. Dias - Jurisprudence. (Aditya Books, New Delhi)
3. Friedmann - Legal Theory. (Sweet & Maxwell, London)
4. G.S. Sharma (Ed.) - Essay In Indian Jurisprudence. (Jaipur)
5. Venkat Subba Rao - Legal Theory & Jurisprudence. (Eastern Book Co.)
6. C.K. Allen - Law In The Making (Oxford).
7. Bodenheimer - Philosophy of Law. (Oxford).
8. P. Raja Ram - Jurisprudence (Ashwin Publication, Chennai, 1998)

**PAPER 4 - FAMILY LAW – II (MATRIMONIAL PROPERTY,  
GUARDIANSHIP & ADOPTION)**

**100 MARKS**

**Unit 1 Hindu Joint Family System :**

- a. Coparcener
- b. Karta
- c. Classification of property
- d. Alienations of property
- e. Son's Pious Obligation

**Unit 2 Partition :**

- a. Subject matter of partition
- b. How partition is effected
- c. Reopening
- d. Reunion

**Unit 3 Woman's Property: Stridhan :**

- a. Concept of Stridhan & Woman's property
- b. Sources and features of Stridhan
- c. Provision under Hindu Succession Act, 1956

**Unit 4 Succession :**

- a. Hindu Law: Succession to the property of Hindu male & female, disqualification, General rules under Hindu Succession Act 1956
- b. Muslim Law: General principles, Sunni & Shia Law of Inheritance, Disqualifications
- c. Indian Succession Act: Rules for Christian and Parsi succession

**Unit 5 Will :**

- a. Muslim Law: Meaning, Requisites, Capacity, formalities, subject matter & revocation of will, Marz-ul-Maut
- b. Indian Succession Act: Provisions for Privileged and Unprivileged will,

**Unit 6 Gift :**

- a. Hindu Law: Gifts under Hindu Law, Hindu Religious & Charitable Endowments
- b. Muslim Law:

1. Hiba: Definition, essentials, capacity, subject matter, formalities, kinds, revocation of gifts
2. Wakfs : Definition, essentials, kinds, creation, revocation of wakf, Mutawalli

**Unit 7 Alimony and Maintenance :**

- a. Hindu Law: Maintenance of wife, children & parents under Hindu Law, Maintenance under S.125 Cr.P.C.
- b. Muslim Law: Maintenance of wife, children & parents under Muslim Law, Maintenance under S.125 Cr.P.C.
- c. Maintenance of wife, children & parents under Christian and Parsi Law, Maintenance under S.125 Cr.P.C.

**Unit 8 Custody, Guardianship and Parentage of Children :**

- a. Hindu Law: Guardianship of minor person and minor's property, Liabilities, Rights, Removal of guardians
- b. Muslim Law: Classification of Guardianship, Hizanat, Rights , Duties & Powers of Guardians

**Unit 9 Adoption:** Adoption under Hindu Law & other Personal Laws

**SUGGESTED READINGS:**

1. Paras Diwan, Family Law in India (1984).Allahabad Law Agency.
2. Diwan Paras , Modern Hindu Law, Allahabad Law agency, Faridabad.
3. Subzari's, Hindu Law(ancient &modified).Ashok Grover & Sons, Aurangabad
4. Mulla, Principles of Hindu Law, Butterworth co
5. Mulla, Mohammedan Law, NM Tripathi, Mumbai
6. Tahir Mahmood, Muslim Law, Universal Law Publishing co. New Delhi
7. Aqil Ahmad, Mohammedan Law, Central Law agency, Allahabad
8. Subbba Rao, G.C.V., Family Law in India, S. Gogia and Co.

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## OPTIONAL-I

### A. BUSINESS LAW GROUP

#### PAPER 5 – BANKING LAW INCLUDING NEGOTIABLE INSTRUMENT ACT

100 MARKS

**Unit 1 Historical background of banking in India :**

History of Banking, banking system in India, Functions of commercial Bank, Structure of Banking system.

**Unit 2 Nationalization of Banks in India :**

Compelling reasons of Bank Nationalization, Argument against nationalization of banks, Development of Banking after Nationalization of Banks.

**Unit 3 Banking Regulation Act 1949 :**

Definition of Bank, Types of Bank, Salient features of banking regulation Act 1949, Structure, Role of Reserve Bank of India under Banking Regulation Act 1949, Memorandum, reconstruction and Amalgamation, The Deposit Insurance Corporation Act 1961.

**Unit 4 Reserve Bank of India :**

Constitution and Management, Functions of Reserve Bank of India, Central Banking Functions, Regulatory and Supervisory Functions.

**Unit 5 Relationship between Banker and Customer :**

Definition of Banker, the relationship between Banker and customers, General relationship between banker and customer, Special features of Relationship between banker and customer (Duties and Rights of Banker), Customers Duties to his Banker.

**Unit 6 Employments of Funds :**

Loans and Advances, Guarantees- Advances secured by collateral securities, Agency Services- Financing of exports, Advance to priority sectors, Credit Guarantee Scheme, Securitization Act 2002.

**Unit 7 Law relating to Negotiable Instruments 1881 with Amendments :**

Negotiable Instruments, Kinds, Holder and Holder in due course, Parties, Negotiation-presentments- Endorsement, liability of Parties, Noting and protest, Dishonor of Negotiable Instrument.

**Unit 8 Customers grievances and Redressal :**



Ancillary Services and E-Banking, Banking Ombudsman Scheme, Consumer Protection Act 1986, and Banking Services, Debt Recovery Tribunal- Establishment, Functions, Power and procedure.

**SUGGESTED READINGS:**

1. M.L. Tannan- Law of Banking
2. P.N. varshney- banking Law and Practice.
3. Dr. S. R. Myneni –law of Banking
4. Avtar Singh- Banking Law and Practice
5. Negotiable Instrument Act 1881
6. Banking Regulation Act 1949
7. Securitization Act 2002
8. Consumer Protection Act 1986
9. The Deposit Insurance Corporation Act 1961

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## OPTIONAL-I

### B. CONSTITUTIONAL LAW GROUP

#### PAPER 5 – MEDIA & LAW

100 MARKS

##### **Unit 1 Concept of Media :**

- a. Meaning of Media
- b. Evolution of Media
- c. Forms of Media

##### **Unit 2 Media and Indian Constitution :**

- Preamble of Indian Constitution
- Article 19 (1) (a)
- Article 19 (2)
- Article 32
- Role of judiciary in promoting and limiting the freedom of media.
- Media, privacy and sting operations

##### **Unit 3 Statutory laws for print Media in India :**

- Contempt of Court Act
- Law of Defamation
- official Secrecy Act and its controversy.
- Law of Copyright
- Cinematographic Act and its significance in light of its Controversy.
- Right to information Act 2000

##### **Unit 4 Electronic media law in India :**

- a. Indian Telegraph Act 1885
- b. The Prasar Bharati (Broadcasting Corporation of India) Act 1990
- c. Cable Television network Act 1955

##### **Unit 5 Media regulatory bodies in India :**

- a. Press Council of India
- b. Self regulation Guidelines
- c. National Broadcasting Association (NBA)

**Unit 6      Role of Media in Democratic Country Like India :**

- a. Role of Media in upholding spirit and values of democracy
- b. Impact and accountability of media
- c. Media and National Security
- d. Role of media during crisis like terror attack
- e. Social media, its influence and impact

**Unit 7      Media Trial and administration of Justice :**

- a. Concept of Media Trial
- b. Media activism and Media Trial
- c. Pre- trial publicity and its impact on fair trial with recent and relevant cases.
- d. Doctrine of postponement evolved by court to stop Media Trial
- e. Media Trial and administration of Criminal Justice.

**Unit 8      Flaws of Media :**

- a. Sensationalism
- b. Poor coverage of the important issues
- c. Profit motive
- d. Glorifying crime
- e. Paid news
- f. Cross media holdings

**Unit 9      Freedom of press and emergency :**

- a. Section 144 of CrPC
- b. Section 5 and 8 of Indian Telegraphy Act
- c. Section 19 and 20 of Cable and Television Network Act

**SUGGESTED READINGS:**

1. Durga Das Basu : Law of Press
2. Vidhisha Barua : Press & Media
3. C-S Raidu, S-B Nageshwar Rao : Mass Media Law & Regulations
4. Justice E.S. Venkatramiah : Freedom of Press Some Recent Trends
5. Madhavi Goradia Diwan : Facets of Media Law
6. Dr. S. R Myneni : Media Law

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## **SIXTH SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 POLITICAL SCIENCE VI- PUBLIC ADMINISTRATION**

**100 MARKS**

#### **Part A: Introduction To Public Administration:**

**Unit 1 Public Administration-** Evolution, Meaning, Nature Scope, Importance and Difference between Public And Private Administration.

**Unit 2** Traditional and Modern approaches to Public Administration.

**Unit 3** Bureaucracy (Meaning, Importance & Weber's Model)

#### **Part B: Indian Administration**

**Unit 4** Evolution and Historical Background.

**Unit 5** Union And State Administration.

**Unit 6** Public Services And Their Contribution. (All India Services, State Services, Upsc And Reforms In Civil Services)

**Unit 7** Judicial Administration. (Structure, Administrative Tribunals, Fast Track Courts, Family Courts And Lok Nyayalay).

**Unit 8** Challenges To Indian Administration. (Developmental Challenges, Socio-Political Challenges And Corruption).

#### **SUGGESTED READINGS:**

1. Singh Sahib And Singh Swinder (2006), Public Administration, Theory And Practice, New Academic Publication Co, Jalandhar
2. Avasthi Amreshwar, Maheshwari Shriram, (1982) Public Administration, Lakshmi Narain Agarwal, Agra – 3
3. Bhagwan Vishnu, Bhushan Vidya (2007), Public Administration, S Chand And Company Ltd, New Delhi
4. Arora Ramesh, Goyal Rajni (2007) Indian Public Administration, Vishwa Prakashan, New Delhi
5. R.D.Sharma:-Development Administration Theory And Practice,
6. H.K.Publishers And Distributers, Delhi, 1992.
7. Avasthi.A:- Municipal Administration In India, Laxminarayan, Agrawal, Agra-19.
8. S.P. Naidu – Public Administration (Concepts And Theories)
9. S.R.Maheshwari – Indian Administration

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## **PAPER 2 - CYBER LAW**

- Unit 1 Evolution of Law in Cyberspace :** Internet related Legal Issues  
Concept and Definitions of Cyberspace, Fundamental Components of Computer, Overview of Computer and Web technology, Application of Network, Origins of Internet and WWW, Communication through Internet, Internet related Legal Issues.
- Unit 2 Evolution of Cyber Crimes and Real World Cases :** Definition and Nature, Evolution of Cyber Crime, Classification of Cyber crimes, Reason for Computer Vulnerability, Computer Contaminant, Real World Cases - Online banking, Credit Card Frauds, Identity Theft, crimes relating to Social Networking websites and Social Media.
- Unit 3 Introduction to Indian Cyber Law :** Objectives and Scope of the Information Technology Act 2000, Regulation of Certifying Authorities, The Cyber Appellate Tribunal, offences and Penalties, Information Technology(Amendment) Act 2008
- Unit 4 National Cyber Security Policy, 2013 :** History, Aim and Objectives, Nature and scope, Strategies, Securing e-governance service, Cyber Terrorism and Cyber security, Promotion of research and development in cyber security.
- Unit 5 Judicial Analysis of Cyber Jurisdiction :** Definition of Jurisdiction in Cyberspace, Model for Jurisdictional Analysis, Personal Jurisdiction, Issue of Geography & Sovereignty, Freedom of Speech in Cyberspace.
- Unit 6 International Cooperation in fighting Cyber Crime:**
- a. United Nations
  - b. The Council of Europe Convention on Cyber Crime
  - c. Position in UK
  - d. Position in US
- Unit 7 Intellectual Property Issues and Cyberspace:** Concept and nature of Intellectual property, Copyright and the Internet, Liability of Domain name registrant, Trademark issues in Cyberspace, Status of Computer Software's under Patent Law.
- Unit 8 Authentication of Electronic Records and Electronic Governance:** Formation of Electronic Contract, Legal issues in Cyber Contract, and E Commerce, Digital Signature, Problems in Taxing E-Commerce, Electronic Governance: Legal Recognition of Electronic Record.
- Unit 9 Admissibility of Digital Evidence:** Concept of Digital Evidence, Conditions for the admissibility of Digital Evidence, Examination of a witness by video conference, Changes in the Evidence Act.

## **Unit 10 Liabilities of an Internet Service Provider in Cyberspace:**

Due Diligence to be observed by intermediary, Information technology (Intermediaries Guidelines) Rules, 2011, Cases in which ISP can be exempted from liability in India.

### **SUGGESTED READINGS:**

1. Information Technology (Amendment) Act,2008, Bare Act Taxmann, Delhi.
2. Dr. Jyoti Rattan, “Cyber Laws & Information Technology”. 2nd Edition, Bharat Law House Pvt Ltd. New Delhi .
3. Dr.R .K.Chaubey,” An Introduction to Cyber Crime and Cyber Law”, Kamal Law House.
4. Dr.Farooq Ahmad., “Cyber Law In India (Law on Internet)”, Pioneer Books, Delhi.
5. Justice Yatindra Singh., “Cyber Laws”. 2nd Edition, Universal Law Publishing Co.Pvt.ltd., Delhi .
6. Kamath Nandon, “Law Relating To Computers, Internet & E-commerce”, Universal Law Publishing Co.Pvt.ltd., Delhi.
7. Matthan Rahul, “Law Relating To Computers and The Internet”, Butterworths, Delhi.
8. Ojha Avadhesh, “Commentary on Information Technology Act-2000”, Tax Law Pub., Jodhpur.
9. Rao S.Joga, “Computer Contracts & Information Technology Law”, Wadhwa Co., Nagpur.
10. Satya Prasad, “Law Relating to Information Technology (Cyber Laws)” T.V.R.,1st edition, Asia Law House.

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## **PAPER 3 - SPECIAL CONTRACT**

### **Part- A LAW OF CONTRACT**

#### **Unit 1 Indemnity and Guarantee :**

- a) Contract of Indemnity- Definition of Indemnity, Rights of Indemnity holder, Indemnifier's liability
- b) Contract of Guarantee- Definition of guarantee, Nature and Extent of Surety's liability, Discharge of surety's liability
- c) Distinction between indemnity and guarantee

#### **Unit 2 Bailment and Pledge :**

- a. Contract of Bailment- Definition, Kinds, Consideration, Rights of Bailor and Bailee, Duties of Bailor and Bailee, Termination of Bailment, Finder of goods
- b. Contract of pledge- Definition, Rights of Pawnor and Pawnee, Duties of Pawnor and Pawnee, Pledge by non-owners
- c. Distinction between Bailment and Pledge

#### **Unit 3 Contract of Agency :**

- a. Definition – Agency, Principal, Agent, General rules of agency, Test of agency, Kinds of Agent
- b. Difference between Agent , Servant and Independent Contractor
- c. Creation of Agency, Termination of Agency, Liability of Principal and Agent, Rights and duties of Agent & Principal, Delegation of Agents authority - Sub Agent and Substituted Agent

### **Part- B LAW OF SALE OF GOODS –**

#### **Unit 4 Contract of Sale of Goods :**

- a. Definition of sale, Goods, Essentials of valid Sale, Kinds of Goods
- b. Conditions and warranties, Transfer of property, Performance of contract of sale

#### **Unit 5 Rights of unpaid seller :**

- a. Definition of Unpaid Seller
- b. Rights of Unpaid Seller- Against the Goods and Against the Buyer

### **Part- C Law of Partnership –**

#### **Unit 6 Nature of partnership :**

- a. Definition, Test of Partnership, Essential elements of Partnership, Kinds of Partners



- b. Distinction between Partnership , Joint Hindu Family business, Company, Co-ownership

**Unit 7 Formation of Partnership :**

- a. Registration of Partnership Firm
- b. Effects of Non-Registration
- c. Dissolution of firm

**Unit 8 Rights, Duties and Liabilities of Partners :**

- a. Rights of Partners
- b. Duties of Partners
- c. Liability of Partner
  - i. Incoming Partner
  - ii. Outgoing Partner

**Part- D Law of Negotiable Instruments –**

**Unit 9 Negotiable Instruments :**

- a. Definition and Characteristics, Kinds of Negotiable Instruments
  - i. Promissory Note
  - ii. Bill of Exchange
  - iii. Cheque
- b. Parties to Negotiable Instruments, Presentment of Negotiable Instruments, Maturity of Negotiable Instruments
- c. Holder and Holder in due course

**Unit 10 Negotiation of Negotiable Instruments : Modes of Negotiation, Kinds of Endorsement, Negotiation and Assignment**

**Unit 11 Dishonour of Negotiable Instruments :**

- a. Dishonour by Non- Acceptance, Dishonour by Non-Payment, Effect of dishonour
- b. Dishonour of Cheque – Amendments

**SUGGESTED READINGS:**

1. Elements of Mercantile Law, N. D. Kapoor, Sultan Chand & Sons
2. Merchantile Law, M.C.Kuchhal, Vikas Publication House Pvt. Ltd
3. Contract II , Dr.R.K.Bangia, Allahabad Law Agency
4. Business Law: Principles of Mercantile Law, Dr. Avtar Singh, Eastern Book Company (2012)

5. Indian Business Laws (second Edition), By S. K. Aggarwal, Galgotia Publications.

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**PAPER 4 – (PRACTICAL PAPER- I) PROFESSIONAL ETHICS,  
ACCOUNTANCY FOR LAWYERS AND BAR BENCH  
RELATIONS**

**Part- A PROFESSIONAL ETHICS**

- Unit 1 Legal Profession :** Historical perspective, Role of a lawyer in Independent India. Concept and necessity of Professional Ethics, Code of conduct, All India Bar.
- Unit 2 Norms of Professional Ethics regarding the client and general public :** Lawyer's ten commandments, Duty to the client, Duty to opponent, Duty to public, Duty to self, Duty to render legal aid, restrictions on the engagement of other employment's.
- Unit 3 Professional Ethics and Etiquettes :** Fee- Structures, Refusal of briefs, Power of compromise, Retainers, Negligence, General Rules of Professional etiquettes to be observed in court, Brief - Stealing, under - cutting, not to used touting.

**Part- B ACCOUNTANCY FOR LAWYERS**

- Unit 4 Fundamentals of Double Entry :** I - Object of Account keeping, Essentials of a proper record, Personal Accounts, Books of Accounts - Ledgers, Cash Books, Bill Book, Purchase Book, Journal, Bank Reconciliation Statement, Trial Balance, Balance Sheet.
- Unit 5 Fundamentals of Double Entry :** II - Capital and Revenue, Income and Expenditure, Receipts and Payments Accounts; Bills of Exchange, Promissory notes and cheque, Partnership Accounts, Single entry system, Depreciation and Reserves, Solicitor's Account.

**Part- C BAR BENCH RELATIONS**

- Unit 6 Duties of Advocate to Judge and Court :** Rules of the Bar Council of India framed under Sec. 49 (C) of the Act.
- Unit 7 Control of Professional Misconduct by Bar Council of India and State :** Function of the Bar Council, Disciplinary Committee - Power in conducting inquiry, When a State Bar Council can initiate action against an Advocate? and for What?. Limitation of time of inquiry and its consequences, Costs, Review of orders; withdrawal of proceedings.
- Unit 8 Appeals to the Bar Council of India, and to the Supreme Court :** 10 major judgments of the Supreme Court on the contempt proceeding.

**Unit 9 Disciplinary proceeding against the lawyer for the violation of ethic rules :** Rules relating to the Disciplinary Proceedings and Review ; Complaint and Inquiry under Sec. 35,36, and 36B of the Advocates Act., 50 selected Decisions (opinions) of the Disciplinary Committee of Bar Council of India.

**Part- D VIVA – VOCE**

**SUGGESTED READINGS:**

**Books**

1. Krishnamurthy Iyer - Advocacy.
2. The Bar Council Code of Ethics.
3. The Contempt Law and Practice
4. Upendra Baxi - "The Pathology of the Indian Legal Profession". 13 Indian Bar Review 1986 P-455.
5. J.R. Batliboy - Advanced Accounting

**10 Decisions Of Supreme Court On Contempt – (Cases for the study of Unit No. 6)**

1. Advocate General Bihar v. M.P. Khair Industries 1980 (3)SCC 311.
2. Naraindas v. Govt. of M.P. (19100) 3 SCC 31.
3. Re : Vinay Chandra Mishra. (1995) 2 SCC 584.
4. M.B. Sanghi Advocate v. High Court of M.P. AIR 1991 SC 1834.
5. Pritam Pal v. High Court of M.P. 1993 Supp. (1) SCC 529.
6. R.K. Garg v. Shanti Bhusan (1995) 1 SCC 3.
7. E.S. Reddy v. The Chief Secretary (1987) 3 SCC 258.
8. Afzal v. State of Haryana 1995 Supp. 2 SCC 388.
9. Harbans Kaur v. P.C. Chaturvedi 1969 (3) SCC 712.
10. C. Ravichandran Iyer v. Jurtime A.M. Bhattacharjee 1995 (5) SCC 457.

**50 Selected Decisions Of The Disciplinary Committee Of All India Bar Council (Cases for the study of Unit No. 7)**

1. F Vs K 1992 I.B.R. XIX (3 & 4) 149
2. C Vs A 1992 I.B.R XIX (3 & 4) 125
3. R Vs Y & S 1987 I.B.R XIV (4) 1006
4. R. G. Vs M. S. 1989 I.B.R XVI (1) 89
5. O. M. Vs R. K. 1989 I.B.R XIV (1) 105
6. M. P. Vs B. P. 1989 I.B.R XVI (1) 102
7. D. Vs B 1987 I.B.R XIV (2) 324
8. P Vs V 1987 I.B.R XIV (2) 314
9. C Vs M 1987 I.B.R XIV (4) 1003
10. S Vs M 1987 I.B.R XIV (4) 749
11. A Vs P 1987 I.B.R XIV (4) 745
12. R Vs L 1985 I.B.R XII (2) 288
13. N Vs S 1985 I.B.R XII (4) 528
14. PC Vs High Court of andhra Pradesh 1985 I.B.R XII (3) 408.
15. M. Y. J. Vs P.R.K. 1985 XII (3) 400

- 16.B.R. Vs M. K. 1985 I.B.R XII (3) 395
- 17.R. Vs C 1988 I.B.R XV (1 & 2) 193
- 18.C.C. Vs S.S. 1988 I.B.R XV (1 & 2) 197
- 19.A. K. Vs R. S. 1988 XV (1 & 2) 200
- 20.G Vs M 1987 I.B.R XIV (3) 488
- 21.R Vs L. J. 1987 I.B.R XIV (3) 491
- 22.K Vs V 1987 I.B.R XIV (3) 496
- 23.N Vs K 1985 I.B.R XII (1) 86
- 24.S Vs K 1985 I.B.R XII (1) 92
- 25.J Vs M 1985 I.B.R XII (1) 95
- 26.Suo Motu Enquiry Vs Shri P. Advocate 1985 I.B.R XII (1)100
- 27.ABC Vs R 1976 Vol. 5 (4) J.B.C.I341.
- 28.A Vs B 1978 Vol. 7 (1) J.B.C.I. 128
- 29.A Vs. B. 1978 Vol. 7 (1) J.B.C.I. 121
- 30.A Vs B 1978 Vol. 7 (1) J.B.C.I. 108
- 31.A Vs Registrar High of Patna 1977 Vol. 6 (3 & 4) 192
- 32.K Vs Judge, Revisions, Sales Tax, Lucknow 1977 Vol. 6 (3 & 4) J.B.C.I. 207
- 33.A Vs B 1977 Vol. 6 (3 & 4) J.B.C.I. 200
- 34.C Vs R 1978 Vol. 7 (3) J.B.C.I. 396
- 35.L Vs M 1976 Vol. 5 (4) 1976 J.B.C.I.
- 36.Lachman Dayaram Jaishinghari Vs Sorabji Kakhashru Jamshedji Modi 1973 Vol. 2 J.B.C.I. 61
- 37.Shri Sant Ram Lumb vs Dewan Chand and Khazanachi Mal 1974 Vol. 3 J.B.C.I.
- 38.L vs A 1976 Vol. 5 J.B.C.I. 327
- 39.R. Sbramanian vs. S. Ramalingam 1974 Vol. 3 J.B.C.I.
- 40.T. Chevanthi vs A. Chidambara Nadar 1974 Vol. 3 J.B.C.I.
- 41.C Vs R 1976 Vol. 5 J.B.C.I. 222
- 42.A Vs Bar Council of Maharashtra 1976 Vol 5 J.B.C.I.
- 43.Padmalochan Panda Vs Ganesh Mahapatr 1974 J.B.C.I. August 370.
- 44.G Vs S 1974 Vol 4 J.B.C.I. 216.
- 45.A Vs N Advocate 19100 Vol 4 J.B.C.I. 211
- 46.Ishwar Bapuji Sonavane Vs Disciplinary Committee of the Bar 1972 Vol 1 J.B.C.I. 111.
- 47.Rama Sankar Gupta Vs
  - 1) Bar Council of U.P.
  - 2) Advocate General of U.P.
  - 3) S. Hasan Ejaz 1973 Vol 3 JBCI 87
- 48.Bakhatawar Singh Liberam Advocate, Ambla Vs Gaide Ram S/O Ude Ram 1973 Vol 2 JBCI 2100.
- 49.Jitendra Mohan Gupta Advocate Vs Bar Council of Delhi and Others 1973 May JBCI 260.
- 50.X v. Y & Z 1973 Vol 2 (2) JBCI 227

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## **PAPER 5 – INTERNATIONAL DISPUTE RESOLUTION BODIES**

### **Unit 1 Settlement of Disputes**

- a. Amicable Means
- b. Compulsive Means

### **Unit 2 The Permanent Court of Arbitration**

- a. Origin
- b. Structure
- c. Panel of Members
- d. Administrative Council
- e. Cases before the Tribunal

### **Unit 3 The International Court Of Justice (ICJ)**

- a. Organization and functioning of the Court
- b. Jurisdiction of the Court
- c. Procedure of court
- d. Role of International Court of Justice to the development of International law

### **Unit 4 International Criminal Court(ICC)**

- a. Need for International Criminal Court
- b. Constitution and composition of ICC
- c. Jurisdiction of ICC
- d. Penalties
- e. Law applied by in ICC
- f. Pre-Trial, trial and appeals Chamber

### **Unit 5 International Trade disputes**

- a. Settlement of dispute under GATT
- b. Settlement of dispute under WTO

### **Unit 6 International Commercial Dispute Resolution**

- a. Introduction
- b. Litigation
- c. International Commercial Arbitration
- d. International Commercial Arbitral Institutions and Other International Bodies
- e. Alternative Dispute Resolution

### **Unit 7 Settlement of the disputes under the Law of the Sea**

- a. The International Tribunal for the Law of the Sea
- b. The Sea Bed Disputes Chamber

### **SUGGESTED READINGS:**

1. J.G. Merrills- International Dispute Settlement(Cambridge University Press)
2. M.P. Tandon- Public International Law (Allahabad Law Agency)
3. Dr. H.O.Agarwal - International Law and Human Rights (Central law Publications)
4. Gurdip Singh - International Law (McMillan Publishers India Ltd)

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## OPTIONAL-II

### A. BUSINESS LAW GROUP

#### PAPER 6 – INSURANCE LAW

1. **Nature of Insurance contract various Kinds of Insurance :** Proposal, Policy, Parties consideration almost good faith insulate interest indemnity.
2. **General principles of Law of Insurance :** Definition, nature and histories.
3. **Indian Insurance Law in General :** History and development
  - a. The Insurance Act 1938
  - b. Insurance Regulatory Authority Act 2000.
4. **Mutual insurance companies & cooperative :**
  - a. Life insurance societies.
  - b. Double insurance and re insurance.
5. **Marine insurance :**
  - a. Nature of the contract
  - b. The Marine Adventure.
6. **Voyage change of voyage, deviation perils of Sea :** Definition, Excluded losses.
7. **Fire insurance:** Meaning of fire & Loss by fire Nature of Fire Insurance Contract standard fire policy.
8. **Life Insurance :**
  - a. Formation of Life Insurance Contract
  - b. Insurable interest
  - c. Proposal and Policy
9. **Motor Vehicle Insurance :** Nature and Scope, Third Party or compulsory insurance of motor vehicles.
10. **Miscellaneous Insurance :** Nature & Scope Personal Accident insurance, Burglary Insurance Liability Insurance – Public Liability Insurance.

#### SUGGESTED READINGS:

1. Modern Law of Insurance-Ksn. Murthy & Dr. Kvs Sarma.
2. Principles of Insurance Law -M.N. Srinivasan.

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## OPTIONAL-II

### B. CONSTITUTIONAL LAW GROUP

#### PAPER 6 – HEALTH LAW

##### Unit 1 Introduction :

- a. Right to Health- International Perspective
- b. Role of WHO.
- c. Health as a Human Right
  - I. Constitutional perspective
  - II. Fundamental Rights (Art-21 & 24)
  - III. Directive principles of state policy (Art- 41,42)
  - IV. Fundamental Duties.(Art 51A(g)

##### Unit 2 Health: Legislative Perspective :

- a. Drugs and Cosmetic Act, 1940
- b. Environment Protection Act-1986
- c. Maternity Benefits Act,1961
- d. Medical Termination of Pregnancy Act,1971
- e. Mental Health Act,1987
- f. Narcotic Drugs and Psychotropic Substance, Act-1985
- g. Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994

##### Unit 3 Inter Relation of Law and Health :

- a. AIDS and the law
- b. Transplantation of Human Organs Act-1994 and rules 1995
- c. Health relating to Children
- d. Health relating to women – Reproductive rights and family planning

##### Unit 4 Medical Profession, Patient and the Law :

- a. Doctor and patient relationship
- b. Medical Negligence (Sec-304-A of I.P.C.) and Medical Malpractices.
- c. Consent and Informed Consent
- d. Confidentiality
- e. Duty to take care and duty to treat
- f. Medical Council Act,1956 and code of medical ethics 1972
- g. Euthanasia- Marcy killing- role of Doctor

##### Unit 5 Hospital Administration :

- a. Professional liability of Hospitals
- b. Civil liabilities –Tort
- c. Criminal liabilities- Indian Penal Code

- d. Contractual liabilities
- e. Statutory liability -Consumer Protection Act, 1986

**SUGGESTED READINGS:**

1. Bakshi P.M. Law and medicine, [1993], UP Institute of Judicial Training and Research, Lucknow
2. Modi's Medical jurisprudence and toxicology ,lexisnexis , Butterworth publication.
3. M.L. Bhargava's Guide to Medical laws containing 37 Acts ,laws and regulations,Lawnann's Kamal publishers New Delhi
4. Y.V. Rao, Law relating to Medical negligence, Asia law house, Hyderabad.
5. Dr. Nandita Adhikari, Law and medicine, Central law Publication.
6. Dr. Lily Srivastava law and Medicine, Universal Law publishing Co. New Delhi.

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## SEVENTH SEMESTER OF B.A. LAW (5 YEAR)

### PAPER 1 - CIVIL PROCEDURE AND LIMITATION ACT

#### Part- A - Civil Procedure Code

**Unit 1 Introductory :** Concept of civil procedure in India before the advent of the British rule, Evolution of civil procedure from 1712 to 1911, Principle features of the civil procedure code, Importance of State Amendments.

**Unit 2 Jurisdiction and Res Judicata :**

- a. Jurisdiction - Meaning, Types, Objectives, Cause of action and Jurisdictional bar.
- b. Res Judicata - Meaning, Conditions and applications, Difference between estoppel and res judicata, Constructive Res Judicata.
- c. Foreign, Judgment - When not conclusive? Presumptions.

**Unit 3 Suits and institution of suit :** Concept of Law suit, Parties to suit (order I), Place of suing (Sec -15), Framing of suit (order II), Institution of suits (order IV), Summons (Sec - 27,28,31, Order IV, VI, IX), Service of foreign summons (Sec - 29), Power for order (Sec - 30 Order XI).

**Unit 4 Pleadings and Plaint :** Material facts, Forms of Pleading, Condition Precedent, Presumptions of law, Striking out or amendment, Particulars in money suits and suits for immovable property, Grounds of Limitation, Return of Plaint, Rejection of Plaint, Production and Listing of Documents, Written Statement, Counter Claim, Set off and Framing of Issues.

**Unit 5 Appearance and Examination :** Appearance, Ex. Parte Procedure, Default of Parties, Summoning and attendance of witnesses, Examination, Admissions, Production, Return of Documents, Hearing and Affidavit.

**Unit 6 Adjournments, Judgment and Degree :** Order XVIII, Adjournment - Judicial discretion and problems of arrears, Concept of judgment - Decree, interim orders and stay, Injunctions, Costs.

**Unit 7 Execution and Commissions :**

Concept of Execution, General principles of Execution, Power for execution of Decrees. (Sec -38-46), Procedure for execution, Enforcement : Arrest and Detention (Sec - 55-59), Attachment (Sec 60-64), Sale (Sec 65-67), The rationale of Commissions,

Order XXVI.

**Unit 8 Suits in Particular Cases :**

- a. Suits by or against government (Sec 79-82).
- b. Suits by Aliens and by or Against foreign Rulers.
- c. Suits relating to public matters (Sec 91-93)
- d. Incidental and Supplementary Proceedings (Sec 100-78, 94-95).

**Unit 9 Appeal, Review and Revision :**

- a. Concept and Meaning of appeal, Review and Revision.
- b. Appeals from Original Decrees. (Sec 96-99 A).
- c. Appeals from Appellate Decrees (Sec 100-103).
- d. Appeals from Orders (Sec. 104-106).
- e. General provisions relating to appeals (Sec 107-108).
- f. Appeals to the Supreme Court (Sec 109).
- g. Appellate Power of High Court in Civil Matters.

**Part- B Limitation Act.**

**Unit 10** Limitation Act - Historical background, Nature and scope of Limitation Act, Limitation of Suits, appeal and applications.

**Unit 11** Computation of period of limitation, Acquisition of ownership by possession

**SUGGESTED READINGS:**

1. Mulla - Code of Civil Procedure. (N.M.Tripathi)
2. A.C. Ganguly - Civil Court Practice and Procedure.
3. Mitra- Limitation Act.((Eastern Book Company)

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## **PAPER 2 - INTERPRETATION OF STATUTES**

- Unit 1** **Introductory:** Meaning & Objects of Interpretation, General Clauses Act.
- Unit 2** **General Principles of Interpretation :** Literal Rule, Golden Rule, Mischief Rule, Statute must be read as a whole, Statute to be construed to make it effective and workable, Omissions not to be inferred, Every word in a statute to be given a meaning.
- Unit 3** **Internal Aid to Construction:** Preamble, Definition, Sections, Heading, Marginal notes, Punctuations, Illustrations, Proviso, Explanation & Schedule.
- Unit 4** **External Aid to Construction:** Parliamentary History, Historical facts and surrounding circumstances, Socio-political & economic developments, Reference to other Statutes, Contemporaneous Exposition & other external aids.
- Unit 5** **Subsidiary Rules :** Same word same meaning, use of different words, Rule of Last Antecedent, Non obstante clause, Legal fiction, Mandatory and Directory Provisions, Conjunctive and Disjunctive words 'or' and 'and' ; construction of General words - Noscitur A Socis, Rule of ejusdem generis, Word of rank, Reddendo Singula Singulis etc.
- Unit 6** **Interpretation of Statute affecting Jurisdiction of Courts :** General principles, the extent of exclusion of jurisdiction of superior Courts.
- Unit 7** **Interpretation of Penal and Taxing Statutes :** Rule of Strict Interpretation, General principle, Limits of the Rule of strict construction, Mens rea in statutory offences and Indian penal Code, Vicarious responsibility in statutory offences.
- Unit 8** **Interpretation of Remedial Statutes :** Distinction between Remedial and Penal statute, Liberal construction of Remedial statutes.
- Unit 9** **Commencement, Operation, Expiry and Repeal of Statutes :** Commencement, Effect of Expiry of Temporary Statutes, Express or Implied Repeal, Consequences of Repeal, Consolidating and codifying statutes.
- Unit 10** **Interpretation of Constitutional documents :** Rules of interpretation of constitutional documents as developed by the Courts in India.

### **SUGGESTED READINGS:**

1. Rupert Cross - Statutory Interpretation, (London : Butterworths).

2. G.P. Singh - Interpretation of Statute (Eastern Book Company)
3. Maxwell - Interpretation of Statute. (Sweet & Maxwell).

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## **PAPER 3 COMPANY LAW (AS PER COMPANIES ACT 2013)**

### **Unit 1 Introduction :**

- a) Meaning, definition of company, characteristics of a company
- b) Lifting of corporate veil,
- c) Kinds of company- Limited by shares, Limited by guarantee, Public company, Private company, Listed company, Government company, Foreign company, Subsidiary company, One person company, Associate company
- d) Comparison of company with other association of persons such as Partnership firm, Hindu Undivided Family etc.

### **Unit 2 Formation of a Company :**

- a. Incorporation and Registration of a company, Procedure for Registration of company, Certificate of Incorporation, Commencement of business
- b. Pre- incorporation Contracts

### **Unit 3 Corporate Charter :**

- a. Memorandum of Association(MOA)- Meaning, Definition , Purpose and Significance, Contents of memorandum, Procedure for alteration, Doctrine of Ultra Vires
- b. Articles of Association(AOA)- Meaning, Definition and Significance, Contents of Articles, Model forms, Procedure for Alteration
- c. Relation of MOA and AOA, Legal effect of MOA and AOA
- d. Doctrine of constructive Notice, Doctrine of Indoor Management-Royal British Bank Vs. Turquand, Exceptions to the rule

### **Unit 4 Prospectus :**

- a. Definition, Meaning, Object and Contents
- b. Abridged Prospectus, Shelf Prospectus, Red herring Prospectus, Misstatements in prospectus and their consequences

### **Unit 5 Promoter :**

- a. Definition and Meaning
- b. Position, duties and Liabilities

### **Unit 6 Membership of a Company :**

- a. Meaning, Definition and Qualification, Rights and liabilities of Member,

- b. Modes of acquiring Membership, Cessation of Membership, Register and Index of members.

**Unit 7 Share Capital :**

- a. Meaning of share Capital, Definition of share, Kinds of share, Allotment of shares
- b. Share certificate, Calls on shares, Forfeiture & Lien on shares
- c. Issue of shares at premium and discount, Issue of sweat equity shares, Issue of bonus shares
- d. Alteration & Reduction of share capital
- e. Transfer & Transmission of shares
- f. Buy – Back of shares

**Unit 8 Debentures :**

- a. Meaning, Definition and Kinds of debentures
- b. Debenture holder & his remedies, Debenture trust deed

**Unit 9 Borrowing Powers :**

- a. Ultra Vires borrowing
- b. Charges & Mortgages, Fixed & Floating Charge, Registration of charges, Effects of non-registration
- c. Deposits

**Unit 10 Meetings :**

- a. Requisites of valid meeting, Kinds of meeting
- b. Voting and Poll, Resolutions

**Unit 11 Directors :**

- a. Position and status of Directors
- b. Appointment, Qualification, Remuneration & Removal of director
- c. Powers, Duties & Liabilities

**Unit 12 National Company Law Tribunal & Appellate Tribunal :**

- a. Definitions and Constitution of NCLT & NCLAT
- b. Qualifications of President, Chairperson and Members
- c. Removal and resignation
- d. Orders & Appeal

**Unit 13 Majority Rule & Minority Rights :**

- a. Importance of majority rule
- b. Rule in Foss vs. Harbottle
- c. Exceptions to the majority rule



d. Prevention of oppression and mismanagement

**Unit 14 Corporate Social Responsibility :**

a. Importance, Mandatory spending

b. CSR committee, Qualified CSR Activities, Failure to contribute

**Unit 15 Winding up :**

a. Meaning, Modes of winding up

b. Compulsory winding up by tribunal

c. Appointment of official Liquidator, Powers and duties of Liquidator

d. Consequences of winding up order

e. Voluntary winding up

f. Resolutions for winding up

g. Declaration of solvency

h. Preferential payments

i. Dissolution of company

**SUGGESTED READINGS:**

1. The New Company Law, Dr.N.V.Paranjape, Central Law Publication
2. Guide to Companies Act 2013, Corporate Law Adviser
3. Companies Act 2013 Impact Assessment, Satwinder Singh, Corporate Law Adviser
4. Companies Act 2013 with Rules, Taxmann
5. Company Law by G.K. Kapoor ,Sanjay Dhamija ,Taxmann
6. A Comparative Study of Companies Act 2013 with Rules and Companies Act 1956, Taxmann
7. A Ramaiya Guide to the Companies Act, Ramaiya, Lexisnexis

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**PAPER 4 - PROPERTY LAW INCLUDING TRANSFER OF PROPERTY ACT AND EASEMENT ACT.**

**Part- A PROPERTY LAW & TRANSFER OF PROPERTY**

**Unit 1 Concept of Property Under Indian Law :**

- a. Concept, Meaning, Nature & Scope of Property
- b. The Law of Property Under Jurisprudence-Corporal and Incorporeal, Movable & Immovable, Real and Personal, Public and Private.
- c. Modes of Acquisition of Property-Possession, Agreement, Prescription & Inheritance.
- d. Concept of Property Under Sales of Goods Act- Mode of Transfer-Differentiate It From topa
- e. Position of Property Under The Constitution-Article 300 A, Scope and Limitations.

**Unit 2 General Principles Relating to Transfer of Property :**

- a. Meaning of Transfer- Concept of Possession and Ownership – Living Person- Definition of Property –Essentials of Valid Transfer-Transferable and Non-Transferable Property.
- b. Conditional Transfers-Transfer For The Benefit of Unborn Person-Rule Against Perpetuity- Vested Interest- Contingent Interest.
- c. Doctrine of Election and Apportionment- Transfer By Ostensible Owner- Benami Transaction Act 1988—Concept of Feeding The Estoppels By Grant.

**Unit 3 General Principles Relating to Transfer of Property Law :**

- a. Doctrine of Notice- Types of Notice- Importance of Notice.
- b. Transfer of Property Pending Suit Relation Thereto I.E. Doctrine of Lis-Pendens –Basis- Effect and Essential Conditions of Lis-Pendens.
- c. Fundamental Transfer
- d. Doctrine of Part Performance

**Unit 4 Specific Transfers: I - Mortgages of Immovable Property. Rights and Liabilities of Mortgagor and Mortgagee and Charge**

**Unit 5 Specific Transfers II -**

- a. Sale of Immovable Property,
- b. Lease of Immovable Property

**Unit 6 Specific Transfers III -**

- a. Gifts

- b. Assignment of Actionable Claims
- c. Exchange

**Part- B EASEMENT ACT**

**Unit 7 Easement Act - I** : General Principles, Imposition, Acquisition and Transfer of Easement, Incidents of Easement.

**Unit 8 Easement Act - II** : Disturbance of Easement and The Extinction, Suspension and Revival of Easements and Licenses.

**SUGGESTED READINGS:**

1. Indian Law Institute - Property and Property Relation In India.
2. S.M. Shah - Principles of The Law of Transfer.(N.M.Tripathi)
3. Khanna and Bakshi - Mulla On Transfer of Property Act. 1882.
4. P.S. Narayan - Indian Easement Act 1882.

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**OPTIONAL PAPER III**  
**A. BUSINESS LAW GROUP**

**PAPER 5 - MERGER AND ACQUISITION**

**Unit 1 Corporate Restructuring :**

- a) Meaning, Concept, Objectives of Corporate restructuring and Modes of Corporate restructuring
- b) Different forms of corporate restructuring

**Unit 2 Corporate Restructuring under Company Law :**

- a. General Concepts under company Law- Definition of Company, Essential characteristics of company, MOA and AOA, Shares and its Kinds, Position of Promoters and Directors
- b. Merger or amalgamation of companies- Power of Tribunal, Procedure for Merger or Amalgamation, Procedure for Small Companies, Power of central government for amalgamation in Public Interest
- c. Acquisition under Company law- Power to acquire shares of dissenting shareholders, Purchase of minority shareholding, Organic restructuring under Company law, Alteration of capital, Reduction of capital, Buyback of shares

**Unit 3 Corporate Restructuring and Competition Law :**

- a. Objectives of Competition Act
- b. Regulation of Combination- Definition of combination, Combination Thresholds, Void Combinations, Procedure for investigation of combinations,
- c. Order of Commission, Appeals, Penalties

**Unit 4 Tax Aspects under Corporate Restructuring :**

- a. Stamp Duty Provisions- Meaning of Stamp Duty, Constitution and payment of Stamp Duty, Central and State laws on Stamp Duty, Levy of stamp duty, Payment of stamp duty on Order of High Court, Landmark Judgments, Exemption from Payment
- b. Amalgamation under Income Tax Act
- c. Provisions related to Capital Gains

**Unit 5 Amalgamation of Sick Companies :**

- a. Definition of Sick Company, Revival of sick companies
- b. Preparation of Scheme, Sanction of scheme

**Unit 6 Amalgamation and Foreign Exchange :**

- a. Basic concepts under FEMA
- b. FEMA 19
- c. FEMA 20

**Unit 7 SEBI Regulations related to Corporate Restructuring :**

- a. Listing Agreements
  - i. Meaning
  - ii. Clause 40 A & 40 B
- b. SEBI Takeover Code
  - i. Definitions - Acquirer, Target Company, Control, Person acting in Concert
  - ii. Disclosures under SEBI Takeover Code
  - iii. Open offer Process, Trigger Points for open offer
  - iv. Exemptions
  - v. Procedure for open offer

**Unit 8 Due diligence :**

- a. Concept and need
- b. Various aspects for due diligence, Due diligence report

**SUGGESTED READINGS:**

1. The New Company Law, Dr. N. V. Paranjape, Central Law Publication
2. Mergers, Acquisitions and Corporate Restructuring, Prasad Godbole, Vikas Publication House Pvt. Ltd
3. Hand book on Mergers , Amalgamations and Takeovers Law and Practice, CCH Publication
4. Competition Law & Practice, D.P. Mittal, Taxmann
5. Bare Act Foreign Exchange Management Act 1999
6. Bare Act Companies Act 2013
7. SEBI Takeover Code 2011
8. About Corporate Restructuring, Dr.K.R. Chandratre , Bharat Law House Pvt. Ltd

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## OPTIONAL PAPER III

### B. CONSTITUTIONAL LAW GROUP

#### PAPER 5 - RIGHT TO INFORMATION

- Unit 1 Introduction of Right to Information Act 2005:** History, Background, Objectives, Preamble of Right to Information Act 2005, Obligation of Public Authorities (Section 3 to 11)
- Unit 2 Right to Information in Global Perspective:** (World right to Know)
- a. United Nations and the Right to Information
  - b. The Commonwealth and the Right to Information
  - c. The Right to Information in USA
  - d. The Right to Information in UK
  - e. Rome Convention for the Protection of Human rights and Fundamental Freedoms, 1950
- Unit 3 Right to Information as Constitutional rights:** Protection of Article 19(1) (a), Right to privacy, Contempt of Court, Public Interest vis-à-vis Information
- Unit 4 The Central Information Commission : Constitutions,** Eligibility criteria and Process of Appointment, Term of office and Condition of Service, Removal of Informational Commissioner
- Unit 5 The State Information Commission :** Constitutions, Eligibility criteria and Process of Appointment, Term of office and Condition of Service, Removal of Informational Commissioner
- Unit 6 Power and Function:** Information Commission, Appeal and Penalties under Right to Information Act 2005
- Unit 7 Breach of Confidentiality and Privacy:** The Indian perspective an 'offence' under the Indian Information Technologies Act 2000
- Unit 8 Public Authority vis-à-vis Right to Information Act 2005:** Origin, History, Public Authority, right to Information, Breach of Duty to disclose by Public Authority
- Unit 9 Right to Information and E-Governance:** Electronic Information Dissemination, need for regulation, Jurisdiction in Cyberspace: Problem and perspective
- Unit 10 Right to Information and Other Acts, Reports, Bill :**
- a. The official Secrets Act, 1923
  - b. Public records Act 1993, Public records rules 1997
  - c. The Freedom of Information Act 2002
  - d. Reports of National Commission to Review the working of the Constitution ,2002(relevant provisions)



- e. 179th Report of Law Commissions of India on Public Interest Disclosure and protection of Informer ,2001(relevant provisions)
- f. The Public Interest Discloser (Protection of Informer Bill)2002

**SUGGESTED READINGS:**

1. The Right to Information Act Book, By Shruti Desai
2. The Right to Information Act,2005 By Dheera Khanawal & Krishna K. Khanawal
3. The Right to Information :Law-Policy-Practice By Rodney D Ryder
4. Handbook on The Right to Information Act By P.K.Das
5. Treaties on The Right to Information Act 2005 By Dr.Hiraj Kumar (2007)

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## **EIGHTH SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 - LABOUR LAWS**

#### **Unit 1 Historical Perspective on Labour and Labor Legislation :**

- i.** Labour Laws- Concept, Origin, Objectives and Classification
- ii.** International Labour Organisation- Genesis, development and dimensions, aims and objectives, Organs of the International Labour Organisation

#### **Unit 2 Industrial Disputes Act, 1947 :**

- a. Definition, Authorities for the settlement of disputes, methods of settlement, collective bargaining, conciliation, arbitration and adjudication.
- b. Scope of Industry, Workmen, Employers, Industrial Disputes, Authorities under the Industrial Dispute Act, 1947; Procedure, Power and Duties of Authorities, Reference of Disputes to Boards, Courts or Tribunals.
- c. Strike, Lock Out, Lay off, Retrenchment and Closure Unfair Labour Practices, Penalties, offences by Companies etc.

#### **Unit 3 The Trade Union Act. 1926 :**

- a. Collective Bargaining- Concept and Process, Legal control, Factor affecting collective bargaining, Merit and Demerit of collective bargaining
- b. History and Development of Trade Union Movement with reference to India, Registration of Trade Union, cancellation of registration, Rights and Liabilities of Registered Trade Union, Penalties and procedure, Powers and duties of Labour officers, Penalties and procedure

#### **Unit 4 The Factories Act, 1948 :**

- a. Definition of factory, Manufacturing process, Worker, Occupies,
- b. Health, welfare and safety provisions under the Act
- c. Employer's liability- liability for hazardous and inherently dangerous industries

#### **Unit 5 The Payment of Wages Act, 1936 :**

- a. Responsibility for payment of wages.
- b. Authorised deductions of wages and delay in payment.
- c. Obligations of employer and employee
- d. Offences, their trial procedure and penalties.
- e. Enforcement machinery under the Act- their powers and functions.

#### **Unit 6 The Minimum Wages Act, 1948 :**

- a. Theories and Concept of Wages , Aims & Objects of Act, Definition, Fixation & Revision of rates of Wages, Working Hours and Determination of Wages and Claim etc.

- b. Authority appointment & Powers of the Authority.
- c. offences and penalties and Exemptions
- d. Concepts of Dearness Allowance and Principles for determination of Dearness allowances

**Unit 7 Employee's Compensation Act, 2010:**

- a. Definitions, Aims & Object, Liability of Employer, Notional Extension & Defenses, Determination of Amount of Compensation, Compensation when due-Penalty for default, Contracting Out ,
- b. Commissioner for Employees' Compensation- his duties, powers and procedure

**Unit 8 The Maternity Benefit Act, 1961:**

- a. Applicability, Nature of benefits and privileges available under the Act
- b. Procedure for claiming payment
- c. Inspectors – their powers and functions. Penalties.

**Unit 9 Maharashtra Recognition of Trade Union and Prevention of Unfair Labour Practice Act, 1971 :**

- a. Authorities under Maharashtra Recognition of Trade Union and Prevention of Unfair Labour Practice Act, powers and duties
- b. Unfair Labour Practices
- c. Penalties and Procedure

**SUGGESTED READINGS:**

1. Dr. V. G. Goswami, Labour & Industrial Laws
2. S. N. Misra, Labour and Industrial Laws
3. S. P. Jain, Industrial and Labour Laws
4. Avtar Singh & Harpreet Kaur, Introduction to Labour and Industrial Laws
5. P. L. Malik, Handbook of Industrial and Labour Law
6. S. R. Myneni, Labour Laws
7. S. R. Samant, Employer's guide to Labour Laws
8. Taxman's Labour Laws
9. Adv. S. R. Bhosale, Law of Industrial Disputes
10. R. C. Saxena, Labour Problems and social Welfare(1974)
11. S. C. Srivastava, Social Security and Labour Laws (1985)
12. K. M. Pillai, Labour and Industrial Laws

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## **PAPER 2 - LAW OF EVIDENCE**

### **Unit 1    Introductory Background of the Indian Evidence Law :**

- a. The Introduction of the British Principles of evidence.
- b. Problem of applicability of Evidence Act. Administrative Tribunals, Industrial Tribunals, Commission of Inquiry, Court Martial.
- c. Law Commission Report on the Evidence Act.

### **Unit 2    General Principles. I (Preliminary) :**

- a. The principle items of judicial evidence - Facts in issue, Evidence - Testimony witness, Admissible hearsay statements, Documents, Things, relevant facts.
- b. The principal classifications of judicial evidence - Direct and circumstantial evidence, Primary and Secondary evidence, oral and documentary evidence.
- c. Facts must generally be proved, evidence-proved-proving disproving.

### **Unit 3    General Principles II (Relevancy of Facts) :** The Doctrine of Res Gestae, (Sec - 6,7,8 & 10), Evidence of Common intention (Sec - 10), The Problems of Relevancy of otherwise Irrelevant facts (Sec. - 11), Relevant facts for proof of custom (Sec - 13) Facts concerning bodies and mental state (Sec 14 & 15).

### **Unit 4    General Principles III (Admission & Confession) :**

- a. General principles concerning admission (Sec. 17-23). Difference between "Admission" and "Confession".
- b. The problems of non-admissibility of confessions caused by any inducement, threat or promise (Sec - 24), Inadmissibility of confession made before a Police officer (Sec - 25).
- c. Admissibility of 'Custodial' Confessions (Sec. - 26), Admissibility of "Information" received from an accused person in custody with special reference to the problem of discovery based on " Joint statement" (Sec. - 27), Confession by co-accused (Sec - 30)

### **Unit 5    Statement by persons who cannot be called as witnesses and relevance of other statements :**

- d. Dying Declaration - The justification for relevance of dying declaration        (Sec - 32).
- e. Judicial standards for appreciation of evidentiary value of dying declaration, General Principles - (Sec 32 (2) to 32 (8)).

- f. Statement made under special circumstances - entries in books of account, statement in maps, charts, plans, public record and Law books.
- g. Relevance of judgment of Court of Justice - General Principles (Sec 40-41) - Admissibility of Judgment in Civil and Criminal matters framed in collusion (Sec - 44).
- h. E. Relevancy of Opinions of Third Party - General principles (Sec - 45-50), who is an expert ? Types of Expert Evidence, Opinion on relationship especially proof of marriage (Sec - 50), The problems of judicial defence to expert testimony.
- i. F. Relevance of Character in Civil and Criminal Cases - when it is relevant? Character affecting damages.

**Unit 6 Facts which need not be proved and presumptions as to documents :**

- a. The scope and justification of the doctrine of Judicial notice (Sec - 114). Facts which need not be proved, facts of which court must take judicial notice, facts admitted need not be proved.
- b. Meaning and classification of presumptions - Presumptions of legality, accuracy, legitimacy, marriage, death, formal admission old documents, Presumption about existence of certain facts. (Sec - 114). Presumption as to certain offences (Sec - 111A).

**Unit 7 Oral and Documentary Evidence :**

- a. General principles concerning oral Evidence (Sec - 59-60), and documentary Evidence (Sec - 67,90).
- b. Public documents - Meaning, Kinds, Proof of documents.
- c. Presumptions as to Documents.
- d. General principles regarding exclusion of Oral evidence by documentary Evidence.

**Unit 8 Estoppel : Principle of estoppel under Sec. 115.**

**Unit 9 Witnesses : Competency to testify Evidence as to the affairs of State (Sec 123), Professional Privileges (Sec 126,127 & 128) & Approver's testimony ( Sec. 133).**

**Unit 10 Chief - Examination and Cross - Examination:** General Principles of Examination in Chief, Cross and Re - Examination (Sec 135 -166). Leading Questions (Sec 141-143). Compulsion to answer question put to witness (Sec. 147, 153). Hostile witness (Sec 154). Impeaching credit of witness (Sec 155)

Refreshing the memory of witnesses (Sec 158).

**SUGGESTED READINGS:**

1. Ratanlal & Dhirajlal - Law of Evidence.(Wadhawa, Nagpur)
2. Venkat Subbarao - Law of Evidence. (Eastern Book Company)
3. V. Sarthi - Law of Evidence. (Eastern Book Company)
4. P.S. A. Pillai - Law of Evidence. (Eastern Book Company)
5. Law Commission Report.
6. Cross - Law of Evidence. (Sweet & Maxwell)

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**PAPER 3 - CRIMINAL PROCEDURE CODE, JUVENILE JUSTICE ACT & PROBATION OF OFFENDERS ACT**

**Part- A CRIMINAL PROCEDURE CODE**

**Unit 1 Rationale of Criminal Procedure and Functionaries under the code :**

- a. The rationale of criminal procedure :- Importance of fair trial, Constitutional perspective : Art - 14,20 and 21, Classification of offences under the Code.
- b. Constitution of Criminal Courts & offices (Sec. 1 to 40)

**Unit 2** Arrest of persons and process to compel appearance & production of things (Sec. 41 to 105)

**Unit 3** Security for keeping the peace & for good behaviour & provisions regarding bail (Sec. 106 to 124) Bail and Bond (Sec. 436 to 450)

**Unit 4** Proceedings for maintenance of wives, children and parents. (Sec. 125 to 128)

**Unit 5** Information to the Police & Powers to investing (Sec. 154 to 176)

**Unit 6** Jurisdiction and conditions of the Criminal Court in Inquiries and trial (Sec. 177 to 199)

**Unit 7** **Complaint to Magistrate** : commencement of proceedings before him. Sec 200- 210

**Unit 8** **Charge and Trial :**

- a. Charge (Sec. 227 to 253)
- b. Trial before a Court of Session (Sec. 225 to 237)
- c. Trial of warrant cases & summons cases by Magistrate Sec. 238 to 269
- d. Summary Trial Sec. 260 to 265

**Unit 9** Evidence in Inquiries and Trials and general provisions Sec 272 to 327

**Unit 10** **Appeal, Review and Revision :**

- a. Submission of death sentence for confirmation Sec. 366 to 371
- b. Appeal - 372 to 394
- c. Reference and Revision Sec. 395 to 405
- d. Transfer of Criminal Cases Sec. 406 to 412
- e. Execution, suspension, Remission and commutation of sentences (Sec 413 to 435)



**Part- B PROBATION ACT & JUVENILE JUSTICE ACT**

**Unit 11 Probation of offenders Act. :** Historical Background of the Indian Probation Act, Powers & Procedure of Court to release offenders under the Act, Probation officer and his functions.

**Unit 12 Juvenile Justice Act :** Meaning of Juvenile Delinquency, Juvenile Court - its Powers and functions, Treatment of Juveniles under the Act.

**SUGGESTED READINGS:**

1. R.V. Kelkar - Outline of Criminal Procedure (Eastern Book Company)
2. Ratanlal & Dhirajlal - Criminal Procedure Code.(Wadhawa, Nagpur)
3. Ved Kumari - Juvenile Justice Act. (I.L.I., New Delhi)
4. N.V. Paranjape - Law Relating to Probation of offenders in India.(Central Law Agency, Allahabad)
5. D.D.Basu - Criminal Procedure Code (Prentice - Hall, Calcutta)

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## **PAPER 4 - PRACTICAL PAPER – II DRAFTING PLEADING AND CONVEYANCING**

**Unit 1 Drafting :** General principles and substantive rules of drafting. Fundamental Rules of Pleadings, Forms of Pleadings, Particulars, Alternative and Inconsistent Pleadings, Amendment, Frame of Suit, Parties to Suit, Plaint, Defence, Appeals, Applications, Affidavits.

**Unit 2 Pleadings :**

- a. Civil: i) Plaint (ii) written statement (iii) Interlocutory Application (iv) Original Petition (v) Affidavit (vi) Execution Petition and (vii) Memorandum of Appeal and Revision (viii) Petition under Articles 226 and 32 of the Constitution of India.
- b. Criminal: i) Complaints (ii) Criminal Miscellaneous Petition, (iii) Bail Application and (iv) Memorandum of Appeal and Revision.

**Unit 3 Conveyancing : (15 Exercises)**

- a. Sale Deed
- b. Mortgage Deeds
- c. Lease Deed
- d. Gift Deed
- e. Promissory Note
- f. Power of Attorney
- g. Will.

**Unit 4 Viva- Voce** on Drafting, Pleading and Conveyancing.

### **SUGGESTED READINGS:**

1. Majumdar - Law Relating to Notices (Particularly Chapter 1 to 6)
2. Mogha-Drafting Pleading and Conveyancing. (Eastern Book Company)

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**Unit 1 Concept Of Maritime Law: Principles And Sources Of Maritime Law:**

- a. Definition, Concept, Sources, Principles, Of Maritime Law.
- b. National Maritime Law.
- c. International Public Maritime Law.

**Unit 2 Legal Issues under Maritime Law:**

Jurisdiction Admiralty & Specific, Maritime Liens, Possessory Liens, Necessaries, A Maritime Claim, Claims Relating To Cargo, Effect Of Arbitration Clause On Arrest, Lay Time, Limitation Of Liability, Claims Payable In Foreign Currency & Interest, Priorities, Applicable Law, Time Bar, Security For Costs And Damages, Wrongful Arrest, Admiralty Rules, Pleadings, Writ Of Summons, Ship Arrest, Advisability Of Litigation Application For Arrest, Effecting The Arrest, Enforced Sale Of The Ship, Execution Of Foreign Decrees, Carriers' Identity, Indian Ships, Registration.

**Unit 3 Maritime Laws In Indian Context**

- a. Merchant Shipping Act, 1958.
- b. Carriage of Goods By Sea Act, 1925.
- c. Multimodal Transportation Of Goods Act, 1993.
- d. Major Port Trust Act, 1963.
- e. Maritime Zones Of India Act 198.
- f. Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act, 1976.
- g. The Customs Act, 1962.
- h. The Indian Ports Act, 1908.
- i. Admiralty Court Act, 1861.
- j. 151<sup>st</sup> Report Of Law Commission
- k. Bombay High Court Rules
- l. Madras High Court Rule

**Unit 4 International Law And Maritime Affairs Regulation:**

- a. Brussels Convention On Arrest Of Ships, 1952.
- b. Geneva Convention On The Arrest Of Ships, 1999.
- c. International Convention For Arrest Of Ships, 1999.

**Unit 5 Comparative Study Of Maritime Laws**

- a. China
- b. U.S.A.
- c. Australia

d. Britain

**Unit 6 Arbitration And Maritime Laws:**

Arbitration Clause In Contract Of Carriage Of Sea, International Arbitration, Merits And Demerits Of International Arbitration, Institutional And Ad Hoc Arbitration International Arbitration, Institutional Arbitration, Issues Under Arbitration Agreements, Applicability Of International Conventions And National Legislation, Procedural Issues In International Arbitration, Recognition And Enforcement Of Awards, Provisional Measures By Arbitrators.

**Unit 7 Practicalities Of Ship Arrest In India**

Brussels Convention, Jurisdiction, Procedure For Arrest Of Ship, Security For Release Of A Ship, Release From Arrest, Legal Expenses, Effect Of Arbitration Clause On Arrest.

**Unit 8 Maritime Security In India**

Costal Security For Terror Attack, Changing Security Dynamics,

**Unit 9 Maritime Contracts**

Preliminary, Mixed And Collateral Contract, Marine Insurance Policies, Contract For Repair.

**Unit 10 Personal Injury And Death Claim**

Remedies Of Seaman, Action For Negligence, Remedies For Wrongful Death, Remedies Of Non-Maritime Person, Damages.

**SUGGESTED READINGS:**

1. Maritime Security Of India: The Costal Security Challenges And Policy Opinion, Suresh R.
2. Shipping Law, Simon Baughen.
3. Modern Maritime Law And Risk Management, Aleka Mandaraka-Sheppard.
4. Maritime Security And The Law Of The Sea, Natalie Klein.
5. International Tribunal For The Law Of The Sea, P. Chandrasekhar Rao, Rahmatullah Khan.
6. Modern Law Of Sea, David Anderson.
7. A Handbook On The New Law Of Sea, René Jean Dupuy, Daniel Vignes.
8. The Maritime Law Of Salvage, Geoffrey Brice, John Reeder.
9. Aspects Of Maritime Law Claim Under Bill Of Lading, M. L. Hendrikse, N. H. Margetson



**OPTIONAL PAPER IV**  
**A. BUSINESS LAW GROUP**

**PAPER 6 - COMPETITION LAW AND PRACTICE**

- 1. Introduction :**
  - a. Economic Reforms and Industrial Policy 1991
  - b. Competition Advantages & Disadvantages
  - c. Need of Competition Regulations
- 2. Competition Law :**
  - a. Historical Background
  - b. Sherman Act, 1890
  - c. Federal Trade Commission Act, 1914
  - d. Competition Law of The European Union
  - e. U.K. Competition Act, 1998
- 3. Monopolies & Restrictive Trade Practices (MRTP) Act, 1969– Indian Laws :**
  - a. Salient Features
  - b. Scheme of The Act
  - c. Unfair Trade Practices
  - d. Categories
- 4. Powers and Functions of The MRTP Commission :**
  - a. Compensation For Loss
  - b. Damages
  - c. Non Compliance offence
- 5. Competition Act, 2002- Overview :**
  - a. Object of The Act, Scheme, Salient Features
  - b. Establishment of Competition Commission of India
  - c. Competition Advocacy
  - d. Competition Fund
- 6. Competition Anti Competitive Agreement :**
  - a. Horizontal and Vertical Agreement
  - b. Klor's Inc. Case
  - c. General Motor Case

7. **Intellectual Property Rights & Anti- Competitive Agreement**  
: Copy Right, Patent and Competitive Agreement
8. **Competition** : Acquisition, Merger and Amalgamation
9. **Competition** : Competition Commission of India and Appellate Tribunal
10. **Commission** : Powers and Functions
11. **Judicial Acquisition and Competition Act**

**SUGGESTED READINGS:**

1. Taxmann's Competition Law & Practice, D.P. Mittal
2. Competition Law in India, Abhir Roy, Jayant Kumar

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**OPTIONAL PAPER IV**  
**B. CONSTITUTIONAL LAW GROUP**

**PAPER 6 - GENDER JUSTICE AND FEMINIST JURISPRUDENCE**

1. **Historical Evolution:** Feminism and Feminist Movement in India, Europe and America.
2. **Global Standards of Gender justice :** I - United Nations and Equality of Women, UN Sub-Commission on the Status of Women, ILO and women - equal pay for equal work, maternity protection, prohibition of the night work of women. Universal Declaration of UN and Women's equality - Art 21, Provisions under the International Convention on Political & Civil Rights, Provisions under the International Convention on Social, Economical & Cultural Rights 1966.
3. **Partriarchical elements and inequalities based on sex and gender in traditional Hindu Society :** Sati, Female infanticide, dowry, Prostitution, child marriage etc.
4. **Feministic Critique of Constitution and Constitution Making :**
  - A) Constitution contents no special heading 'Women' six provisions relating to women.
  - B) Fundamental Right against Exploitation (Art - 23) non inclusion of exploitation of women - domestic Labour no recognition or value given.
  - C) Different personal Laws - unequal position of women, movement of uniform civil code.
5. **Critique of Divorce and Marriage Law :** Discriminatory Provisions under Hindu, Muslim Law and Christian Law.
6. **Critique of Criminal Law :**
  - A) Adultery.
  - B) Rape.
    - i. Critique of law relating to Employment and Labour Conditions.
    - ii. Discriminatory provisions under Guardianship, Adoption and Maintenance Law.



**SUGGESTED READINGS:**

1. Bina Agrawal- Structures of patriarchy (Introduction).
2. Kamla Bhasin and Nighat Said Khan - Some questions of Feminism and its Relevance in South Asia.
3. South Asia.
4. Maria Mies - Patriarchy and Accumulation on a World Scale.
5. S. K. Kuba - Status of Women in International Law.
6. Alison M. Jaggar - Feminist Thought and Human Nature (Sussex, Harvester Press).
7. Ratna Kapur & Brenda Cossman - Subvert Sites - Feminist engagements with law in India (Sage Publication New Delhi 1992).

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## **NINTH SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 - ADMINISTRATIVE LAW**

- Unit 1     **Introductory** :** Nature and Scope of Administrative Law.  
a. Evolution and Development of Administrative Law-India, UK, USA & France.  
b. Rule of Law, Doctrine of Separation of Powers.
- Unit 2     **Delegated Legislation** :** Reason for growth of delegated legislation in India, Constitutional limits, Control Mechanism of delegated legislation- Judicial, Legislative, Procedural, Sub-delegation.
- Unit 3     **Administrative Adjudication** :** Reason for growth & it's need; structure and procedure of adjudicatory bodies; tribunals in some special areas, e.g. tax assessment, labour laws, railway rates tribunal.
- Unit 4     **Principles of Natural Justice** :**  
a. Concept, Evolution & Importance  
b. Application of Natural Justice  
c. Rule against Bias and Rule of Fair Hearing-reasoned decision; institutional decision.
- Unit 5     **Judicial control of administrative action through writs** :**  
a. General conditions for the issuance of writ.  
b. Writ of Certiorari & Mandamus.  
c. The scope of review of administrative actions through writs  
d. High Court : Power of Superintendence (Article 227).
- Unit 6     **Administrative Discretion** :**  
a. Meaning & Definition.  
b. Control of Administrative Discretion.  
c. Special leave to appeal.
- Unit 7**  
a. Public Undertaking : Reason for autonomous bodies; types, controls - Parliamentary, judicial and governmental.  
b. Power of investigation and inquiry : under Statutes, under Commissions of Inquiry Act, 1952 and kinds of power to obtain information.
- Unit 8**  
a. Statutory judicial remedies, Ordinary civil remedies, special remedies under certain statutes, injunctions, declaratory actions.  
b. Exclusion of judicial review.
- Unit 9     **Liability of the Administration** :**  
a. Contractual Liability of the Administration-Constitutional & Other Provisions  
b. Tortious Liability of the Administration-Constitutional &

Other Provisions

- c. Government privileges in legal proceeding & Promissory Estoppel

**Unit 10 Ombudsman in India : Vigilance Commissions**

**Unit 11 Emerging Trends in Administrative Law :**

- a. Administration & Good Governance-Corruption-Prevention of Corruption Act
- b. Right to Know-Right to Information Act, 2005

**SUGGESTED READINGS:**

1. M.P. Jain & S. N. Jain - Principles of Administrative Law (N.M.Tripathi)
2. Prof. Kailash Rai – Principles of Administrative Law
3. M.C. Jain, Kagzi & Balbir Singh – A Case Book of Administrative Law.
4. M.C. Jain, Kagzi – The Administrative Law.
5. Dr. I.P. Massey - Principles of Administrative Law.
6. S.P.Sathe - Administrative Law.
7. H.W.R. Wade - Administrative Law.
8. O Hood Philips & Jackson – Administrative Law

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## **PAPER 2 - ENVIRONMENTAL LAW**

### **Unit 1 Concept of Nature, Environment & Eco-system :**

- a. Nature, scope, need and application of Environmental law
- b. Environmental pollution - causes and effects
- c. Study of Ecological Cycle

### **Unit 2 Constitutional Provisions and Environmental legislations :**

- a. Right to life, Right to Wholesome environment, Right to development, Right to clean & decent environment, Directive Principles of State Policy, Fundamental Duties,
- b. Environment Protection and Public Interest Litigation

### **Unit 3 Common Law aspects of Environmental Protection :**

- a. Traditional remedies under Law of Torts for Nuisance, Negligence and Strict Liability
- b. Remedies under Specific Relief Act - Reliefs against Smoke and Noise Pollution.
- c. Writ Jurisdiction under Art 32 and 226 and Public Interest Litigation.

### **Unit 4 International Environmental Regime :**

- a. Sustainable Development, Polluter-Pays-Principle, Precautionary Principle
- b. Salient features and critical study of Stockholm Conference on Human Environment, 1972
- c. Copenhagen Conference on Environment and Development, 1995
- d. Rio-Conference on Environment and Development, 1992 (Earth Summit)
  - i. Rio Declaration
  - ii. Convention on Biological Diversity, The Indian Biological Diversity Act 2002
  - iii. Convention on Climate Change 1992

### **Unit 5 Environment Protection Act. (1986) :**

- a. Environment Protection Rules, Coastal Zone Regulation, ECO-Mark
- b. Environment Impact Assessment, Environmental Audit
- c. Public Participation in Environmental decision making, Environment information, public hearing
- d. Regulation on Bio-Medical Waste.

### **Unit 6 Problems of Environmental Pollution, Control Measures and Acts :**

- a. Environment Pollution - Causes and effects

- b. Environment Pollution Control Mechanism
  - i. Air (Prevention and Control of Pollution) Act
  - ii. Water (Prevention and Control of Pollution) Act
- c. Protection of Wild Life and Forests
  - i. The Wild Life (Protection) Amendment Act, 2006
  - ii. The Indian Forest Act, 1927
  - iii. The Forest (Conservation) Act, 1980
- d. National Environmental Tribunal and National Environmental Appellate Authority.

## **Unit 7 Important Decisions of High Courts and The Supreme Court**

### **SUGGESTED READINGS:**

1. Environmental Law, Jaswal P.S. and Jaswal Nishtha, (Ed 3), Allahbad Law Agency, 2012
2. Environmental Law, Prof. Satish C. Shastri, (Ed. 4), Eastern Book Company, Lucknow, 2012
3. Commentaries on Water and Air Pollution and Environment Laws, Lal C. S. (Ed. 3), Law Publishers (India) Pvt. Ltd. Null, 1997
4. Cases and materials on Environment and Pollution Laws, Lal C. S. (Ed.4), Law Publishers (India) Pvt. Ltd. Allahabad, 2003
5. Cases and Material on Environmental Law and Policy in India. Rosencranz and Diwan - (N.M. Tripathi)
6. The Bhopal Case, Upendra Baxi, (2 Vol.) Indian Law Institute, 1990
7. Environment Protection Act: An Agenda for Implementation Upendra Baxi (Ed), Indian Law Institute

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### **PAPER 3 - LAW ON INFRASTRUCTURE DEVELOPMENT**

#### **Unit 1 Introduction of Indian Legal System and Basic Principles :**

- a. Housing One of The Basic Needs, Security and Comfort; Investment, Housing Policy
- b. Concepts of Ownership and Possession
- c. Basic Principles of Contract
- d. Definition and Concept of Immovable Property
- e. Devolution of Immovable Property During Life Time - Intervivos
- f. Devolution of Immovable Property On Death of A Person By Inheritance/ Succession

#### **Unit 2 Legal Requirements and Implications :**

- a. Power of Attorney, Kinds and Procedure
- b. Certain Specific Transfers, Cooperative Societies, Mhada, Apartments Leasehold Land Etc.
- c. Revenue Records and Procedure
- d. Valuation of Property
- e. Public Notice; Questionnaire; Search Report and Title Investigation; Registration Record, Verification of Documents Etc.
- f. Purchase of Flats -From Booking of Flats/Apartments Until Formation of Society/Condominium
- g. Registered, Unregistered and Notarized Documents.

#### **Unit 3 Formation and Management of Societies & Apartments :**

- a. Development Agreement and Redevelopment of Buildings In A Co-Operative Housing Society - Recent Law Provisions and Procedure In Respect of Deemed Conveyance.
- b. Farm Houses, Agricultural Land, Non-Agriculture Land Its Parameters
- c. Stamp Duty and Registration Act – Relevant Provisions
- d. The Maharashtra Apartment Ownership Act 1970
- e. The Maharashtra Ownership of Flats Act 1963
- f. Procedure, Documentation and Registration of Co-Operative Housing Society
- g. Land Acquisition Act, 1894 – An Overview

#### **Unit 4 Law Relating to Tenants and Licensees :**

- a. Tenants and Licensees

- b. Housing: An Avenue For Investment
- c. Mortgage On Immovable Property
- d. Housing Finance
- e. Service Tax and Vat On Purchase of Immovable Property
- f. Relevant Provisions of Specific Relief Act Pertaining to Transactions of Immovable Property

**Unit 5 Land Use Policies and Other Related Laws :**

- a. Dispute Settling Mechanism to Resolve Problems Relating to Housing and Land Deals
- b. Applicability of The Consumer Protection Act to Housing.- Case Studies
- c. Challenges Before Construction Industry
- d. Liability of Builders/Promoters/ Developers
- e. New Bills Relating to Immovable Property and Real Estate Pending Before The Parliament Relating Land Titling Bill ;The Maharashtra Housing (Regulation and Development) Act, 2012; The Real Estate (Regulation & Development) Bill, 2011
- f. Labour Laws With Regard to Construction Industry

**SUGGESTED READINGS:**

1. Dr. Poonam Pradhan Saxena, Property Law, 2<sup>nd</sup> Edition, 2011, Lexis-Nexis Publication.
2. Sunil Dighe, Ownership of Flats and Apartments In Maharashtra, Snow White Publication, 2010.
3. Land Laws In Maharashtra Sunil Dighe, Snow White Publication.
4. Bombay Stamp Act 1958, A. K. Gupte, Hind Law House, 2010.
5. Mulla On Transfer of Property Act , G.L. Bhanuka, Lexis Nexis Butterworths, 2005.
6. P.J. Fitzgerald "Slamond On Jurisprudence 12<sup>th</sup> Edi 2004, Universal Law Publishing Co. Pvt. Ltd.
7. Gupte and Dighe, Maharashtra Co-Operative Society Act 1949.
8. G.M. Divekar, Law of Ownership of Flats, Chaudhari Law Publisher, 2<sup>nd</sup> Edition, 2004.
9. The Maharashtra Apartment Ownership Act 1970
10. The Maharashtra Ownership of Flats Act 1963
11. Land Acquisition Act, 1894

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**PAPER 4 - PRACTICAL PAPER –III (MOOT COURT, PRE TRIAL PREPARATIONS AND PARTICIPATION IN TRIAL PROCEEDINGS)**

- Unit 1 Moot Court (30 marks) :** Every student will do at least three moot courts in a year with 10 marks for each. The moot court work will be on assigned problems and it will be evaluated for 5 marks for written submissions and 5 marks for oral advocacy.
- Unit 2 Observance of Trial in two cases, one Civil and one Criminal (30 Marks) :** Students will attend two trials in the course of the last 2 years of LL.B. studies. They will maintain a record and enter the various observations made during their attendance on different days in the court assignment. This scheme will carry 30 marks.
- Unit 3 Interviewing techniques and Pre trial preparations (30 marks):** Each student will observe two interviewing sessions of clients at the Lawyers office/Legal Aid office and record the proceedings in a diary which will carry 15 Marks each. Student will further observe the preparation of documents and brief by the Advocate and the procedure for the filling of the petition. This will be recorded in the diary.
- Unit 4** The fourth component of this paper will be **Viva Voce** examination on all the above three aspects. This will carry (10 marks.)

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**OPTIONAL PAPER V**  
**A. BUSINESS LAW GROUP**

**PAPER 5 - DIRECT TAX**

**A INCOME TAX ACT 1961**

- Unit 1**    **Definitions (Sec 2)** : Agricultural Income, Assessee, Previous Year, Assessment Year, Income, Person
- Unit 2**    Basis of Charge, Scope of Total Income & Residential Status of different Assesses, Exempted Income
- Unit 3**    **Computation of taxable income under different heads of Income :**  
a) Salaries  
b) Income from House Property  
c) Profit and Gains from Business or Profession  
d) Capital Gain  
e) Income from other sources
- Unit 4**    Clubbing of Income, Aggregation of Income and setoff and carry forward of losses, deductions from total income, rebate & relief
- Unit 5**    Advance Tax, Deduction and collection of tax at source, Assessment
- Unit 6**    Income Tax Authorities, Refunds, Appeals & Revision, offences & Penalties  
a) Wealth Tax Act 1957
- Unit 7**    **Definitions:** Valuation Date, Net Wealth, Assessee, Person, Assets Scope of Liability to Wealth Tax or Incidence of Tax (Sec 6)
- Unit 8**    Deemed Assets, Exempted Assets, Valuation of Assets, Penalty, Appeal & Revision  
a) Profession Tax Act 1975
- Unit 9**    Certificate of Registration, Enrolment, Exemption from Profession Tax, Rate of Profession Tax, E- Filing of Returns under Profession Tax

**SUGGESTED READINGS:**

1. Taxman's Direct Taxes, Law & Practice By Vinod Singhania
2. Direct Tax Law By Manoharan T.N
3. Direct taxes By Melhotra and Goel
4. The Maharashtra State Tax on Professions By PL Subramanian

**OPTIONAL PAPER V**

**B. CONSTITUTIONAL LAW GROUP**

**PAPER 5 - LAW ON EDUCATION**

**Unit 1 International law and Right to Education :**

1. Convention against Discrimination in Education, 1960.
2. International Bill of Rights and Right to Education.
3. Regional Legal Instruments.
4. Role of UNO's Specialized Agencies.

**Unit 2 Development of Right to Education in India :**

- a. Elementary Education
- b. Secondary Education
- c. Technical Education
- d. Adult Education
- e. Teachers Education and training
- f. National Policy on Education, 1986
- g. Right of Children to Free and Compulsory Education Act, 2009
- h. The Constitution (Eighty-sixth Amendment) Act, 2002

**Unit 3 Recent Development in Women's Education in India :**

- a. UGC policy and Programmes on Women's Education
- b. Legislations on Women Education
- c. Role of Judiciary in Protection and Promotion of Women's Education
- d. Education Among Rural Girls in India
- e. MHRD and Women's Education.

**Unit 4 Judiciary and Right to Education: An Overview**

**Unit 5 Problems of Higher Education**

**Unit 6 Privatisation of Education :**

- a. Privatization : Causes and Consequences
- b. Privatization of Professional Education
- c. Cases Against Privatization

- d. Accessibility and Accountability in Education
- e. Impact of Privatisation on Globalization
- f. Privatization and Law

**Unit 7 Professional Bodies for Quality Improvement :**

- a. Role of University Grant Commission
- b. Other Professional Bodies
- c. Problem of Co-ordination

**Unit 8 Role Performed by Different Commissions and Committees :**

- a. Law Commission of India
- b. Kothari Commission
- c. Yashpal committee
- d. Hurtog committee
- e. National Knowledge Commission

**SUGGESTED READINGS:**

1. History and Development of Elementary Education in India, D.D. Agarwal.
2. Fifty Years of Higher Education in Education the Role of University Grant Commission, Amrik Singh.
3. Higher Education in India Development and Problems, B. Deka,
4. Problems of Education in India, Ram Nath Sharma, Rajendra K. Sharma.
5. History of Modern Indian Education, J. C. Agarwal,
6. Development of Education in India, S.P. Agarwal.
7. Women's Education in India, S. P. Agarwal.
8. Education in India, M. Dash.
9. Decentralization and Privetisation in Education, Josef Zajda.
10. Privatization of Education, N Ramnath Kishan.
11. The Protection of The Right To Education By International Law, Klaus Dieter Beiter.

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## **TENTH SEMESTER OF B.A. LAW (5 YEAR)**

### **PAPER 1 - PUBLIC INTERNATIONAL LAW**

#### **Unit 1 Nature of International Law :**

- a. Its Origin, Definition and Basis of International Law
- b. Schools of International Law – Positivist, Naturalist, Communist (Recent Approach)

#### **Unit 2 Sources of International Law :**

- a. Treaties, Custom, General Principles of Law
- b. Judicial Decisions-Tribunals
- c. Other Sources of International Law-Reports of International Law Commission, United Nations Organization

#### **Unit 3 Relation between International Law and Municipal Law :**

- a. Conflict Between International Law and Municipal Law
- b. Monistic Theory and Dualistic Theory

#### **Unit 4 State In General :**

- a. Definition of State, Classification of States and Equality of States
- b. Diplomatic Privileges and Immunities

#### **Unit 5 Recognition of States :**

- a. Definition of Recognition and Forms of Recognition
- b. Recognition of Governments

#### **Unit 6 State Succession :**

- a. Meaning of Succession of States and Types of State Succession
- b. Consequences of State Succession

#### **Unit 7 State Territory, the Law of the Sea and Air Law :**

- a. State Territory, National and Territorial Waters, Maritime Belt
- b. Law of the Sea – First and Second Conference on the Law of the Sea, Third Conference on the Law of Sea, Territorial Sea
- c. Contiguous Zone, Continental Shelf

#### **Unit 8 Outer Space :**

- a. Outer Space Treaty 1966
- b. Prevention of Arms Race in Outer Space

c. The Moon and other Celestial Bodies,

**Unit 9 Treaties :**

- a. Definition, Kinds of Treaties and Formation of Treaties
- b. Termination of Treaties, Reservations to Treaties

**Unit 10 Settlement of Disputes :**

- a. Amicable Means
- b. Compulsive (Coercive Means)

**Unit 11 International Court of Justice :**

- a. Composition and Jurisdiction of Court
- b. Law Applied by The Court
- c. Role of The Court In The Development of International Law

**Unit 12 International Terrorism :**

- a. Forms of International Terrorism
- b. Terrorism and United States
- c. Terrorism and National Measures
- d. Terrorism and Human Rights

**SUGGESTED READINGS:**

1. Dr. A.O. Agarwal – International Law
2. M.P. Tandan: Public International Law
3. Shaw – International Law

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**Unit 1 Meaning, Evolution & Scope of Intellectual Property :**

- a. Introduction of Intellectual Property
- b. Rights, Property Rights & Intellectual Property Rights, Types of Intellectual Property
- c. WTO, TRIPS, WIPO, & Indian Intellectual Property Law.

**Unit 2 Patent Act 1970 :**

- a. Concept and History of Patent in India, Essential Features of Patents, Specifications, Patent in Addition.
- b. Non Patentable Inventions, Types of Patent.

**Unit 3 Registration and Licensing of Patents :**

- a. Procedure for application, Effects of registration of Patents.
- b. Rights and obligations of patentee.
- c. Mode of assignment, licencing and its effects, Concept of compulsory licencing, and circumstances when it can be issued.
- d. Novartis AG v Union of India, Bayer v Natco and other landmark cases.

**Unit 4 Infringement of patents, remedies :**

- a. Concept of infringement, Remedies available in cases of infringer, Defenses available in case of infringement of patents.
- b. Controller and his powers.
- c. Intellectual Property Appellate Board.

**Unit 5 Patents Act and living organisms :**

- a. Concept of Biotechnology, Status of biotechnology patent in India.
- b. Ever greening of patents, Sui Generis, Pharmaceutical patents

**Unit 6 Trade Mark Act 1999:**

- a. Concept of Trademark, Functions & Utility of a trade mark
- b. Associate Mark & Collective Mark
- a. Salient features of Designs Act 2000, Conflict between Trade mark & Design.

**Unit 7 Registration, Infringement, Piracy & Passing off :**

- b. Registration procedure of Trade mark & Industrial Design, Infringement & remedies for infringement,
- c. Piracy of registered design, Passing off remedy for unregistered trade mark & designs
- d. Service Mark, Function, GATT & GATS

e. Assignment & Licensing

**Unit 8 Copyright Act 1957 :**

- a. Meaning, application, Subject matter and nature, Copyrightable matter, Qualification for copyright subsistence.
- b. 2013 Amendment and recent trends relating Copyright

**Unit 9 Registration, Infringement & Transfer of Copyrights :**

- a. Registration procedure with the Registrar
- b. Infringement & Infringement remedies, Defenses against Infringement
- c. Assignment & Licensing provisions

**Unit 10 Law relating to Geographical indications and trade secret :**

- a. Concept of Trade secret, Position of trade secret in India and reasons for its non development
- b. Concept of Geographical indications.
- c. Infringement and remedies.

**Unit 11 International perspective of Intellectual property and its impact on India: UCC, Berne Convention, PCT, Paris Convention**

**SUGGESTED READINGS:**

1. Dr. G. B Reddy: Intellectual Property and the Law
2. Vikas Vashisht: Law and Practise of Intellectual Property in India.
3. Dr. B. L Wadhera : Intellectual Property Law Handbook
4. Dr. Jayant Lahiri : Lectures on Intellectual Property Law
5. Dr. P Narayanan: Intellectual Property Law
6. Dr.S.R Myneni : Law of Intellectual Property
7. Bibek Debroy (Editor) : Intellectual Property Rights
8. CCH India : Intellectual Property Rights Case Digest

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## **PAPER 3 – COURT MANAGEMENT**

### **Unit 1 Introduction to Law & Management :**

- a. Meaning and Classification of Law, Function of Law, Sources of Law
- b. Basics of Administrative Management
- c. Concepts and Evolving Areas: Interface Between Law and Management, Economic Analysis of Law. Accounting For Law

### **Unit 2 Public Administration :**

- a. Theories and Methodologies
- b. Concept of Governance
- c. Introduction to E-Governance & Its Concepts
- d. Best Practices of Governance-Case Studies

### **Unit 3 Introduction to Judicial System :**

- a. Understanding Indian Legal System
- b. Judicial Process and The Court Structure
- c. The Constitutional Role of Judiciary
- d. Administration of Justice (Civil and Criminal With Special Reference to C.P.C, Cr.P.C, Indian Evidence Act & Limitation Act)
- e. Alternate Dispute Resolution System
- f. Judicial Review, Independence of Judiciary, Writ Jurisdiction and Public Interest Litigation.
- g. Judicial Reforms
- h. Judicial Conduct and Disciplines

### **Unit 4 Court Management and Practices :**

- a. Justice Theories, Justice Delivery System and Justice Management
- b. Cash Flow Management and Docket Control and Calendaring, Judicial Responsiveness Management
- c. E-Court Management: Role of ICT In Courts. Application of Ict to Court Administration
- d. Management of Court Personnel and Leadership: Staff Control and Supervision.
- e. Management of Court and Administrative Records: Maintenance of Registers Supervision and Accuracy of Returns, Court Accounts and Financial Matters Including Financial Rules, Correspondence With Superior Courts, Government and High Court Circulars
- f. Civil and Criminal Manuals
- g. Alternative Dispute Resolution System and Process, Lok Adalat, Legal Aid.

### **Unit 5 Legal Research, Analysis and Reporting :**

- a. Law and Logic
- b. Judicial Reasoning and Case Briefing
- c. Reading Law: Statutory Interpretation
- d. Legal Research, Legal Analysis, and Legal Writing
- e. Introduction to Law Libraries, Legal Authority Retrieval, and Citations
- f. Research Skills, Ethics and Standards



**Unit 6 Ethics, Integrity and Aptitude :**

- a. Legal Profession
- b. Professional Codes and Ethics
- c. Access to Justice
- d. Judicial Code of Conduct and Integrity
- e. Court Manners and Etiquettes

**Unit 7 Legal Skills and System :**

- a. Communication Techniques
- b. Organizational Behavior and Soft Skills
- c. Drafting Skills-Relevance In Legal Profession.

**SUGGESTED READINGS:**

1. Benjimin N Cardozo, The Nature of The Judicial Process, Universal Law Publishing Company Ltd. 2010
2. Dr. Kailash Rai, Moot Court, 2<sup>nd</sup> Edition, Central Law Publication.
3. Avtar Singh, Introduction to Jurisprudence, Eastern Book Company.
4. M P Jain, Constitution of India, Wadhawa Publication, Nagpur
5. Paranjape, Criminology and Penology.
6. Ict Training
7. Cpc, Cr.P.C. Evidence Act Relevant Provisions.
8. Civil and Criminal Manual

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**PAPER 4 - PRACTICAL PAPER IV (ARBITRATION, CONCILIATION AND ALTERNATIVE DISPUTE RESOLUTION SYSTEMS)**

**Part- A ARBITRATION AND CONCILIATION**

- Unit 1** **Historical Background and Development:** Arbitration law in India  
Arbitration and Conciliation Act - Basic concepts and objectives.
- Unit 2** Arbitration without intervention of a court; and with intervention of a court where there is no suit pending.
- Unit 3** Arbitration agreement, Composition of Arbitral tribunal Jurisdiction of Arbitral Tribunals.
- Unit 4** Condition of Arbitral proceeding, making of arbitral award and termination of proceedings, Recourse against arbitral award, and Finality and enforcement of Arbitral awards.
- Unit 5** Conciliation - Conciliation proceedings and Conciliators Appointment, Role power and Duties and Procedure.
- Unit 6** International Arbitration: International Commercial Awards passed within the country; award passed outside the country, Enforcement of foreign Awards - New York convention and Geneva Convention Awards.

**Part- B ALTERNATIVE MODELS OF DISPUTE SETTLEMENT RESOLUTION.**

- Unit 7** Models of Dispute settlement, Litigation versus Arbitration, Models of alternative dispute resolutions - Negotiation, Conciliation, Mediation, Mini-trial, Fast tract Arbitration, Nature, scope, limitations and necessity of alternative models of disputes Resolution.
- Unit 8** Administrative Tribunal - Art. 323 A and B - Sampath Kumar Case (1987).
- Unit 9** Family Court under the Family Court Act, 1984.
- Unit 10** Consumer Council and Forums under the Consumer Protection Act, 1986.
- Unit 11** Settlement of Disputes through Lok Adalat and Lok Nyayalayas - Grassroot justice and Panchayat System for Resolution of dispute.
- Unit 12** Problems and Hurdles in the Alternative Settlement of Disputes - Legal aid movement, Legal literacy

**SUGGESTED READINGS:**

1. Upendra Baxi - Crisis of the Indian Legal System (1982).
2. B.S. Patil - The Law of Arbitration and Conciliation.
3. S.D. Singh - Law of Arbitration (Eastern Book Company).
4. P.C. Rao & William Sheffield - Alternative Dispute Resolution.

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**PAPER 5 – INTERNATIONAL ENVIRONMENTAL LAW 100 MARKS**

**Unit-1: Introduction And Instruments Of International Environmental Law**

- a. Nature And Scope Of International Environmental Law
- b. Difference Between National And International Environmental Law
- c. Instruments Or Mechanisms Of International Environmental Law

**Unit -2: International Environmental Regime**

- a. Regime, International Regime, International Environmental Regime
- b. Conventions And Protocols Of International Environmental Law
- c. Role Of Ngos In The Protection Of Environment

**Unit-3: State Liability and Customary International Law**

- a. State ,Liability And Customary International Law
- b. State International Liability
- c. State's Environmental Liability

**Unit 4 Customary International Law Concerning Transnational Pollution**

- a. ILC-International Law Commission
- b. State Liability Under Customary International Law In Case Of Transnational Pollution Customs
- c. State Liabilities- Prevention, Reduction And Control

**Unit-5: Liability Of Multinational Corporations/Companies**

- a. Un And Multinational Corporations
- b. Liability Of MNC's
- c. Social Liability Of Multinationals And Voluntary Initiatives Of MNC's

**Unit-6: International Conventions For Protection Of Environment**

- a. Stockholm Declaration On Human Environment,1972
- b. The Ramsar Convention On Wetlands,1971
- c. International Conventionfor The Protectionof Birds,Paris 1950
- d. Bonn Convention On The Conservation Of Migreatory Species Of Wild Animals,1979
- e. The Earth Summit,1992(Unced)
- f. Kyoto Protocol To The United Nations Framework Convention On Climate Change,1997
- g. Johannesburg Convention,2002

**Unit-7: Role Of UN Environment Programme (UNEP) For Protection Of Environment**

**Unit-8: Environmental Protection and The WTO Regime**

**SUGGESTED READINGS:**

1. International Environmental Law- Dr. Padma (Asia Law House, Hyderabad)
2. Environmental Law- Dr. S.R.Myneni (Asia Law House, Hyderabad)
3. International Environmental Law- Bhatt S
4. Basic Documenta On International Law And The Environment- Bernew,Partacia And Boyle,Alan

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**OPTIONAL PAPER VI**  
**A. BUSINESS LAW GROUP**

**PAPER 6 - INDIRECT TAXES**

**Part- A Central Excise Act 1944**

- Unit 1** Nature & scope of excise duty, Definitions of Excisable Goods, Factory, Manufacture, Assessee, Deemed Manufacturer,.
- Unit 2** Types of Excise Duty, Classification of Excisable Goods, SSI Units, Central Excise tariff Act 1985, CENVAT Credit.
- Unit 3** Central Excise Authorities, offences & Penalties, Returns.

**Part- B Customs Act 1962**

- Unit 4** Definitions: Goods, Customs Area, Import & Export,
- Unit 5** Types of Customs Duties, Clearance & Prohibition on import and export of goods, Levy of and exemption from customs duty, tax liability and valuation of goods.
- Unit 6** Search, Seizure and Arrest, Penalty & Prosecution, Appeal & revision

**Part- C Service Tax**

- Unit 7** Scope of Service Tax, List of Services under Service tax & Exempted Services
- Unit 8** Definitions: Assessee, Taxable Services,
- Unit 9** Registration & Payment of Service Tax, Service tax Credit , Import & Export of Services

**Part- D MVAT Act 2002 & Central Sales Tax Act 1956**

- Unit 10** Definitions : MVAT Act - Agriculture, Sale, Purchase Price, Turnover, Dealer CST Act - Appropriate State, Business, Goods, Declared Goods, Place of Business
- Unit 11** Incidence, levy of tax & Registration under MVAT & CST Act, E-Filing of returns, Online Payment of Taxes.
- Unit 12** Assessment, VAT Audit, Setoff, Penalty & Interest, Appeal & Revision.

**SUGGESTED READINGS:**

1. Maharashtra VAT Act 2002 :By PL Subramanian
2. Maharashtra VAT Act 2002 : By M.L.Anand
3. Central Sales Tax Laws : By Patel & Chaturvedi
4. Indirect Taxes : By V.S.Date
5. Central Excise and Customs : By R.K.Jain
6. Indirect Taxes : By Malhotra and Goel

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**OPTIONAL PAPER VI**  
**B. CONSTITUTIONAL LAW GROUP**

**PAPER 6 - HUMAN RIGHTS LAW AND PRACTICE**

**Unit 1 Concept of Human Rights :**

- a. Meaning, Kinds of Human Rights, and Evolution of Human Rights
- b. Human Rights under U.N charter
- c. Classification of Human Rights

**Unit 2 Universal Declaration of Human Rights :**

- a. Preparation of the universal declaration of Human Rights.
- b. Legal effect of declaration.
- c. India and Universal declaration.

**Unit 3 International Covenants of Human Rights :**

- a. Preparation of the draft of two conventions.
- b. Covenant on civil and political Rights.
- c. Covenant on Economic, Social & Cultural Rights

**Unit 4 International Convention on Inhuman Acts :**

- a. Genocide, Apartheid.
- b. Torture and other cruel inhuman
- c. Degrading treatment
- d. Slavery and slave trade
- e. Elimination of Rapid dissemination
- f. Death penalty

**Unit 5 Vulnerable groups and human Rights :**

- a. Women
- b. Child
- c. Migrant Workers
- d. Disabled Person
- e. Indigenous People
- f. Older People

**Unit 6 Regional Convention on Human Rights :**

- a. European convention on human rights.

- b. American convention on human rights.
- c. African charter on human and people's rights
- d. Arab commission on human rights

**Unit 7 International Humanitarian Law :**

- a. Application of humanitarian law
- b. Historical development of humanitarian law
- c. Character of humanitarian law

**Unit 8 India & International Covenants :**

- a. Covenants on civil & political rights & the Indian constitution & restrictions on rights
- b. Covenant on economic, social & cultural rights & the Indian constitution & restrictions on Rights.

**Unit 9 Human Rights Commission in India :**

- a. Protection of Human Rights Act.
- b. National Human Rights Commission (NHRC)
- c. State Human Rights Commission

**Unit 10 International Conferences on Human Rights :**

- a. International Conferences on Human Rights (Tehran Conference)
- b. World Conferences on Human Rights (Vienna Conference 1993)
- c. Follow up to the world conference on Human Rights.

**SUGGESTED READINGS:**

1. Dr. H. O. Agarwal, International Law
2. Dr. Kapoor, International Law Human Rights
3. Dr. V.K. Anand, Human Rights.

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**BHARATI VIDYAPEETH UNIVERSITY PUNE (INDIA)**

# **NEW LAW COLLEGE**

**Erandwane, Pune - 411038.**

**'A' GRADE UNIVERSITY STATUS BY MINISTRY OF HRD, GOVT. OF INDIA  
RE- ACCREDITATION WITH 'A' GRADE BY NAAC**

## **LL.M. SYLLABUS (TWO YEAR PROGRAM)**

**CHOICE BASED CREDIT SYSTEM**

**w.e.f. June 2018**

# BHARATI VIDYAPEETH

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Bharati Vidyapeeth, the parent body of Bharati Vidyapeeth University was established in May, 1964 by Dr. Patangrao Kadam with the objective of bringing about intellectual awakening and overall development of the people through education. Bharati Vidyapeeth is now a leading educational institution in the country, which has created a history by establishing within a short span of 51 years, 171 or so educational institutions imparting education from the pre-imparting stage to post graduate stage. Our colleges and institutions of higher education impart education in different disciplines including medicine, dentistry, ayurved, homeopathy, nursing, arts, science, commerce, engineering, pharmacy, management, social science, law, environmental science, architecture, hotel management and catering technology, physical education, computer science, library science and information technology.

The spectacular success achieved by Bharati Vidyapeeth is mainly a creation of unusual foresight, exceptionally dynamic leadership and able guidance of the founder of Bharati Vidyapeeth, Dr. Patangrao Kadam. It has been our constant endeavor to impart high quality education and training to our students and so, no wonder that our institutions have become nationally known for their academic excellence. In recognition of the academic merit achieved by these institutions and potential for development which they have, the Department of Human Resource Development, Government of India and the University Grants Commission of India have accorded the status of a deemed to be university to its 29 constituent units.

These educational institutions which achieved an academic excellence cater to the educational needs of thousands of students coming from different parts of India and abroad. Our teaching faculty includes highly qualified, experienced, dedicated and student-caring teachers. These educational centers are located at various places viz. Pune, Navi Mumbai, Kolhapur, Solapur, Karad, Panchagani, Jawhar and New Delhi.

The Department of Human Resource Development, Government of India on the recommendation of University Grants Commission accorded the status of Deemed University to twelve units of Bharati Vidyapeeth (vide their notification No. F.9- 15/95-U.3 dated 26/4/96 under the Section 3 of the University Grants Commission Act of 1956). Subsequently the Govt. of India on the recommendations of the UGC has brought more institutions of Bharati Vidyapeeth within the ambit of Bharati Vidyapeeth Deemed University. Today there are total 30 Constituent Units of BVU which includes Colleges and Research Centers.

## **Constituent Units of Bharati Vidyapeeth Deemed University**

- BVDU Medical College, Pune.
- BVDU Dental College & Hospital, Pune
- BVDU College of Ayurved, Pune
- BVDU Homoeopathic Medical College, Pune
- BVDU College of Nursing, Pune
- BVDU Yashwantrao Mohite College of Arts, Science & Commerce, Pune.
- BVDU New Law College, Pune
- BVDU Social Sciences Centre (M.S.W.), Pune
- BVDU Yashwantrao Chavan Institute of Social Science Studies & Research, Pune.
- BVDU Centre for Research & Development in Pharmaceutical Sciences & Applied Chemistry, Pune
- BVDU College of Physical Education, Pune.
- BVDU Institute of Environment Education & Research, Pune
- BVDU Institute of Management & Entrepreneurship Development, Pune
- BVDU Poona College of Pharmacy, Pune
- BVDU College of Engineering, Pune
- BVDU Interactive Research School in Health Affairs (IRSHA), Pune
- BVDU Rajiv Gandhi Institute of Information Technology & Biotechnology, Pune
- BVDU College of Architecture, Pune
- BVDU Abhijit Kadam Institute of Management & Social Sciences, Solapur
- BVDU Institute of Management, Kolhapur
- BVDU Institute of Management & Rural Development administration, Sangli
- BVDU Institute of Management & Research, New Delhi
- BVDU Institute of Hotel Management & Catering Technology, Pune
- BVDU Yashwantrao Mohite Institute of Management, Malakapur-Karad
- BVDU Medical College & Hospital, Sangli
- BVDU Dental College & Hospital, Mumbai
- BVDU Dental College & Hospital, Sangli
- BVDU College of Nursing, Sangli
- BVDU College of Nursing, Navi Mumbai

# BHARATI VIDYAPEETH UNIVERSITY

## NEW LAW COLLEGE, PUNE

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### **PROFILE**

Bharati Vidyapeeth Deemed University's New Law College, Pune established in the year 1978 is one of the premier institutes of legal education in India. It is recognized by Bar Council of India & University Grants Commission. It is one of the constituent units of Bharati Vidyapeeth Deemed University, Pune.

### **Ranking and Accreditation**

It is consistently ranked amongst top 10 law colleges in India by reputed magazines like India Today, Outlook, Lawyers Collective, Legally India, Times of India, Indian Express, etc. The law college is reaccredited with 'A' grade by NAAC in 2011.

### **Infrastructure**

The new seven storied building of the law college was inaugurated in the year 2005 at hands of Hon. Mr. Justice R. C. Lahoti, the then Chief Justice of India. It consists of 32 classrooms, moot court room, human right cell, cyber cell, placement cell, legal aid cell, research cell & auditorium.

### **Knowledge Partners**

The college has teaching faculty comprising of retired judges of Supreme Court and High Court eminent academicians, senior lawyers, social activists and eminent jurists from abroad. The college has total 72 faculty members out of which 8 are Ph.D. and 40 are full time lecturers. Senior advocates like Adv. Ram Jethmalani, Adv. P. P. Rao, Adv. Abhishek Manu Singhvi, Adv. Soli Sorabjee, Adv. Geeta Luthra, Adv. Pinky Anand, etc. are invited to guide the law students. International Knowledge Partners from reputed universities in U.K. & U.S.A. also visit the law college regularly. International Knowledge Partners from reputed universities in U.K. & U.S.A. also visit the law college regularly.

### **Innovative Interdisciplinary Programme**

The college offers B.B.A. Law (5 years Interdisciplinary Programme). There are also various para legal courses offered.

### **ICT Teaching Methods**

The college has E-Facility in library, classrooms and moot court room. Emphasis is given on ICT Teaching and Learning Methods. The college has an E-Court room in its building.

### **Clinical Legal Education**

The college regularly conducts field work, seminars, workshops, court visit, project work as a part of its curriculum.

**Library**

The college has a library worth Rs. 1 crore. In addition to the text books the college has international journals, online legal databases like Lexis Nexis, Manupatra, Westlaw, SCC Online, etc. The library is equipped with cyber cell consisting of more than 100 computers, with free internet and Wi-Fi facility. The college also has a video – conferencing facility.

**Foreign Students & International Collaborations**

The college has 22 foreign students from across 10 countries in Undergraduate & Post-Graduate programs. The Law College has collaborated with renowned universities in U.K., U.S.A. and Europe. The college has also established academic linkages with University of Oxford, Harvard Law School, John Marshall Law School, and University of Reading etc. The collaboration aims at joint research programs, teacher – student exchange programmes, research activities, international mooting and joint international conferences.

**International Moot Court Competition**

The students of the college have participated & won several International and National Moot Court Competitions during last 5 years. The college is ranked among top law colleges by India Mooting League. The college also conducts Justice P.N Bhagwati International Moot Court Competition on Human Rights every year, wherein students from various national law schools all over India as well as Foreign Universities participate.

**Research Centers**

This college is recognized by UGC under 2f & 12(b) of UGC Act for research & development grants. The college has Indo- European Legal Study and International Research Centre & also IPR Research Centre. This college publishes Bharati Law Journal (ISSN: 2278 – 6996). During the last 5 years the faculty has published more than 70 articles in reputed national and international journals and 5 books. Minor and Major research projects are also being undertaken.

**Legal aid**

The college has legal aid cell which is administered by senior advocates from Supreme Court & High Court. It provides free legal aid to the needy & poor persons who seek social justice. Students are encouraged to participate in Lok-Adalat, Legal Aid Camps, Legal Aid Clinics & Community Services Programs. The college has established special family legal aid cell to help women and children.

**Judicial Colloquia**

Besides organizing seminar & legal discourses the college conducts Annual Judicial Colloquia wherein judges of Supreme Court of India & High Court are invited to interact

with students of law. So far the college has invited 8 former Chief Justices of India, more than 75 Judges from Supreme Court and High Court.

### **Alumni**

The alumni of the college includes judge of Supreme Court of India, High Court judges, senior advocates, JMFC, lawyers renowned academicians, human right activists, corporate professionals, company secretaries, LPO professionals, legal advisors, notary, income tax office, police personnel etc.

### **Placement**

Placement assistance is supervised by the eminent corporate lawyers. Placement record of the college is outstanding. The final year law students are actively involved in the placement process. More than 30 reputed legal firms have visited for campus recruitment. The students are placed at multinational companies, corporate firms, LPO, judicial services, educational institutions, courts & commissions etc. Alumni of the college hold respectable and important post and offices.

### **Other activities**

To enhance the professional skills of the students the law college conducts All India Bar Examination training programmes, judicial services training program, mock parliament, intra- collegiate moot court competition, essay competition, workshops, seminars, research projects and NSS activities. Sports and cultural facilities are adequately provided.

### **LL.M Program (Two-Year Course)**

Bharati Vidyapeeth New Law College offers Two –Year LL.M Program with Specialization in the following groups subject to minimum 15 students in each group.

- Business Law
- Human Rights Law
- Intellectual Property Law
- Environment Law

# RULES FOR LLM TWO YEAR PROGRAM

## CHOICE BASED CREDIT SYSTEM

(w.e.f June 2018)

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1. Two year LL.M program is a semester program, the duration of each semester will be of six months with the University Examinations at the end of each semester.
2. Admission to Two Year LLM program is through an All India Admission Test conducted by Bharati Vidyapeeth University on the basis of merit subject to intake capacity.
3. **Eligibility for Admission:** The applicant shall have obtained LL.B. degree of any university recognized by UGC with atleast 50% marks or equivalent grade (45% for SC/ST candidates)
4. **Course Structure:** Two year LL.M program shall consists of the following Courses

<b>COURSE STRUCTURE</b>			
Sr.No	Name of the Course	No. of Marks	No. of Credits
1.	<b>Core Courses (Foundation Courses)</b>		
	1. Law and social transformation in India	100	05
	2. Indian Constitutional Law: The New Challenges	100	05
	3. Judicial Process	100	05
	4. Legal Education and Research Methodology	100	05
	5. Dissertation	200	30
2.	<b>Elective Courses (Specialisation Courses)</b>		
	1. Business Law (6 Papers)	100(each paper)	05(each paper)
	2. Human Rights Law(6 Papers)	100(each paper)	05(each paper)
	3. Intellectual Property Law(6 Papers)	100(each paper)	05(each paper)
	4. Environment law(6 Papers)	100(each paper)	05(each paper)
3.	<b>Practical Paper</b>		
	1. Practical Paper I	100	10
	2. Practical Paper II	100	10
	3. Practical Paper III	100	10
4.	<b>Interdisciplinary Courses</b>		
	1. Educational Technology and E-learning	100	03
	2. Computer Application and Legal Research	100	03
5.	<b>Value Added Course</b>		
	1. Soft skills and Personality Development	100	04

5. **Course Design:** The LL.M two year program is a semester program which shall consists of four semesters. The course design for the LL.M two year Program is as follows:

**COURSE DESIGN OF LL.M (TWO YEAR PROGRAM)  
(SEMESTER PATTERN)**

Semester	Core Course	Elective Course	Practical Paper	Open Course	General Course	Total No. of Papers	Total Marks	Total Credits
First Semester	02	02	01	NIL	NIL	05	500	30
Second Semester	02	02	01	NIL	NIL	05	500	30
Third Semester	NIL	02	01	02	01	06	600	30
Fourth Semester	Dissertation	NIL	NIL	NIL	NIL	01	200	30
<b>Total</b>						17	1800	120

6. **Scheme of Examination:** The examinations for two year LL.M. Program will be held in each Semester. The medium of instruction and the examination shall be in English. Every paper shall carry 100 marks out of which 60 marks are for written examination i.e. University Examination (UE) & 40 marks for Internal Assessment (IA). There shall be no written examination (i.e UE) for Practical Paper and Dissertation.

▪ **Internal Assessment (IA) will be as follows:**

- Unit Tests - 15 marks
- Home assignment - 10 marks
- Tutorial/Class Presentation - 10 marks
- Attendance - 5 marks

▪ **Practical Paper**

- The student has to appear for a Practical Paper in First, Second and Third Semester each respectively.
- The practical paper shall carry 100 marks each which shall be evaluated on the basis of the performance of the students under following headings:
  - Research Project (Doctrinal/Non-doctrinal)
  - Research publication
  - Clinical work
  - Law teaching

▪ **Dissertation**

- Dissertation shall carry 200 marks which shall be evaluated as follows:
  - Written work submission – 100 Marks
  - Research Publication – 50 Marks  
(in Peer reviewed journal having ISSN No.)
  - Presentation and Viva voce – 50 marks



The student shall also have to submit two progress reports signed by their research guide highlighting the work carried out by the student during his research.

7. **Credit System:** Choice based credit system designed as per the University rules has been implemented for this program. The two year LL.M. program will have **120 credits**. Each credit is of 15 hours.
8. **Grading System:** The University has adopted a **10-point absolute grading system** for grading in each head of passing. The grading system shall be as shown in Table-1 below.

The Grading System under CBCS

Range of Marks (out of 100)	Grade Point	Grade
$80 \leq \text{Marks} \leq 100$	10	O
$70 \leq \text{Marks} < 80$	9	A+
$60 \leq \text{Marks} < 70$	8	A
$55 \leq \text{Marks} < 60$	7	B+
$50 \leq \text{Marks} < 55$	6	B
Marks < 50	0	D

The performance indicators O, A+, A, B+, B, and D shall respectively mean Outstanding, Excellent, Very Good, Good, Average, and Poor. It may be noted that entries in Table are meant for converting marks in individual courses to grade points. The respective grade points can also be computed from the following formulas given in Table-2.

**The Formula to calculate the Grade Points (GP):**

Suppose that '**Max**' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, set  $x = \text{Max}/10$  (since we have adapted 10-point system). Then GP is calculated by the formulas shown in Table-2. After computing the grade point the grade can be found from Table-1.

Table-2: Formula to Calculate Grade Point in Individual Evaluations

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq M \leq 10x$	10

$5.5x \leq M < 8x$	$\text{Truncate}(M / x) + 2$
$4x \leq M < 5.5x$	$\text{Truncate}(M/x) + 1$

**9. Computation of Grade Point Averages: Cumulative performance indicators such as GPA, SGPA, or CGPA shall be calculated as described and illustrated below.**

- I. The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. **The weights for performance at UE and IA shall respectively be 60% and 40%.**
- II. The grade point average (GPA) for a course shall be calculated by first finding the total marks **out of 100 for the course. The corresponding GP (as per the table in (2) above) shall be the GPA for the course.**
- III. Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of a learner when he/she completes the programme is the final result of the learner.
- IV. The SGPA is calculated by the formula 
$$\text{SGPA} = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**
- V. The CGPA is calculated by the formula 
$$\text{CGPA} = \frac{\sum C_k \times GP_k}{\sum C_k}$$
, where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**
- VI. The CGPA, calculated after the minimum credits specified for the programme are 'earned', will be the final result.

**10. Standards of Passing**

- For all courses, both UE and IE constitute separate heads-of-passing (HoP).
- In order to pass in such courses and to 'earn' the assigned credits the learner must obtain a minimum grade point of **6.0 (50% marks) at UE** and also a minimum grade point of **6.0 (50% marks) at IA;**
- The GPA for a course will be calculated only if the learner passes at the UE.

- A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the HoP.
- Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the HoP.

**11. Rules of Promotion:** - The admission of students to the Two Year LL.M Program shall be on the yearly basis. A student admitted to the First Year of the course who complies with norms of the credit system and internal assessment with minimum 75% of attendance in the first year shall be automatically promoted to the Second year.

**12. Award of Honours:**

1. A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given in Table 4.

Table 4: Criteria for the Award of Honours at the End of the Programme

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 < CGPA < 10.00$	O	Outstanding	$80 < Marks < 100$
$9.00 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks < 80$
$8.00 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks < 70$
$7.00 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks < 60$
$6.00 \leq CGPA \leq 6.99$	B	Satisfactory	$50 \leq Marks < 55$
CGPA below 6.00	F	Fail	<i>Marks Below 50</i>

2. Formula to compute equivalent percentage marks for specified CGPA:

$$\%Marks(CGPA) = \begin{cases} 10 \times CGPA - 10, & \text{if } 5.00 \leq CGPA \leq 6.00 \\ 5 \times CGPA + 20, & \text{if } 6.00 \leq CGPA \leq 8.00 \\ 10 \times CGPA - 20, & \text{if } 8.00 \leq CGPA \leq 9.00 \\ 20 \times CGPA - 110, & \text{if } 9.00 \leq CGPA \leq 9.50 \\ 40 \times CGPA - 300, & \text{if } 9.50 \leq CGPA \leq 10.00 \end{cases}$$

# COURSE STRUCTURE FOR LL.M

## (TWO YEAR PROGRAM)

## (SEMESTER PATTERN)

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### ➤ Core courses

- Law and social transformation in India (5 credits)
- Indian constitutional law: The new challenges (5 credits)
- Judicial process (5 credits)
- Legal education and research methodology (5 credits)

### ➤ Elective Courses

#### ▪ Business law

- Law of industrial and Intellectual property (5 credits)
- Legal regulation of economic enterprises (5 credits)
- Law of export import regulation (5 credits)
- Banking laws (5 credits)
- Insurance laws (5 credits)
- Corporate finance (5 credits)

#### ▪ Human rights law

- Concept and development of human rights (5 credits)
- Human rights and international order (5 credits)
  - Protection and enforcement of human rights in India (5 credits)
- Human rights of disadvantaged groups (5 credits)
- International humanitarian law and refugee law (5 credits)
- Science technology and human rights (5 credits)
- Dissertation (30 credits)

#### ▪ Intellectual Property Law

- General Regime of Intellectual Property Rights (5 credits)
- Law Relating to Patents (5 credits)
- Law Relating to Trademarks (5 credits)
- Law Relating to Copyright (5 credits)
- Biotechnology and IPR (5 credits)
- Law of geographical indication and traditional knowledge (5 credits)

#### ▪ Environment Law

- Environment and Development: Law and Policy (5 credits)
- Environment and international legal order (5 credits)
- Environment protection in India (5 credits)
- Environment protection and disaster management (5 credits)
- Climate change and legal order (5 credits)

○ Biological diversity and legal order (5 credits)

➤ **Practical Paper**

- Practical Paper I (10 Credits)
- Practical Paper II (10 Credits)
- Practical Paper III (10 Credits)

➤ **Interdisciplinary Courses**

- Educational Technology and E-learning (3 credits)
- Computer Application and Legal research (3 credits)

➤ **Value Added Course**

- Soft skills and Personality Development (4 credits)

DETAILED SYLLABUS  
OF  
LL.M TWO YEAR PROGRAM  
w.e.f June 2015

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# FOUNDATION COURSES

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## 01. LAW AND SOCIAL TRANSFORMATION IN INDIA

### Objective of the Course

This course is designed to offer the teacher and the taught with – (a) awareness of Indian approaches to social and economic problems in the context of law as a means of social control and change; and (b) a spirit of inquiry to explore and exploit law and legal institution as a means to achieve development within the framework of law. The endeavour is to make the students aware of the role the law has played and has to play in the contemporary Indian society.

### Syllabus

1. Law and social change
  - 1.1 Law as an instrument of social change.
  - 1.2 Law as the product of traditions and culture. Criticism and evaluation in the light of colonization and the introduction of common law system and institution in India and its impact on further development of law and legal institution in India.
2. Religion and the law
  - 2.1 Religion as a divisive factor.
  - 2.2 Secularism as a solution to the problem
  - 2.3 Reform of the law on secular lines: Problems.
  - 2.4 Freedom of religion and non-discrimination on the basis of religion.
  - 2.5 Religious minorities and the law
3. Language and the Law
  - 3.1 Language as a divisive factor: Formation of linguistic states.
  - 3.2 Constitutional guarantees to linguistic minorities.
  - 3.3 Language policy and the constitution: Official language, multi-language system.
  - 3.4 Non-Discrimination on the ground of language
4. Community and the law
  - 4.1 Caste as a divisive factor
  - 4.2 Non-discrimination on the ground of caste
  - 4.3 Protective discrimination: Scheduled castes, tribes and backward classes.
  - 4.4 Reservation: Statutory commissions, Statutory Provisions.
5. Regionalism and the law
  - 5.1 Regionalism as a divisive factor
  - 5.2 Concept of India as one unit
  - 5.3 Right of movement, residence and business; impermissibility of state or regional barriers.
  - 5.4 Admission to educational institutions: Preference to residents of a state
6. Women and the law

- 6.1 Crimes against women
- 6.2 Gender injustice and its various forms
- 6.3 Women's Commission
- 6.4 Empowerment of women: Constitutional and other legal provisions
7. Children and the law
  - 7.1 Child labour
  - 7.2 Sexual exploitation
  - 7.3 Adoption and related problems
  - 7.4 Children and education
8. Modernization and the law
  - 8.1 Modernization as a value: Constitutional perspectives reflected in the fundamental duties.
  - 8.2 Modernization of social institutions through law
    - 8.2.1 Reform of family law
    - 8.2.2 Agrarian reform – Industrialization of agriculture
    - 8.2.3 Industrial reform: Free enterprise v. State regulation – Industrialization v. environmental protection.
  - 8.3 Reform of court processes
    - 8.3.1 Criminal Law: Plea bargaining; compounding and payment of compensation to victim
    - 8.3.2 Civil law: (ADR) Confrontation v. Consensus; Mediation and Conciliation; Lok adalats
    - 8.3.3 Prison reforms  
Democratic decentralization and local self-government
9. Alternative approaches to law
  - 9.1 The jurisprudence of Sarvodaya – Gandhiji, Vinoba Bhave, Jayprakash Narayan – Surrender of dacoits; Concept of Grama Nyayalayas.
  - 9.2 Socialist thought on law and justice: An enquiry through constitutional debates on the right to property.
  - 9.3 Indian Marxist critique of law justice.
  - 9.4 Naxalite movement: causes and cure

**Books Recommended:**

- March Galanter (ed.), Law and Society in Modern India ( 1997), Oxford
- Robert Lingat, The Classical Law of India (1998), Oxford.
- U.Baxi, The Crisis of the Indian Legal system (1998) Vikas, New Delhi.
- U. Baxi (ed) Law and Poverty Critical Essays (1988), Tripathi, Bombay
- Manushi, A Journal about Women and Society
- Duncan Derret, The State, Religion and Law in India (1996)Tripathi
- D.D.Basu, Shorter Constitution of India (1996), Prentice-Hall of India (P) Ltd, New Delhi
- Sunil Deshta and Kiran Deshta, Law and Menace of Child Labour (2000), Armol Publications, Delhi



- Savitri Gunasekhare, Children, Law and Justice(1997) Sage
- Indian Law Institute, Law and Social Change : Indo-American Reflections, Tripathi (1998)
- J.B. Kripalani, Gandhi : His Life and Thought, (1970) Ministry of Information and Broadcasting, Government of India
- M.P.Jain, Outlines of Indian Legal Histroy, (1993) Tripathi, Bombay
- Agnes, Flavia, Law and Gender Inequality : The Politics of Women's Rights in India (1999), Oxford

## 02. INDIAN CONSTITUTIONAL LAW: THE NEW CHALLENGES

### Objective of the Course

The Constitution, a living document, is said to be always in the making. The judicial process of constitutional interpretation involves a technique of adapting the law to meet changing social more. Constitution being the fundamental law, an insight into its new trends is essential for a meaningful understanding of the legal system and processes. The post graduate students in law, who had the basic knowledge of Indian Constitutional Law at LL.B level, should be exposed to the new challenges and perspectives of constitutional development while they are allowed to choose an area of law for specialization. Obviously, rubrics under this paper require modification and updating from time to time

The following syllabus prepared with this perspective will be spread over a period of one semester.

### Syllabus

1. Federalism
  - 1.1 Creation of new states
  - 1.2 Allocation and share of resources-distribution of grants in aid
    - 1.2.1 The inter-state disputes on resources
  - 1.3 Rehabilitation of internally displaced persons.
  - 1.4 Centre's responsibility and internal disturbance within States.
  - 1.5 Directions of the Centre to the State under Article 356 and 365
  - 1.6 Federal Comity: Relationship of truth and faith between centre and State
  - 1.7 Special status of certain States
    - 1.7.1 Tribal Areas, Scheduled Areas
2. "State": Need for widening the definition in the wake of liberalization
3. Right to equality : Privatization and its impact on affirmative action
4. Empowerment of women
5. Freedom of press and challenges of new scientific development
  - 5.1 Freedom of speech and right to broadcast and telecast
  - 5.2 Right to strike, hartal and bandh
6. Emerging regime of new rights and remedies
  - 6.1 Reading Directive Principles and Fundamental Duties into Fundamental Rights
    - 6.1.1 Compensation jurisprudence
    - 6.1.2 Right to education
      - 6.1.2.1 Commercialization of education and its impact
      - 6.1.2.2 Brain drain by foreign education market
7. Right of minorities to establish and administer educational institutions and state control.

8. Secularism and religious fanaticism
9. Separation of powers: stresses and strain
  - 9.1 Judicial activism and judicial restraint
  - 9.2 PIL: implementation
  - 9.3 Judicial independence
    - 9.3.1 Appointment, transfer and removal of judges
  - 9.4 Accountability: executive and judiciary
  - 9.5 Tribunals
10. Democratic process
  - 10.1 Nexus of politics with criminal and the business
  - 10.2 Election
  - 10.3 Election commission: Status
  - 10.4 Election Reforms
  - 10.5 Coalition government, 'Stability, Durability, Corrupt Practice'
  - 10.6 Grass root democracy

**Books Recommended:**

No Specific bibliography is suggested for this course since the course materials obviously depends upon the latest developments. These developments in the areas specified in the course can be gathered from the recent materials such as case law, changes and amendments of laws, critical comments, studies and reports, articles and research papers and lastly contemporary emerging ethos impacting on constitutional values.

## 03 JUDICIAL PROCESS

### Objective of the Course

A lawyer, whether academic or professional, is expected to be competent to analyze and evaluate the legal process from a broader juristic perspective. Hence a compulsory paper on judicial Process is essential in the LL.M curriculum. The objective of this paper is to study the nature of judicial process as an instatement of social ordering. It is intended to highlight the role of court as policy maker, participant in the power process and as an instrument of social change. This paper further intends to expose the intricacies of judicial creativity and the judicial tools and techniques employed in the process.

Since the ultimate aim of any legal process or system is pursuit of justice, a systematic study of the concept of justice and its various theoretical foundations is required. This paper, therefore, intends to familiarize the students with various theories, different aspects and alternative ways, of attaining justice.

The following syllabus prepared with the above perspective will spread over period of one semester.

### Syllabus

#### 1. Nature of Judicial process

- 1.1 Judicial process as an instrument of social ordering
- 1.2 Judicial process and creativity in law – common law model- Legal reasoning and growth of law – change and stability
- 1.3 The tools and techniques of judicial creativity and precedent
- 1.4 Legal development and creativity through legal reasoning under statutory and codified system.

#### 2. Special Dimensions of Judicial Process in Constitutional Adjudications.

- 2.1 Notions of judicial review
- 2.2 'Role' in constitutional adjudication various theories of judicial role
- 2.3 Tools and techniques in policy-making and creativity in constitutional adjudication.
- 2.4 Varieties of judicial and juristic activism
- 2.5 Problems of accountability and judicial law-making

#### 3. Judicial Process in India

- 3.1 Indian debate on the role of judges and on the notion of judicial review
- 3.2 The "independence" of judiciary and the "political" nature of judicial process
- 3.3 Judicial process in pursuit of constitutional goals and values new dimensions of judicial activism and structural challenges.
- 3.4 Institutional liability of courts and judicial activism scope and limits.

#### 4. **The Concepts of Justice**

- 4.1 The concept of justice or Dharma in Indian thought
- 4.2 Dharma as the foundation of legal ordering in Indian thought
- 4.3 The concept and various theories of justice in the western thought.
- 4.4 Various theoretical bases of justice: the liberal contractual tradition, the liberal utilitarian tradition, and the liberal moral tradition.

#### 5. **Relations between law and justice**

- 5.1 Equivalence Theories justice as nothing more than the positive law of the stronger class
- 5.2 Dependency theories – For its realization justice depends on law, but justice is not the same as law.
- 5.3 The independence of justice theories-means to end relationship of law and justice. The relationship in the context of the Indian constitutional ordering.
- 5.4 Analysis of selected cases of the Supreme Court where the judicial process can be seen as influenced by theories of justice.

#### **Books Recommended:**

- Julius Stone, The province and Function of law, Part II, Chs. 1.8-16(2000), Universal, New Delhi
- Cardozo, The Nature of Judicial Process (1995) Universal, New Delhi
- Henry J. Abraham, The judicial Process (1998), Oxford
- J. Stone, Precedent and the law: Dynamic of Common Law Growth (1985) Butterworth's.
- W.Friedmann, legal Theory (1960), Stevens, London
- Bodenheimer, Jurispurdence the Philosophy and Method of the Law (1997), Universal, Delhi
- J.Stone, Legal System and Lawyers' Reasoning (199), Universal, Delhi.
- U.Baxi, the Indian Supreme Court and Politics (1980), Eastern, Lucknow
- Rajeev Dhavan, The Supreme Court of India A Socio Legal Critique of its Juristic Techniques (1977), Tripathi, Bombay
- John Rawls, A Theroy of Justice (2000) Universal, Delhi
- Edward H. Levi, an introduction to Legal Reasoning (1970), University of Chicago.

## 04. LEGAL EDUCATION AND RESEARCH METHODOLOGY

### Objective of the Course

A post graduate student of law should get an insight into the objectives of legal education. He should have an exposure to programmes like organization of the seminars, publication of law journals and holding of legal aid clinics.

Law is taught in different ways in different countries, The LL.M course, being intended also to produce lawyers with better competence and expertise, it is imperative that the student should familiarize himself with the different systems of legal education. The lecture method both at LL.B. Level and LL.M level has many demerits. The existing lacunae can be eliminated by following other methods of learning such as case methods, problem method, discussion method, seminar method and a combination of all these methods. The student has to be exposed to these methods so as to develop his skills.

Growth of legal science in India depends on the nature and career of legal research. The syllabus is designed to develop also skills in research and writing in a systematic manner.

### Syllabus

#### 1. Research Methodology – An Introduction

- 1.1. Meaning of Research
- 1.2. Objectives of Research
- 1.3. Characteristics of Research
- 1.4. Significance of Research
- 1.5. Research Methodology
- 1.6. Importance of Research Methodology

#### 2. Legal Research Methodology

- 2.1. Meaning of Legal Research
- 2.2. Characteristics of Legal Research
- 2.3. Objectives of Legal Research
- 2.4. Types of Legal Research
  - 2.4.1. Doctrinal Legal Research
    - 2.4.1.1. Characteristics
    - 2.4.1.2. Components
    - 2.4.1.3. Merits and Demerits
  - 2.4.2. Non-Doctrinal Legal Research
    - 2.4.2.1. Features
    - 2.4.2.2. Limitations

#### 3. Methods for Legal Research

- 3.1. Analytical Method
- 3.2. Historical Method
- 3.3. Empirical Method(socio-legal Research)

- 3.4. Scientific Method
- 3.5. Comparative Method
- 3.6. Ethical Method
- 3.7. Statistical Method
- 3.8. Critical Method

#### **4. Steps involved in Legal Research**

#### **5. Legal Research Problem**

- 5.1. Meaning of Research Problem
- 5.2. Types of Research Problems
- 5.3. Criteria of Research Problem
- 5.4. Evaluation of Research Problem
- 5.5. Advantages of right selection of Research Problem

#### **6. Hypothesis**

- 6.1. Meaning- Significance-characteristics
- 6.2. Types of Hypothesis
- 6.3. Ideal formulation of hypothesis
- 6.4. Testing of Hypothesis

#### **7. Research Design**

- 7.1. Meaning-Need-Characteristics
- 7.2. Important concepts-variable, independent variables, dependent variables, controls
- 7.3. Types of Research Design
  - 7.3.1. Descriptive Design
  - 7.3.2. Exploratory Design
  - 7.3.3. Experimental Design
  - 7.3.4. Diagnostic Design

#### **8. Sampling technique**

- 8.1. Need for Sampling
- 8.2. Assumptions related to sampling
- 8.3. Procedure to select a sample
- 8.4. Types of sampling
  - 8.4.1. Probability Sampling
    - 8.4.1.1. Random sampling
      - 8.4.1.1.1. Lottery method
      - 8.4.1.1.2. Random numbers
      - 8.4.1.1.3. Sequential List
      - 8.4.1.1.4. Grid system
    - 8.4.1.2. Systematic Sampling
    - 8.4.1.3. Stratified random sampling
    - 8.4.1.4. Cluster Sampling
    - 8.4.1.5. Multi-Stage Sampling
  - 8.4.2. Non-Probability Sampling
    - 8.4.2.1. Representative sampling
    - 8.4.2.2. Judgment Sampling

- 8.4.2.3. Accident Sampling
- 8.4.2.4. Purposive Sampling
- 8.4.3. Quota Sampling
- 8.4.4. Area Sampling
- 8.4.5. Sampling by regular intervals
- 8.5. Reliability of sampling
  - 8.5.1. Sampling Error and Standard Error

## **9. Collection of Data**

- 9.1. Sources of data
- 9.2. Tools/Methods of Data Collection
  - 9.2.1. Observation Method
  - 9.2.2. Interview Method
  - 9.2.3. Questionnaire Method
  - 9.2.4. Survey Method
  - 9.2.5. Case Study Method
  - 9.2.6. Projective Techniques
  - 9.2.7. Content Analysis

## **10. Data Processing**

- 10.1. Analysis of Data
- 10.2. Interpretation of Data
- 10.3. Socio-metrics and Jurimetrics
- 10.4. Induction and Deduction

## **11. Report writing**

- 11.1. Techniques of report writing
- 11.2. Citation rules

## **12. Legal Writing**

- 12.1. Objective
- 12.2. Types
- 12.3. Principles
- 12.4. Role of writing in Legal system
- 12.5. Writing a Law Review article
- 12.6. Approach ,structure and writing of dissertation
- 12.7. Use of research findings in legal writing
- 12.8. Correct referencing in dissertations
- 12.9. Legal citation system
- 12.10. Finishing and polishing the writing

## **13. Computerized Research-Lexis Nexis, Westlaw, Manupatra**

### **Books Recommended:**

1. M.O.Price, H.Bitner and Bysiewiez, Effective Legal Research (1978)
2. Pauline. V.Young , Scientific Social Survey and Research (1962)
3. Morris.L.Cohan, Legal Research in Butshell (1996)
4. C.R.Kothari, Research Methodology Methods and Techniques (2009)
5. Dr.S.R.Myneni, Legal Research Methodology (2012)



6. Shipra Agarwal, Legal Research Methodology (2009)
7. Amanda Martinsek, Legal Writing (2009)
8. Webley Lisa, Legal Writing (2012)
9. Legal Language and Legal Writing, B.M.Gandhi (2010)
10. Goode and Hatt, Methods in Social Research.
11. Miller D., Hand Book of Research Design and Social Measurement.
12. Jain S. N., Legal Research and Methodology.
13. Erwin C. Surrency, B. Fielf and J. Crea, A Guide to Legal Research (1959).
14. Wilkinson, Bhandarkar, Research Methodology.
15. Selltis Johoda, Research Methodology.
16. Stott D, Legal Research.
17. Mackie S., Legal Research, How to find & understand Law.
18. Campbell, Fox Kentey, Students guide to Legal writing.
19. Ackoff R. L., Design of social research.
20. Beveridge WIR, Art of Scientific investigation.
21. Claire Selltis and others-Research methods in Social Relations.

# OPTIONAL COURSES

## GROUP A

### BUSINESS LAW

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#### **A01: LAW OF INDUSTRIAL AND INTELLECTUAL PROPERTY**

##### **Objective of the Course:**

The concept of intellectual property rights as developed in India cannot be divorced from the developments in the international arena as well as in the nation-to-nation relations. The impact of IPR regime on the economic front is emphasized in this paper. In particular, greater attention would be given here to the law relating to unfair and restrictive trade practices as affecting the regime of intellectual property rights. New areas of development, especially plant patenting and patenting of new forms of life (biotechnology) should receive special attention. Evidentiary aspects of infringement and human right dimensions of the regime of intellectual property law will also be addressed.

The following syllabus prepared with this perspective.

##### **SYLLABUS:**

###### **1: Basic Principles and National Regime of Intellectual property.**

- 1.1 Meaning and definitions of Intellectual Property
- 1.2 Significance of Intellectual property
- 1.3 Classification of Intellectual property
- 1.4 Basic understanding of Intellectual Property Laws with recent amendments

###### **2: Basic Principles and International Regime of Intellectual property.**

- 2.1 International organizations related to Intellectual property
- 2.2 Trade related Aspects of Intellectual property (TRIPs)
- 2.3 World Intellectual property Organization (WIPO)
- 2.4 World Trade Organization (WTO)
- 2.5 European Economic Council (EEC)
- 2.6 Basic understanding of International Convention and treaties
- 2.7 Universal Copyright Convention(with protocols)
- 2.8 The Berne Convention for the protection of Literary and Artistic works, 1971
- 2.9 The Paris Convention for the protection of industrial property, 1967
- 2.10 United Nations Convention on Biological Diversity
- 2.11 Johannesburg Declaration on Sustainable development 2002.

- 2.12 Rome Convention
- 2.13 Madrid Agreement concerning the International registration of marks 1979
- 2.14 Hauge Agreement of International Deposits of Industrial Design, 1960
- 2.15 Budapest Treaty
- 2.16 Patent Co-operation Treaty , 1970

### **3: Copyright and Related Rights Issues**

- 3.1 Nature and History of Copyright Act
- 3.2 Ownership of Copyright and Licencing of Copyrights
- 3.3 Rights of Broadcasting organizations and of performers
- 3.4 Infringement and piracy of copyright
- 3.5 Offences , penalties and defences
- 3.6 Copyright infringement issues in digital era

### **4: Trademark and Related Rights Issues.**

- 4.1 The register and conditions for registration
- 4.2 Procedure and duration for registration
- 4.3 Offences, penalties and procedure
- 4.4 Unfair trade practice
- 4.5 Trademark-related Issues Raised by the Internet
- 4.6 issues of trademark infringement in e-commerce and enforcement

### **5: Patent Rights and Related Issues.**

- 4.7 Concept, and non patentable inventions
- 4.8 Examination of patents, specification and patent of addition
- 4.9 Licensing of patents and compulsory licensing
- 4.10 Infringement and remedies
- 4.11 International patents, its filing of patents and date of priority
- 4.12 Pharmaceutical patents and related issues
- 4.13 Nature and types of biotechnology patents over new forms of life: TRIPS obligation
- 4.14 Plant patenting and sui generic protection for plant varieties

### **6: Geographical Indications and Industrial Designs.**

- 6.1 Concept of Geographical Indications and the conditions for the registration
- 6.2 Duration, procedure and effects of the registration of Geographical Indications
- 6.3 Difference between Geographical Indication and trademarks
- 6.4 Offences, penalties, and the appellate board
- 6.5 International Scenario of Geographical Indications
- 6.6 Concept, registration and the effects of registration of Designs
- 6.7 Salient features of Designs Act 2000
- 6.8 Piracy of registered designs and penalties

## 6.9 Position of Industrial Designs Act in various International Conventions

### **7: Intellectual Property and Human Right.**

7.1 Freedom of speech and expression as the basis of the regime of intellectual property law.

7.2 Human right of the impoverished masses intellectual property protection of new products for healthcare and food security

7.3 Traditional knowledge protection biodiversity convention right of indigenous people.

### **Books Recommended:**

- P Narayanan's, "Intellectual Property Law" Published by Eastern Law House Private Ltd.
- P.Narayanan, Copyright Law, Published by Eastern Law House Private Ltd.
- Cornish, W R ' Intellectual Property', Sweet and Maxwell, London.
- Dr B L Wadehra, Law relating to Intellectual Property Patents, TM, Copyright.
- Dr. Ashok Soni, 'Intellectual Property Rights Laws'.
- Dr.G.B Reddy's Intellectual Property Rights and the Law.
- Dr.G.B.Reddy's Copyright Law in India, Published by GOGIA Law Publications.
- W.R. Cornish , Intellectual Property(Sweet and Maxwell).
- Alka Chawla' s Law of Copyright Comparative Perspectives.
- Gopalakrishnan, N.S., Intellectual Property and Criminal Law.
- Krishna Kumar, Cyber Laws Intellectual Property and E-Commerce Security.

## 02. LEGAL REGULATION OF ECONOMIC ENTERPRISES

### Objective of the Course:

After independence we have placed greater emphasis on the growth of our economy. The focus is on growth, both in public and private sectors, so as to cope up with the problems of population explosion. We have found that there is now almost a circle from laissez faire to welfare state and again back to laissez faire. Adoption the concept of global economy in the presence of the socialistic perspectives in the Constitution presents a dilemma. The trends of liberalization starting in the early nineties and continuing to this day bring a shift in focus of regulation in diverse fields of economic activities.

This course is designed to acquaint the students of the eco-legal perspectives and implications of such developments.

### Syllabus

#### 1. Government and Business

- 1.1 Economic Systems – Capitalism, Socialism and mixed-economy.
- 1.2 Forms of Government regulations.

#### 2. Rational of Government Regulation

- 2.1 Economic rules of Government
- 2.2 Constitutional perspectives of business

#### 3. Industrial Policy

- 3.1 Industrial Policy 1948
- 3.2 Industrial Policy 1956
- 3.3 New Industrial Policy 1991 and Globalization.

#### 4. The place of Public, Small Scale, Co-operative, Corporate, Private and joint sectors in the changing context.

#### 5. Competition Law & Policy

- 5.1 Consumerism and Consumer Protection in India.

#### 6. Development and Regulation of Industries

#### 7. Industrial Development and Regulation Act 1951.

- 7.1 Financial Services – Changing Techniques of Regulation
- 7.2 Sick Undertakings – Policy and Law
- 7.3 Definition, Causes and Effects
- 7.4 Remedies – Government and Legal Remedy
- 7.5 Revival and Rehabilitation of Sick Companies.

#### 8. Capital Issues

- 8.1 Equity and debt finance
- 8.2 Global Depositories
- 8.3 De-materialised securities
- 8.4 The Securities Market and Stock Exchange

#### 9. Protection of Environment

9.1 Mass Disaster and Environmental degradation.

9.2 Regulation of Hazardous Activity

9.3 Environment Protection Act

9.4 Public Liability Insurance

**10. Legal Regulation of Select Public Enterprises**

10.1 Telecom Regulatory Authority

10.2 Insurance Regulatory Authority

10.3 Broadcasting Regulatory Authority

**11. Multinational Companies**

11.1 Role of Multinationals in development

11.2 Development and Regulation of Foreign Investment

11.3 Investment in India : FDI and NRI's

11.4 Investment in Abroad.

**Books Recommended:**

1. Business Organisation and Management : V.K.Bhushan
2. Indian Economy : Rudra Dutt and
3. Indian Economy : Mishra and Puri
4. Economic Law : Taxman
5. Business Environment : Frances Cherunilam.
6. S.Aswani Kumar, The Law of Indian Trade Mark (2001), Commercial Law House, Delhi.
7. Industrial Policy Resolutions of 1948, 1956, 1991
8. Industrial Licensing Policy 1970, 1975
9. Industrial Policy Statements 1973,1977,1980
10. Reports of Committees on Public Undertakings of Parliament
11. Industries (Development and Regulation) Act, 1951
12. U Baxi & A. Dhandha, Valiant Victims and Lethal Litigation: The Bhopal Case (1989)
13. Indian Law Institute, Law of International Trade Transactions, (1973)

## 03: LAW OF EXPORT IMPORT REGULATION

### Objective of the Course:

After independence India has embarked upon all round efforts to modernize her economy through development ventures, Greater and greater emphasis is placed on increase of production in both industrial and agricultural sectors. Besides, there was the ever-pressing need for raising capital for investment in certain basic and key industries. All these required a considerably high rate to investment of capital. The process of modernization necessitated had to be borrowed from other developed countries. This, in turn needed foreign exchange which could be earned by the increased exports of goods and raw materials from India.

The need for accelerating the exports trade of India's developing economy can hardly be over emphasized. Export earnings enable a developing country to finance its massive requirements of growth to maintain its essential imports and thereby stimulate the process of its economic developments. In the words of Prof. V.K.R.V.Rao: "In fact, expansion of exports may well be described as an integral part of the development process, neglect of which can only be at the peril of development itself."

Increasing exports have been necessitated to meet the growing needs of defense. India is country rich in natural resources. One of the approaches to combat its economic backwardness could be in large-scale production and in maximization of its exports.

Import and export of goods and raw materials is a complex, complicated and intricate activity. It involves elaborate economic, fiscal, budgetary and monetary policy considerations. Export and import control policy is also closely connected with country's balance of payment position.

The detailed procedures for imports and exports are provided in the Hand Book. The union Government used to declare its import and export policy for five years. The controls on exports and imports are closely connected with the Foreign Trade Regulation act 1992.

This Course is designed to acquaint the students about the parameters of legal controls on import and exports.

The following syllabus prepared with these objectives will comprise about 42 units of one-hour duration each spread over a period of one semester.

### Syllabus

#### 1. Introduction

- 1.1 State Control over import and export of goods from rigidity to liberalization
- 1.2 Impact of regulation on economy

#### 2. 2.1 Advantages & Disadvantages of Free Trade (Laisse Fair Policy)

- 2.2 Protection (Protectionism)
- 2.3 Tariff Barriers and Non-Tariff Barriers.

2.4 Role of International and National Law in International Trade.

### **3. International Regime**

- 3.1 Evolution of GATT Law
- 3.2 GATT 1947 and GATT 1994
- 3.4 W.T.O and its objectives and Principles
- 3.5 W.T.O and Tariff and Non-Tariff restrictions
- 3.6 Investments and Transfer of Technology Permissible regulations.
- 3.7 Problem of Dumping in international market
- 3.8 Reductions of subsidies and counter measures

### **4. Control of imports and exports**

- 4.1 Export Import Policy of Government
- 4.2 Pre and Post Liberalisation
- 4.3 Legislative control
  - 4.3.1 Power of control: Central government and RBI
  - 4.3.2 Foreign Trade Development and Regulation Act 1992
  - 4.2.3 Restrictions under customs law
  - 4.2.4 Prohibition and penalties
  - 4.2.5 Control under FEMA

### **5. Exim policy: Changing Dimensions**

- 6.1 Investment policy: NRIs, FIIs (Foreign Institution Investors), FDIs
- 6.2 Joint venture

### **6. Promotion of foreign trade**

- 6.1 Agriculture products
- 6.2 Textile and cloths
- 6.3 Jewellery
- 6.4 Service sector

### **7. Export Promotion**

- 7.1 Export Promotion Schemes
- 7.2 Export Promotion Councils
- 7.3 Export Oriented Units and Export Zone
- 7.4 SEZ (Special Economic Zone)
- 7.5 Export Import Bank of India (EXIM Bank) and its major programmes.

### **7. Law Relating to Customs**

- 7.1 Prohibition on importation and exportation of goods
- 7.2 Control of smuggling activities in export-import trade
- 7.3 Levy of, and exemption from, customs duties
- 7.4 Clearance of imported goods and export goods
- 7.5 Conveyance and warehousing of goods



## **8. Regulations on Investment**

- 8.1 Borrowing and lending of money and foreign currency
- 8.2 Securities abroad issue of
- 8.3 Immovable property purchase abroad
- 8.4 Establishment of business outside
- 8.5 Issue of derivatives and foreign securities GDR (Global depositories receipts), ADR (American depository receipts)
- 8.6 Investment in Indian banks
- 8.7 Repatriation and surrender of foreign securities

## **9. Technology transfer**

- 9.1 Restrictive terms in technology transfer agreements
- 9.2 Automatic approval schemes

## **Suggested Reading**

- International Trade Law : Dr.S.R.Myneni
- Indian Economy : Mishra & Puri
- International Trade Law : Ishita Chatterjee.
- Government of India, Handbook of Import Export Procedures, (Refer to the latest edition)
- Government of India Import and Export Policy (1997-2002)
- Foreign Trade Development and Regulation Act 1992 and Rules
- Foreign Exchange Management Act 1999
- Marine Products Export Development Authority 1972

## **A04. BANKING LAW**

### **Objectives of the Course:**

A vitally important economic institution the banking system is deeply influenced by socio-political and economic changes. The emerging changes in India, particularly after the initiation of the planning process as an instrument of rapid economic development had moulded and affected the banking structure, policies, pattern and practices. A significant development in the banking system is diversification in banks financing. The commercial banks entered 'into the field of wide ranging financial assistance to industry, both large and small scale, requiring the need for social control of the banking system eventually leading to the nationalization of banks.

The conventional banking system, found to be deficient for planned development purposes paved the way for development banking. The fag end of the last millennium witness influx of foreign banking companies it to India and a shift in the banking policy as part of the global phenomenon of liberalization. The legal system is adopting itself into the new mores.

This course is designed to acquaint the students with conceptual and operational parameters of banking law, the judicial interpretation and the new emerging dimensions of the banking system.

The course will comprise of about 42 units of one-hour duration each spread over a period of one semester.

### **Syllabus:**

#### **1. History of Banking**

- 1.1 Origin and Development of the World Banking
- 1.2 Early history of banking and evaluation of banking in England.
- 1.3 Evolution of History of Banking in India.
- 1.4 Structure of Banking in India and their functions. Functions of Commercial Banks

#### **2. Law Relating to Banking Companies in India**

- 2.1 Banking Regulation Act, 1949 – Features
- 2.2 Role of Reserve Bank of India under the Banking Regulation Act.
- 2.3 Control by government and its
- 2.4 control over banking and agencies on management

#### **3. Social Banking Institutions**

- 3.1 Nationalisation of Bank in India
- 3.2 Objectives of Nationalisation, Arguments for Nationalisation  
And Arguments against Nationalisation of bank
- 3.3 Development of Banking after Nationalization , and
- 3.4 Critical evaluation of Banking in the present context
- 3.5 Priority sector Lending

#### **4. Deposit Insurance**

- 4.1 The Deposit Insurance Corporation Act 1961
- 4.2 Objects and reasons
- 4.3 Relation between Insured bank DIC and
- 4.4 Reserve Bank of India

## **5. The Central Bank**

- 5.1 Evolution of Central Bank
- 5.2 Characteristics and Functions
- 5.3 The Reserve Bank of India as the Central Bank organizational structure
- 5.4 Functions of RBI
- 5.5 Regulation of monetary mechanism of the economy
  - Credit control
  - Exchange control
  - Monopoly of currency issue
  - Bank rate Policy formulation
- 5.6 Control of RBI over Non- Banking Companies

## **6. Relationship between Banker and Customer**

- 6.1 Banker and Customer
- 6.2 General Relationship between Banker and Customer
- 6.3 Special features of Relationship between Banker and Customer
- 6.4 Obligation ,Duties and Rights of the Banker, Customers duties or Obligation to his banker
- 6.5 Nature and Types of Accounts
- 6.6 Special classes of customers – Lunatics partnership, Corporation and local authorities
- 6.7 Consumer Protection – Banking as Service
- 6.8 Banking Ombudsman

## **7. Negotiable Instruments**

- 7.1 Meaning and kinds
- 7.2 Transfer and Negotiations
- 7.3 Holder and Holder in due course
- 7.4 Presentment and Payment Law on Liabilities of Partner and Dishonor of cheques.

## **8. Recent Trends of Banking system in India**

- 8.1 New Technology and Computer Banking
- 8.2 Automation and Legal aspects - ATM, Smart Card, Debit Card and Credit Cards Information Technology, Banking through Mobiles and E-Commerce.

## **9. Lending by Banks**

- 9.1 Loans and Advances
- 9.2 Main Principles of Social Lending
- 9.3 Credit worthness of Borrowers
- 9.4 Classification of Loans and Advances
  - Secured and Unsecured Loans
- 9.5 Modes of Creating a Charge of Banking    change
  - Pledge, Hypothication, Mortgage, Pledge, Guarantee
  - Secured Advances
- 9.6 General Principles of Secured Advances
  - Types of Securities for Advances
  - (Advances against Land, against Goods, against Documents)
- 9.7 Default and Recovery of Advances
  - Recovery through persuasion
- 9.8 Recovery without Courts intervention
  - Compromise with Borrowers
  - Efforts of Legal action
- 9.9 Debts Recovery Tribunal

**Books Recommended:**

- M.L. Tannan, Tannan’s Banking Law and Practices in India (1997) India Law House, New Delhi, 2 Volumes.
- Law of Banking : Dr.S.R.Myneni
- Banking Laws : R.N.Chaudhary
- Indian Economy: V.K. Puri & S.K.Mishra.
- K. C. Shekhar, Banking Theory and Practices (1998) UBS Publisher Distributors Ltd. New Delhi.
- R. S. Narayan, the recovery of Debts to Banks and Financial Institutions Act, 1993 (51 of 1993), Asia Law House, Hyderabad.

## **A05: INSURANCE LAWS**

**Objective of the Course**

As early as in 1601 one finds an excellent exposition of the insurance idea expressed in these words of an Act of British Parliament “the loss length rather easily, upon many than heavily upon few”. The insured person transfers from his own shoulders to the insurers., who, in return for agreeing to assume a potential risk of loss receive a payment known as premium. The insurers rely on the probability that only some of the losses, they insure against will in fact occur within any given period. They calculate,

therefore that they will be left with a profit. The insurer on the other hand, is better able to risk his capital in trade since he knows that certain events which he cannot control, such as fire, Shipwreck, will not cause him to lose his investment.

The insurance idea is an old-institution of transactional trade. The age old from the insurance was the marine insurance. There is nothing like disaster to set men's minds to work. Consequently, in due course of time fire and life insurance, made their appearance. Within the last hundred years the insurance principle is being extended wider. Today one finds insurance cover for accidents, motor vehicles, class, live stock, crop, burglary and various other disasters.

Insurance is a device not to avert risks, calamities and disasters; but to mitigate their rigours and financial losses. The function of insurance is to spread such loss arising from risks of life cover a large number of persons.

The operational framework of insurance idea is provided by the general principles of contract. The insurance policy, being a contract, are subject to all the judicial interpretative techniques. Besides, the insurance idea has a compensatory justice component. This brings it in the arena of the law of tort as well. It is even suggested that a fully grown and developed law of insurance may, if not totally displace, decrease the significance of the law of tort.

This course is designed to acquaint the students with the conceptual and operational parameters of insurance law in the context of the development of the general principles of law and judicial interpretation to inform the students about the use of law for the establishment of just order in insurance and to develop the appreciative and evaluative faculties of the students. The following syllabus is prepared with the above perspective

### **Syllabus:**

#### **1. Development and growth of Insurance in India**

- 1.1 History of Insurance
- 1.2 Insurance in India
  - Life Insurance
  - General Insurance
  - Privatisation of Insurance Industry

#### **2. Definition and nature of Insurance**

- 2.1 Definition
- 2.2 Nature of Insurance
- 2.3 Functions of Insurance
- 2.4 Classification of Insurance

#### **3. Principles of Insurance**

- 3.1 Contract of Insurance
- 3.2 Principle of Co- operation
- 3.3 Principle of Probability
- 3.4 Principle of Insurable interest
- 3.5 Principle of utmost good faith

- 3.6 Warranties
  - 3.7 Principles of Indemnity
  - 3.8 Principles of Subrogation
  - 3.9 Principles of Contribution
  - 3.10 Maxim of “Causa Proxima (Proximate clause)”
- 4. Indian Insurance Law (general)**
- 4.1 History and Development
  - 4.2 The Insurance Act 1938 Insurance Regulatory Authorities Act 2000
  - 4.3 Double Insurance and Re- Insurance
- 5. Life Insurance**
- 5.1 Definition of life Insurance , Nature
  - 5.2 Essential elements of Life Insurance
  - 5.3 Formation of Life Insurance Contract
  - 5.4 Insurable Interest in Life Insurance
  - 5.5 Premium
  - 5.6 Circumstances affecting risk
    - Persons entitled to payment settlement of claim and payment of money
- 6. Marine Insurance**
- 6.1 Nature and scope
  - 6.2 Classification of Marine policies
    - The Marine Insurance act, 1963
    - Insurable Interest, Insurable Value
    - Marine Insurance Policy, Condition- Express, Warranties
    - Voyage- deviation
    - Peril of Sea
    - Assignment of Policy
    - Partial loss of ship and of freight,
    - General average, particular charges
    - Return of Premium
- 7. Insurance against Accident**
- 7.1 The fatal Accident Act, 1853
  - 7.2 Objects and reasons
  - 7.3 Assessment of compensation
  - 7.4 Contributory negligence
  - 7.5 Compensation and liability
- 8. The Personal Injuries (Compensation Insurance ) Act , 1963**

- 8.1 Compensation payable under the Act
- 8.2 Compensation Insurance Scheme under the Act

### **9. Miscellaneous Insurance Schemes: New Dimensions**

- 9.1. Group life insurance
- 9.2. Mediclaim, sickness insurance

#### **Books Recommended:**

1. Law of Insurance : Dr.S.R.Myneni
2. Law of Insurance : R.N. Chaudhary.
3. John Hanson and Christopals Henly, All Risks Property Insurance (1999), LLP Asia, Hongkong
4. Peter Mac Donald Eggers and Patric Foss, Good Faith and Insurance Contracts (1998) LLP Asia, Hongkong
5. Banerjee, Law of Insurance (1994), Asia Law House, Hyderabad.
6. Mitra B. C., Law Relating to marine insurance (1997) Asia Law House, Hyderabad.
7. JCB Gilmar and Mustill, Arnold on the Law of Marine Insurance, (1981), Sweet & Maxwell
8. Birds, Morden Insurance Laws (1997), Sweet & Maxwell
9. Colinvaux's law insurance 1997 Sweet & Maxwell

## **A06. CORPORATE FINANCE**

### **Objective of the Course:**

Industrialization has played, and has to play a very vital role in the economic development of India. In the post independent era, industrial development is regarded, and hence employed as principal means in the strategy for achieving the goal of economic and social justice envisioned in the Constitution. Corporations, both public and private, are viewed as a powerful instrument for development. In a developing society like India enormous varieties of consumer goods are manufactured or produced. Obviously, the situation raises the issue of procuring, utilizing and managing the finances. For this purpose a science of financial management techniques has been evolved. The faculties of commerce, business and management studies have since last decades started to impart instruction so as to turn out sufficiency well equipped and adequately trained financial personnel. However, the legal and juristic aspects of corporate finance have been more or less not effectively taken care of.

In View of the above perspectives the broad objectives of this cause may be formulated as follows-

1. To understand the economic and legal dimension of corporate finance in the process

of industrial development in establishing social order in the context of constitutional Values.

2. To acquaint the student with the normative, philosophical and economic contours of various statutory rules relating to corporate finance.
3. To acquaint the students with the organization, functions, lending, and recovery procedures, conditions of lending and accountability of international national and state financing institutions and also of commercial banks and
4. To acquaint the students with the process of the flow and outflow of corporate finance.

The following syllabus prepared with the above perspective will be spread over a period of one semester.

### **Syllabus:**

#### **1. Introduction**

- 1.1 Meaning, importance and scope of corporation finance
- 1.2 Capital needs capitalization working capital securities borrowings deposits debentures
- 1.3 Objectives of corporation finance profit maximization and wealth maximization
- 1.4 Constitutional perspectives the entire 37, 38, 43, 44, 45, 46, 47, 52, 82, 85, and 86 of List 1 Union List; entry 24 of List 11 State List.
- 1.5 Methods of Financing

#### **2. Equity Finance**

- 2.1 Prospectus information disclosure
- 2.2 Remedies for Misrepresentation
- 2.3 Shares
- 2.4 Types of Shares
- 2.5 Purchase by Company of its shares
- 2.6 Member and Shareholder, Acquiring membership
- 2.7 Rights and Liabilities of members
- 2.8 Shares without monetary consideration
- 2.9 Issue of shares and allotment of shares
- 2.10 Share Capital
- 2.11 Kinds of Share Capital
- 2.12 Reduction of Share Capital

#### **3. Debt Finance**

- 3.1 Debentures
  - 3.1.1 Debentures and its features
  - 3.1.2 Kinds of Debentures
  - 3.1.3 Remedies available to a debenture holder
  - 3.1.4 Charges
  - 3.1.5 Mortgages



### 3.1.6 Borrowing

## 4. Conversation of corporate Finance

- 4.1 Regulation by disclosure
- 4.2 Dividends
  - Interest
  - Control on payment of dividend
- 4.3 Managerial remuneration
- 4.4 Payment of commissions and brokerage
- 4.5 Inter-corporate loans and investments
- 4.6 Buy-back of shares
- 4.7 Other corporate spending

## 5. Protection of creditors

- 5.1 Need for creditor protection
  - 5.1.1 Preference in payment
- 5.2 Rights in making company decisions affecting creditor interests
- 5.3 Creditors self-protection
  - 5.3.1 Incorporation of favorable terms in lending contracts
  - 5.3.2 Right to nominate directors
- 5.4 Control over corporate spending

## 6. Protection of Investors

SEBI (Disclosure and Investor Protection)  
Guidelines 2000

## 7. Corporate Fund Raising

- 7.1 Depositories IDR (Indian depository receipts) ADR (American depository receipts), GDR (Global depository receipts)
- 7.2 Public financing institutions IDBI, ICICI, IFC and SFC
- 7.3 Mutual fund and over collective investment schemes
- 7.4 Institutional investments LIC, UTI and banks
- 7.5 FDI and NRI investment foreign institutional investments (IMF and World Bank)

## 8. Administrative Regulation on Corporate Finance

- 8.1 Inspection of accounts
- 8.2 SEBI and its functions
- 8.3 Power of the Central Government under the SEBI Act, 1992
- 8.4 Central government control
- 8.5 Control by registrar of companies
- 8.6 RBI Control

## 9. The Securities Market (Including Stock Exchange, Securities Contracts, Regulation Act) 1956

### Books Recommended:

- Alastair Hundson, The Law on Financial Derivatives (1998), Sweet & Maxwell
- Eil's Ferran, Company Law and Corporate Finance (1999), Oxford

- Jonathan Charkham, Fair shares: the Future of Shareholder power and Responsibility (1999), Oxford
- Ramaiya A, Guide to the Companies Act (1998), Vol. I,II and III
- H.A.J Ford and A.P. Austen, Foreds' principle of Corporations Law (1999) Butterworths
- J.H. Farrar and B.M.Hanniyan, Farrar's company Law (1998) Butterworths
- Austen R.P.The Law of Public Company Finance (1986) LBC
- R.M. Goode, Legal Problems of Credit and Security (1988) Sweet and Maxwell
- Altman and Subrahmanyam, Recent Advances in Corporate Finance (1985) LBC
- Gilbert Harold, corporation Finnance (1956)
- Henry E. Hoaglad, Corporation Finance (1947)
- Maryin M. Kristein, Corporate Finance (1975)
- R.C.Osborn, Corporation Finance (1959)
- S.C.Kuchhal Corporation Fincance: Principles and Problems (6th ed 1966)

## GROUP B

# HUMAN RIGHTS LAW

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### **B01.CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS**

#### **Objective of the Course**

Protection of Human Rights (HR) became an important issue after the Second World War and after the acceptance of Universal Declaration of Human Rights. The growth of HR Law and Jurisprudence thereafter was spontaneous and continuous. The changes in the global scenario bring new concept of HR protection against violation. In one sense, HR can be said as the rights which the nature has endowed with human beings. However, they are not mere privileges given to the subjects by the ruler but are liberties permitted to the 'citizens' in a democracy. Manifestly a law that violates human rights is no law at all. Probably this perspective may give an impression that human rights are not different from natural rights envisaged by the natural law school.

Although Indian polity waited for more than one score and five years for adoption of Fundamental Duties in the Constitution, it is beyond doubt that every human being has responsibilities and obligation not only towards the other fellow beings, but also towards the society at large. Only when a society is aware of this right-duty relationship can there be any meaning to human rights.

This course is intended to highlight the concept of human rights, their evolution and their importance in our society now particularly in the era of privatization, globalization and liberalization.

#### **Syllabus**

1. **Human Rights: Concept**
  - 1.1 Human Rights in Indian tradition: ancient, medieval and modern
  - 1.2 Human rights in western tradition
  - 1.3 Development of natural rights
  - 1.4 Human rights in international law and national law
2. **Classification of Human Rights First Second and Third Generations: Historical Development**
3. **Human Right: Politics and Society**
  - 3.1 Colonization, imperialism and human rights
  - 3.2 Power, practices, accountability and transparency
  - 3.3 Liberalization, privatization and globalization
  - 3.4 Human duties: responsibilities and obligations
4. **Human Rights and Judicial Process**
  - 4.1 **Judicial activism**
5. **Human Rights Protection Agencies**

**Books Recommended:**

- Angela Hegarty, Siobhan Leonard, Human Rights as Agenda for the 21<sup>st</sup> Century (1999)
- Lalit Parmar, Human Rights, (1998)
- Rama Jois, Human Rights: Bharatiya Values, (1998)
- David P. Forsythe, Human Rights in International Relations.
- Lon. L.Fuller, The Morality of Law
- Jlhon Finnis, Natural law and Natural Rights, (1980)
- Julius Stone, Human Law and Human Justice, (2000), Universal, New Delhi.
- M.G.Chitkara, Human Rights: Commitmentand Betrayal (1996)
- V.D.Kulshreshtra, Landmarks in the Indian Legal and Constitutional History, (1995)
- Robert Lewngat, The Classical Law of India(1998), Oxford

## **B02. HUMAN RIGHTS AND INTERNATIONAL ORDER**

### **Objective of the Course**

Human rights have universal application. They gathered importance when the United Nations adopted the Universal Declaration of Human Rights in 1948. The role of international organizations in promoting awareness of human rights is very significant. The international conventions, though not binding, have persuasive force since the violations will be decried by the international community. International Non-government Organizations watch and monitor human rights violations in every country. However, in the absence of national legislation, the enforcement of the rights will be difficult.

### **Syllabus:**

- 1. Development of the Concept of Human Rights under International Law**
  - 1.1 Role of International Organization and Human Rights
  - 1.2 Universal Declaration of Human Rights (1948)
  - 1.3 Covenants on Political and Civil Rights (1966)
  - 1.4 Covenants on Economic, Social and Cultural Rights (1966)
  - 1.5 ILO and other Conventions and Protocols dealing with human rights
- 2. Role of regional Organizations**
  - 2.1 European Convention on Human Rights
  - 2.2 European Commission on Human Rights/Court of Human Rights
  - 2.3 American Convention on Human Rights
  - 2.4 African Convention on Human Rights
  - 2.5 Other regional Conventions.
- 3. Protection agencies and mechanisms**
  - 3.1 International Commission of Human Rights
  - 3.2 Amnesty International
  - 3.3 Non-Governmental Organizations (NGOs)
  - 3.4 U.N. Division of Human Rights
  - 3.5 International Labour Organization
  - 3.6 UNESCO
  - 3.7 UNICEF
  - 3.8 Voluntary Organizations
  - 3.9 National and State Human Rights Commissions
- 4. International enforcement of Human Rights**
  - 4.1 Role of ICJ and regional institutions

### **Books Recommended:**

- Benedetto Conforti and Francesco Francioni, Enforcing International Human Rights in Domestic Courts, (1997)

- Francisco Forrest Martin, International Human Rights Law and Practice (1997)
- Luck Clements, European Human Rights Taking a case under the Convention (1994)
- Evelyn A. Ankumah, The African Commission on Human Rights and People's Rights (1996)
- R.K. Sinha, Human Rights of the World(1997)
- Philip Alston, The United Nations and Human Rights A critical Appraisal, (1992)
- R.S.Sharma and R.K. Sinha, Perspectives in Human Rights Development, (1997)
- The Human Rights watch Global Report on Women's Human Rights, (2000), Oxford
- B.P.Sigh Seghal, Himan Rights in India (1996)
- Chandan Bala, International Court of Justice: Its Functioning and Settlement of International Disputes.(1997)

## **B03. PROTECTION AND ENFORCEMENT OF HUMAN RIGHTS IN INDIA**

### **Objective of the Course**

A reading of fundamental rights and duties in the Constitution of India reveals that they constitute the human rights charter in India. The Judiciary, the major protective and enforcement machinery, is very active in protecting human rights. There are a number of cases where courts apply the provisions of the international conventions to fill the gaps in legislation. The apex court has also ventured to apply international conventions even where there was no legislation in the area. Thus the judiciary aims at familiarising students with the judicial activism in protecting human rights and enables them to evaluate the adequacy of the methods of enforcement.

### **Syllabus :**

- 1. History and Development of Human Rights in Indian Constitution**
  - 1.1 Constitutional Philosophy-Preamble
  - 1.2 Fundamental Rights
  - 1.3 Directive Principles of State Policy
  - 1.4 Fundamental Duties
- 2. Judicial Activism and Development of Human Rights Jurisprudence**
- 3. Enforcement of Human Rights**
  - 3.1 Formal enforcement mechanisms
    - 3.1.1 Role of Supreme Court
    - 3.1.2 Role of High Courts
    - 3.1.3 Role of Civil and Criminal Courts
    - 3.1.4 Statutory Tribunals
    - 3.1.5 Special Courts
- 4. Role of India in implementing international norms and standards**

### **Books Recommended:**

- D.D. Basu, Human Rights in Indian Constitutional law, (1994)
- Vijay Chitnis, (et.al) Human Rights and the law: National and Global Perspectives (1997)
- B.P.Singh Seghal, Law, Judiciary and justice in India (1993)
- James Vadakkumchery, Human Rights and the politics in India (1996)
- D.R.Saxena, Tribals and the law (1997)
- Poornima Advani, Indian Judiciary: A Tribute, (1997)
- Justice Venkataramiah, Human Rights in the Changing World (1998)
- Paramjit S. Jaiswal and Neshtha Jaiswal, Human Rights and the Law, (1996)

## **B04. HUMAN RIGHTS OF DISADVANTAGED GROUP: PROBLEMS AND ISSUES IN THE PROTECTION AND ENFORCEMENT**

### **Objective of the Course**

Human rights are the rights of all human beings. Violation of these rights is human rights violations. Due to frequent violations to particular groups in disadvantageous positions, new categories of human rights have emerged. These groups are of people such as women, children, prisoners and dalits. Violation of human rights of these groups is of great concern of every nation today. The officials of the state like the police force commit such violations. This is only an illustration. There are several other categories of violations.

### **Syllabus:**

- 1. Concept of Disadvantaged Groups**
- 2. Emerging Human Rights Jurisprudent and the Role of the Judiciary**
  - 2.1 Rights of Women
  - 2.2 Rights of the Child
  - 2.3 Rights of Prisoners
  - 2.4 Rights of dalits
  - 2.5 The tribal and other indigenous people
  - 2.6 The mentally ill
  - 2.7 The stateless persons
  - 2.8 The unorganized labour
  - 2.9 Aids Victims
  - 2.10 Rights of minorities
- 3. Enforcement of Human Rights**
  - 3.1 Protection Laws of the Disadvantaged Groups: Problems and Issues
- 4. Future Perspective of the Human Rights of the Disadvantaged**

### **Books Recommended:**

- G.S.Bhargava and R.M.Pal, Human Rights of Dalit Societal Violation, (1999)
- Geraldine Van Bueren, The International Law on the Rights of the Child. (1998)
- Prabhat Chandra Tripathi, Crime Against Working Wome (1998)
- Paras Diwan and Piyush Diwan, Women and Legal Protection
- Philip Alston (et.al.) Children, Rights and the Law
- Kelly D. Askin, Dorean M.Koening, Women and International Human Rights Law (1999)
- N.K.Chadrabarti, Juvenile Justice in the Administration of Criminal Justice (1999)
- Rebecca Wallace, International Human Right, Text and Materials, (1997)

## **B05. INTERNATIONAL HUMANITARIAN LAW AND REFUGEE LAW**

### **Objective of the Course**

The two world wars had enough of lessons to teach. But the present scenario shows that the nations have not learnt any lesson: wars continue to be there. The International humanitarian law aims at humanizing war though war itself is inhuman. Human rights do have value only in peace time war is the negation of all human rights. Though the United Nations Charter does not permit war, it has shown the wisdom to regulate the war if one occurs.

War is one of the factors which create the problem of refugees. There have been some endeavors on the part of the international community to protect the interests of refugees. But due to political interference, the formulation of the definition of the term 'refugee' in the 'Convention relating to the status of 'refugees' has been such that it helps the developed countries to shrink the responsibility towards the refugees leaving the burden to the developing countries.

This course intends to equip the students with the awareness of the various problems of refugees and to inspire them to critically evaluate the international conventions and national legislation.

This paper comprises of about 42 units of one hour duration spread over a period of one semester.

### **Syllabus:**

#### **1. Humanization of Warfare**

- 1.1 Amelioration of the wounded and sick
- 1.2 Armed forces in the field
- 1.3 Armed forces at sea
- 1.4 The Shipwrecked
- 1.5 Protection and facilities
- 1.6 Prisoners of war
- 1.7 Civilians in times of war
- 1.8 Cultural Properties

#### **2. Control of weapons**

- 2.1 Conventional
- 2.2 Chemical
- 2.3 Biological
- 2.4 Nuclear

#### **3. Humanitarian law: Implementation**

- 3.1 Red Cross role
- 3.2 National Legislation

#### **4. The Concept of refugees**

- 4.1 Definition of refugees and displaced persons their problems
- 4.2 The UN Relief and Rehabilitation Administration and other International Refugee



Organization: International Protection

4.3 Protection under national laws

5. **Strategies to combat refugee problem**

5.1 Repartition, resettlement local integration and rehabilitation

5.2 UNHCR role

5.3 UNHCR and India

**Books Recommended:**

- B.S.Chimni, International Refugee Law (2000)
- Jean Yves Calier, who is a Refugee A Comparative Case law Study, (1997)
- Kelly Dawn Askin, War Crimes Against Women, (1997)
- M.K. Balachandran, Rose Varghese, Introduction to International Humanitarian Law (1997)
- Guy S. Goodwin-Gill, The Refugee in International law, (1996)
- Veral Gowlland Debbas, The Problem of Refugees in the Light of Contemporary International law issues, (1996)
- Anti-personal Landmines Friend or Foe? International Committee of Red Cross (1996)
- Resettlement Handbook, The United Nations High Commissioner for Refugees.
- James C. Hathaway, Hohn A. Dent, Refugee Rights: Report on a Comparative Survey (1995)

## **B06.SCIENCE, TECHNOLOGY AND HUMAN RIGHTS**

### **Objective of the Course**

We live in an era of scientific development. The alarming rate of development in biotechnology calls for drastic change in the law. Many concepts and terms have to be re-defined. The development in information technology poses serious problems and challenges. The rapid changes made by science and technology will have to be reflected in law to make it meaningful and realistic in the modern era. This course is intended to make students conscious of various legal problems arising due to developments in such areas as biotechnology and information technology and to identify the changes needed in the law.

### **Syllabus:**

- 1. Interrelationship of Science, Technology and Human Rights**
- 2. Implication of Development of Science and Technology on Human Rights.**
  - 2.1 Right to environment in the development of science and technology
  - 2.2 Right to development in the advancement of science and technology
  - 2.3 Right to development in the advancement of science and technology
  - 2.4 Right to Human health and impact of developments in medical sciences
- 3. Medicine and the Law**
  - 3.1 Organ transplantation
  - 3.2 Experimentation on human beings
  - 3.3 Euthanasia (mercy killing)
  - 3.4 Gene therapy
- 4. Issue of Human Rights Ethics in Scientific and Technological Development**
  - 4.1 Sex determination test
  - 4.2 Induced abortion
  - 4.3 Reproductive technology
  - 4.4 Cloning
  - 4.5 In vitro fertilization
  - 4.6 Artificial insemination
  - 4.7 Surrogate motherhood
- 5. Development in information Technology and Human Rights**
- 6. Impact of scientific and Technological Progress on Human Rights: Normative Response of the International Community**
  - 6.1 Right to life
  - 6.2 Right to privacy
  - 6.3 Right to physical integrity
  - 6.4 Right to information
  - 6.5 Right to benefit from scientific and technological progress
  - 6.6 Right to adequate standard of living.

### **Books Recommended:**

- Diane Rowland, Elizabeth Macdonald, information Technology Law (1997)
- Suresh T. Vishwanathan, The Indian Cyber Law (2000)
- The International Dimensions of Cyberspace Law (2000), UNESCO Publication
- D.P.Mittal, Law of Information Technology (Cyber Law) (2000)
- Michael Chissick, Alistair Kelman, Electronic Commerce, Law and Practice, (1999)
- Adwin W. Patterson, Law in a Scientific Age, (1963)
- Steve Jones, Borin Van Leon, Genetics for Beginners, (1993)
- Weeramantry, C.G. Human Rights and Scientific and Technology Development, 1990
- Kamenka, E Ideas and Ideologies Human Rights (1978)
- Galtung, Human Rights in Another Key, (1994)
- Akbar, M.J. Riots After Riots (1988)
- Baxi U.(ed) Rights to be Human (1986)
- Kazmi, F.Human Rights (1987)
- Levin L. Human Rights (1982)
- Gromley W.P. Human Rights and Environment (1976)
- Madhavtirtha, Human Rights (1953)
- Beddard H. Human Rights and Europe, (1980)
- Swarup J. Human Rights and Fundamental freedoms (1975)
- Nagendra Singh, Human Rights and International cooperation (1969)
- Kashyap, S.C. Human Rights and Parliament (1978)
- Khare S.C. Human Rights and United Nations (1977)
- Moskowitz, Human Rights and world order, (1958)
- Drost, Human Rights as Legal Rights (1965)
- Garling M. Human Rights Handbook, (1979)
- Andrews J.A. Human Rights in Criminal Procedure (1982)
- Klaiah A.B. Human Rights in International Law, (1986)
- Menon, I. (ed) Human Rights in International Law (1985)
- Robertson, A.B. (ed) Human Rights in National and International Law (1970)
- Lauterpacht, E. International Law and Human Rights (1968)
- Roberson, E, Human Rights in the world (1972)
- Sohn, Lonis & Burgenthal, International Protection of Human Rights (1973)
- Baxi, U, "Human Rights, Accountability and Development" Indian Journal of International Law ,279, (1978)
- Basu, D.D. Human Rights in Constitutional Law, (1994)
- Macfarlane, L.J. The Theory and Practice of Human Rights, (1985)
- Krishan Iyer, V.R. Human Rights – A Judge's Miscellany (1995)
- Rama Jois, M. Human Rights: Bharatiya Values, (1998)



# GROUP C

## INTELLECTUAL PROPERTY LAW

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### **C01. GENERAL REGIME OF INTELLECTUAL PROPERTY RIGHTS**

#### **Objective of the course:**

Countries have laws to protect intellectual property for two main reasons. One is to give statutory expression to the moral and economic rights of creators in their creations and the rights of the public in access to those creations. The second is to promote, as a deliberate act of Government policy, creativity and the dissemination and application of its results and to encourage fair trading which would contribute to economic and social development.

This course thus introduces IPR and its nature explaining its origin and development. It also aims at giving the students a brief idea of the international and national regime related to IPR.

#### **Syllabus:**

##### **1. Introduction to IPRs**

- 1.1. Concept & Meaning
- 1.2. Types of Intellectual Property Rights

##### **2. Nature of Intellectual Property Rights**

- 2.1. Monopolistic Perspective
- 2.2. Economic Perspective
- 2.3. Public welfare perspective
- 2.4. Theories
  - 2.4.1. Natural theory
  - 2.4.2. Locke's Theory of property
  - 2.4.3. Hegelian Philosophy
  - 2.4.4. Utilitarian guidelines
  - 2.4.5. Incentive theory
  - 2.4.6. Prospect theory
  - 2.4.7. Schumpeterian theory

##### **3. Origin & Development**

- 3.1. Historical Background
- 3.2. Technological Development of IPRs
- 3.3. Intellectual Property Rights: From National to International Character
- 3.4. Sustainable Development
- 3.5. Challenges for IPR system
  - 3.5.1. Digital Economy

- 3.5.2. E-commerce
- 3.5.3. Domain names
- 3.5.4. Biotechnology including Human genomes
- 3.5.5. Nanotechnology

#### **4. International regime of Intellectual Property Rights**

- 4.1. Pre WTO régime
  - 4.1.1. Paris Convention
  - 4.1.2. Berne convention
  - 4.1.3. Rome convention
  - 4.1.4. Patent Cooperation treaty
  - 4.1.5. World Intellectual Property Organization (WIPO), etc
- 4.2. Post WTO regime
- 4.3. TRIPS

#### **5. National Regime of Intellectual Property Rights**

- 5.1. Pre WTO régime
- 5.2. Post WTO regime

#### **Books Recommended:**

- Shiv Sahai Singh, The Law of Intellectual Property Rights, Deep & Deep Publication Pvt. Ltd. 2004
- Intellectual Property Rights: Text and Cases, By Radhakrishnan, Excel Books
- Catharine Colstone -Principles of Intellectual Property Law, Cavendish, London, 1999
- Phillippe Culet, Intellectual Property Protection and Sustainable Development, Lexis Nexis Butterworth, 2004.
- Paul Torremans and Jan Holyoak - Intellectual Property Law, 2nd edn. Butterworths. 1998.
- W R Cornish, Intellectual Property: Patents, copyright, Trademarks and allied rights , London : Sweet & Maxwell, 1996
- Jayanti Bagachi , World Trade organization; an Indian Perspective(2000).
- Narayanan, P., Intellectual Property Rights, Eastern Law House. Calcutta.
- Special attention should be given to literature of the U.N.System, WIPO and the UNESCO
- Odagiri et.al, Intellectual Property Rights, Development, and Catch Up, Oxford University Press, (2010)
- Christopher May & Susan K. Sell, Intellectual Property Rights: A Critical History, Lynne Rienner Publications, (2005)

### **LAW RELATING TO PATENTS**

#### **Objective of the course:**

Patent is recognition for an invention, which satisfies the criteria of global novelty, non-obviousness, and industrial application. Patents are vital resources for businesses, researchers, inventors, academics, and others who need to keep abreast of

developments in their fields. Patents are also an important means of sharing know-how, because each patent document describes a new aspect of a technology in clear and specific terms and is available for anyone to consult.

The objective of the course is to introduce the concept of patents and explain the various international and national laws related to patents. The course also aims to discuss the present trends and issues related to patent protection in the fields of biotechnology, pharmaceuticals, food and information technology etc.

## **Syllabus:**

### **1. Introduction to Patents**

- 1.1. Overview
- 1.2. Historical development
- 1.3. Concepts
  - 1.3.1. Novelty
  - 1.3.2. Utility
  - 1.3.3. Inventiveness/Non-obviousness
- 1.4. Types of patents
  - 1.4.1. Product patents
  - 1.4.2. Process patents
  - 1.4.3. Plant patents
  - 1.4.4. Design patents
  - 1.4.5. Utility patents

### **2. International Convention and Treaties on Patents**

- 2.1. Paris convention on Patents
- 2.2. Patent co-operation treaty
- 2.3. Patent Law treaty
- 2.4. TRIPS Agreement and uniform patent system

### **3. Patent law in India**

- 3.1. Salient features of Patent Act 1970
- 3.2. Procedure for Obtaining of Patents
- 3.3. Working of Patents
- 3.4. Infringement

### **4. Rights of patentees**

- 4.1.1. Assignment
- 4.1.2. Licensing
- 4.1.3. Compulsory licensing
- 4.1.4. Scope of governmental intervention

### **5. International protection of Patents**

- 5.1. Protection of patents beyond boundaries
- 5.2. International patent application
- 5.3. Who can file international patent application
  - 5.3.1. Process of filing

- 5.3.2. Requirements of an international application
- 5.3.3. Priority of the international application
- 5.3.4. International preliminary examination
- 5.3.5. International search and publication
- 5.3.6. Processing of international application at national level
- 5.3.7. Grant and issue of an international patent

## **6. Present trends and issues in the patent system**

### 6.1. Product patents

- 6.1.1. TRIPS Mandate : Product Patents on Food and Pharmaceuticals
- 6.1.2. Courts on Pharmaceutical and Drug Patents in India

### 6.2. Technology Patents

- 6.2.1. Biotechnology and its inventions
  - 6.2.1.1. Life as patentable subject matter
  - 6.2.1.2. Microorganisms as patentable subject matter
  - 6.2.1.3. Plant as patentable subject matter
  - 6.2.1.4. Animal as patentable subject matter
  - 6.2.1.5. Patents on human genetic material: Human cells, Genes, DNA
- 6.2.2. Biotech Patents in India: The way ahead

### 6.3. Patenting the inventions of information technology

- 6.3.1. Software: Conceptualization
- 6.3.2. Patenting Computer Programs and software
- 6.3.3. Software Patenting: Lessons from India
- 6.3.4. Why software should be patented?

## **Books Recommended:**

- Law Relating to Intellectual Property, Sreenivasulu N.S, Partridge Publishing
- W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000) Terrell On Patent, 2000
- P. Narayana, Patent Law, Wadhwa Publication.
- Merges, Patent Law and Policy: Cases and Materials, 1996
- Brian C. Reid, A Practical Guide to Patent Law, 2nd Edition, 1993
- Brinkhof (Edited), Patent Cases, Wolters Kluwer
- Carlos M. Correa (ed.). Intellectual Property and International Trade Patent Cooperation Treaty Hand Book (1995) Sweet and Maxwell.
- Prof. Willem Hoyng & Frank Eijsvogels, Global Patent Litigation, Strategy and Practice, Wolters Kluwer
- Gregory Stobbs, Software Patents Worldwide, Wolters Kluwer
- Feroz Ali Khader, The Law of Patents – with a special Focus on Pharmaceuticals in India, LexisNexis Butterworths Wadhwa, Nagpur.
- Sookman, Computer Law, 1996
- Intellectual Property Rights: Text and Cases, By Radhakrishnan, Excel Books
- N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow



- N.R.Subbaram - Patent Law.

## **C03. LAW RELATING TO TRADEMARKS**

### **Objective of the course:**

Trademark has a major value for any business, and one of the primary concerns of any well established or successful business man. Trademark is important because it helps businesses build and retain demand for their products and services while enabling consumers to quickly identify and make a purchase based on a recognized trademark.

The objective of this course is to explain the importance of protection of trademarks and thus explain the efforts to protect it at international and national level. This course further aims to highlight the concerns related to trademark in the internet world.

### **Syllabus:**

#### **1. Introduction to trademark**

- 1.1. Defining trademark
- 1.2. Characteristic features of trademark
- 1.3. Forms of trademarks
- 1.4. Functions of trademarks
- 1.5. Protection of trademarks
- 1.6. Objectives of trademarks law

#### **2. Philosophy and theories of protection**

- 2.1. Analyzing the character of trademarks
  - 2.1.1. Distinctive character of trademarks
  - 2.1.2. Philosophy of distinctive character
    - 2.1.2.1. German theory
    - 2.1.2.2. Second theory
    - 2.1.2.3. Cynics theory
  - 2.1.3. Types of distinctiveness
    - 2.1.3.1. Inherent distinctiveness
    - 2.1.3.2. Acquired distinctiveness
  - 2.1.4. Deceptive similarity
    - 2.1.4.1. Types of similarity
    - 2.1.4.2. Assessment of similarity

#### **3. International law on trademarks**

- 3.1. Paris convention on trademark
- 3.2. Madrid agreement
- 3.3. Trademark law treaty
- 3.4. Singapore treaty on trade mark
- 3.5. TRIPS Agreement on trademarks

#### **4. Trademark laws in India**

- 4.1. Historical Development of trademark laws in India
- 4.2. Registration of trademarks

- 4.2.1. Process of registration
- 4.2.2. Grounds for refusal of registration
- 4.2.3. Opposition proceedings
- 4.3. Enforcement of trademarks
  - 4.3.1. Infringement
    - 4.3.1.1. Determination of infringement
    - 4.3.1.2. Defences in case of infringement
  - 4.3.2. Passing off
    - 4.3.2.1. Invasion of proprietary rights
    - 4.3.2.2. Modes and types of passing off
  - 4.3.3. Remedies for infringement and passing off

## **5. Concerns of trademark in the internet**

- 5.1. Domain Name and Cyber Squatting
  - 5.1.1. Domain name registration
  - 5.1.2. Legitimate use of trademarks in the internet
  - 5.1.3. Illegitimate use of trademark: Cyber Squatting
    - 5.1.3.1. Various forms
      - 5.1.3.1.1. Classical cyber squatting
      - 5.1.3.1.2. Derogatory cyber squatting
      - 5.1.3.1.3. Typographical cyber squatting
      - 5.1.3.1.4. Political cyber squatting
      - 5.1.3.1.5. Liking and meta tagging
  - 5.1.4. Regulating the outrage of cyber squatting
    - 5.1.4.1. Role of ICANN and registration of Domain Name
    - 5.1.4.2. Domain name and law of passing off
    - 5.1.4.3. Penalties

### **Books Recommended:**

- Paul Torremans and Jan Holyoak - Intellectual Property Law. 2nJ edn. Butterworths. 1998.
- Catharine Colstone -Principles of Intellectual Property Law. Cavendish. London. 1999
- P.Narayanan - Intellectual Property Law, Eastern Law House. Calcutta.
- P.Narayanan - Law of Trade Marks (Trade Marks Act 1999) and Passing off. Eastern Law House. House. Calcutta. 2000.
- Law Relating to Intellectual Property, Sreenivasulu N.S, Partridge Publishing
- P. Narayanan - Trade Marks Trade Name and Passing of Cases. Easter Law House, Calcutta. 1977.
- J.S. Sarkar - Trade Marks; Law and Practice. Kamal Law House. Calcutta. 2000.
- S. Venkateshwaran - The Law of Trade Marks and Passing - off. Reprint 1999.
- W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
- Law Relating to Intellectual Property, Sreenivasulu N.S, Partridge Publishing

- Kerly's Law of Trade Marks and Trade Names, 14th Edition, Thomson, Sweet & Maxweel.
- A. K. BanSal, Law of Trade Marks in India (2009 Edition) Institution of Constitutional and Parliamentary Studies and Centre for Law, Intellectual Property and Trade, New Delhi.
- Christoher Wadlow, The Law of Passing Off, 1995
- Marsha A. Echols, Geographical Indications for Food Products, International Legal and Regulatory Perspectives (2008), Wolters Kluwer.
- N.S. Gopalakrishnan & T.G. Agitha, Principles of Intellectual Property (2009), Eastern Book Company, Lucknow

## **C04. LAW RELATING TO COPYRIGHT**

### **Objective of the course:**

The objective of copyright is to promote the public good by encouraging and fostering cultural and scientific activity. Copyright protects cultural works, the creative expression of thoughts and feelings. To demonstrate its importance to culture and society, copyright is recognised as one of the Human Rights in the Universal Declaration of Human Rights. Consequently, the value and benefits associated with copyright and the systems which support it cannot be underestimated. The existence of strong and enforceable copyright laws are also a necessary precursor to participation in the global economic community, bringing particular benefits to the economies of developing countries. The internet and lower costs of communication means that copyright works can be made available more easily, enabling improvements in the education system and skills development within communities.

The objective of this course is to understand the key aspects of the copyright system, including its strengths and limitations.

### **Syllabus:**

#### **1. Introduction to copyright**

- 1.1. Defining Copyright
- 1.2. What is protected
  - 1.2.1. Literary
  - 1.2.2. Drama
  - 1.2.3. Artistic
  - 1.2.4. Sound recordings
  - 1.2.5. Cinematographic films
- 1.3. Requirements for copyright
  - 1.3.1. Originality
  - 1.3.2. Doctrine of sweat of the brow
  - 1.3.3. Doctrine of independent creation
  - 1.3.4. Doctrine of merger
  - 1.3.5. Doctrine of skill and judgment
  - 1.3.6. Indian Doctrine
- 1.4. Nature and significance of copyright protection

#### **2. International law on copyrights**

- 2.1. Berne Convention
- 2.2. Universal copyright convention
- 2.3. Rome convention
- 2.4. Convention for the protection of producers of phonogram
- 2.5. WIPO Copyright Treaty
- 2.6. WIPO Performers and Phonograms Treaty

2.7. TRIPS Agreement

### **3. Copyright protection in India**

3.1. Historical development

3.2. Protection of neighboring rights

3.2.1. Broadcaster's rights

3.2.2. Performer's rights

3.3. Copyright assignment

3.4. Licensing of copyright

3.5. Transmission of copyright

3.6. Relinquishing the rights

3.7. Infringement of copyright

3.7.1. Matters of jurisdiction

3.7.2. Defences and exceptions

3.7.2.1. Doctrine of fair use

3.7.3. Remedies against infringement

### **4. Copyright in digital age**

4.1. Internet and copyright

4.1.1. Content of digital copyright

4.1.2. Regulating digital copyright in India

4.1.2.1. Copyright for computer software

4.1.2.2. Copyright for the database

4.1.2.3. Infringement of copyright on the internet

### **5. Copyright in the media**

5.1. Changes introduced in the copyright law affecting the film media

5.2. Viability of copyright protection for titles and characters

#### **Books Recommended:**

- R. G. Chaturvedi (ed.) Iyengar's The Copyright Act 1957, Butterworths. India 2000.
- 15. A.S. Srivastava (ed.) Lai's Commentary on Law of Copyright, 1999. Delhi Law House.
- David Bainbridge, Software Copyright Law (1999), Butterworths Sookman, Computer Law (1998), Carswell
- Law Relating to Intellectual Property, Sreenivasulu N.S, Partridge Publishing
- Whale on Copyright, 1996
- W.R. Cornish, Intellectual Property, Sweet & Maxwell, London (2000)
- Prof. Bernt Hugenholtz & Dr. Lucie Guibault (Edited), Kluwer Copyrights Cases, Wolters Kluwer

## **C05. BIOTECHNOLOGY AND IPR**

#### **Objective of the course:**

Intellectual property law, which protects works of the mind as personal property, is of increasing importance to those who create new products and processes using biotechnology and computers. Intellectual property involves several areas of the law:

patent, copyright, trademark, trade secret, and plant variety protection. All affect emerging high-technology industries and can help bring important technological information and products into commerce.

This course examines the law related to intellectual property rights for inventions created through the use of biotechnology (with particular focus on plants and animals) and computer-related technologies.

## **Syllabus:**

### **1. Introduction to Biotechnology**

- 1.1. Definition and meaning
- 1.2. Historical development to go Biotechnology
  - 1.2.1. First generation
  - 1.2.2. Second generation
  - 1.2.3. Third generation
- 1.3. Application and scope
  - 1.3.1. Agriculture
  - 1.3.2. Animal husbandry
  - 1.3.3. Pharmaceuticals and drugs
  - 1.3.4. Environment protection
  - 1.3.5. Food and beverages
  - 1.3.6. Other application
- 1.4. Classification of biotechnological inventions
  - 1.4.1. Biotechnological processes
  - 1.4.2. Biotechnology products

### **2. Biotechnology and patent law**

- 2.1. Patentability of biotechnology inventions
  - 2.1.1. Doctrine of Product of Nature
  - 2.1.2. Patentable subject – matter
    - 2.1.2.1. Invention vs. discovery
    - 2.1.2.2. Novelty
    - 2.1.2.3. Non-obviousness
    - 2.1.2.4. Life, microorganisms, plants ,genes human cells and DNA as patentable subject matter
- 2.2. Transformation of biotechnology
  - 2.2.1. Non commercial science to commercial industry
- 2.3. Challenge posed by biotechnology before the existing patent system
  - 2.3.1. Human genetic patents
- 2.4. Divergence in Biotechnology patent practices under different jurisdictions
- 2.5. Comparative study
  - 2.5.1. USA, Europe, Canada, India

### **3. Patentability of Biotechnology under International regime**

- 3.1. Patentability under TRIPS
  - 3.1.1. Interpretation of the term “invention”
  - 3.1.2. Exceptions under the agreement

- 3.1.3. Patenting of life forms under TRIPS
- 3.1.4. Other patent eligibility criteria under TRIPS
- 3.2. Uniform Global Patent System
  - 3.2.1. Draft substantive Patent Law treaty
  - 3.2.2. Differentiation vis-a-vis harmonization
  - 3.2.3. Merits and demerits of Uniform Patent law
- 3.3. Existing international patent regime in the present technology Age
- 4. Plant varieties and farmers rights**
  - 4.1. International treaties and convention
    - 4.1.1. TRIPS
    - 4.1.2. UPOV
    - 4.1.3. ITPGRFA
    - 4.1.4. Convention on Biological Diversity
  - 4.2. Features of plant variety system
    - 4.2.1. Benefit sharing
    - 4.2.2. Public interest
    - 4.2.3. Farmers right and breeders rights
    - 4.2.4. Sui generis protection of plant varieties
    - 4.2.5. Protection of plant varieties in India
      - 4.2.5.1. Registration
      - 4.2.5.2. Compulsory licensing
      - 4.2.5.3. Protection of farmers rights
      - 4.2.5.4. Infringement
      - 4.2.5.5. Remedies
      - 4.2.5.6. Plant Varieties Tribunal
- 5. Biotechnology and Ethics**
  - 5.1. Ethical objections to biotechnology research and protection
    - 5.1.1. Concept of integrity and self sustenance of living beings
    - 5.1.2. Natural law principles - living beings as marketable commodities
    - 5.1.3. Monopoly over life and living matter
      - 5.1.3.1. Ethics in patenting various life forms
      - 5.1.3.2. Debate on ethics versus technology
      - 5.1.3.3. ICMR guidelines
    - 5.1.4. Biotechnology, trade and development
      - 5.1.4.1. Trade in genetically modified organisms(GMO)
      - 5.1.4.2. Living modified organisms (LMO)
      - 5.1.4.3. Concerns in trade in GMO / LMO
      - 5.1.4.4. GMO and international obligations
        - 5.1.4.4.1. WTO agreements on trade
        - 5.1.4.4.2. Technical Barriers to trade agreement and trade in biotechnology
        - 5.1.4.4.3. Concept of prior informed consent
- 6. Bio-safety concerns in biotechnology**
  - 6.1. Cartagena Protocol on Bio-safety



- 6.1.1. Bio-safety clearing house
- 6.1.2. Revisiting the objects of protocol
- 6.1.3. Precautionary principles
- 6.1.4. Cartagena protocol and WTO
- 6.2. Health related concerns in biotechnology
  - 6.2.1. Sanitary and Phyto-sanitary measures agreement
  - 6.2.2. DNA safety guidelines
- 6.3. Biotechnology and Bio-diversity
  - 6.3.1. UNCTAD conference on trade and environment
  - 6.3.2. Convention on biological diversity
  - 6.3.3. Biological diversity Act of India

**Books Recommended:**

- William H. Lesser and Robert T. Masson, *An Economic Analysis of the Plant Variety Protection Act*, 1983
- Pat Roy Mooney, *The Law of the Seed: Another Development and Plant Genetic Resources*, Development Dialogue, 1983
- Iver P. Cooper, *Biotechnology and the Law*, 1996
- Francesco Franioni and Tullio Scovazz (Edited), *Biotechnology and International Law*, (2006), Hart Publishing, Oxford and Portland, Oregon
- Francesco Franioni (Edited), *Biotechnologies and International Human Rights* 2006), Hart Publishing, Oxford and Portland, Oregon
- Dr. T. Ramakrishan (Edited), *Biotechnology and Intellectual Property Rights* (2003), CIPRA, NLSIU, Bangalore.
- *Biotechnology and Patent Law: Patenting Living Beings*, By N. S. Sreenivasulu, C. B. Raju, Manupatra
- *Biotechnology, IPRs, and Biodiversity*, By Medury Bhaskara Rao, Manjula Guru, Dorling Kindersley (India) Pvt. Ltd.
- Iver P. Cooper, *Biotechnology and Law* (1998), Clerk Boardman Callaghan, New York

## **C06. LAW OF GEOGRAPHICAL INDICATION AND TRADITIONAL KNOWLEDGE**

### **Objective of the course:**

With Intellectual Property Rights (IPRs) increasingly influencing trades both at the national and international level; harnessing trade benefits depends on the degree of protection enjoyed by the owners of the IPRs. A geographical indication (GI) acts as a mechanism that helps producers differentiate their products from competing products in the market and enables producers to build a reputation and goodwill around their products that will fetch a premium price.

Traditional knowledge encompasses the beliefs, knowledge, practices, innovations, arts, spirituality, and other forms of cultural experience and expression that belong to indigenous communities worldwide. Only recently, however, has the need to protect, preserve and provide for the fair use of indigenous intellectual property – traditional knowledge – entered the domestic and international debate on intellectual property rights. Of particular concern to indigenous peoples has been the unlicensed use by non-indigenous groups, such as corporations, of traditional knowledge that has been developed over centuries. Indigenous/traditional knowledge and intellectual property law is a complicated contemporary legal problem. There are multiple perspectives and opinions circulating about what the problems are where they manifest and what needs to happen to alleviate them.

The objective of this course is to highlight the importance of geographical indications and traditional knowledge as community intellectual property rights the present trends and issues related to it in the new technology age.

### **Syllabus:**

#### **1. Concept of community intellectual property rights**

##### 1.1. Community IPR

1.1.1. Recognizing the rights of the groups

1.1.2. Associations and communities.

1.1.3. Efficacy of geographical indications regime in securing community rights

#### **2. Introduction and overview of geographical indications**

2.1. Meaning, scope, features of geographical indication

2.2. Reasons for protection of geographical indication

2.2.1. Indications of source

2.2.2. Applications of origin

2.3. Geographical indications related to goods

2.3.1. Agriculture goods

2.3.2. Manufactured goods

### 2.3.3. Natural goods

## **3. International law on geographical indications**

- 3.1. Paris convention
- 3.2. Madrid Agreement
- 3.3. Lisbon Agreement
- 3.4. TRIPS Agreement

## **4. Protection of geographical indications in India**

- 4.1. Application for registration
- 4.2. Essential conditions for registration
- 4.3. Geographical indication agents
- 4.4. The famous geographical indications
- 4.5. Limitations of protection of geographical indications
- 4.6. Prohibition of misleading use of indications of geographical origins
- 4.7. Prohibition of dilution of geographical origins
- 4.8. The interface between trademarks and geographical indications
- 4.9. Geographical indications as a tool to protect traditional knowledge

## **5. Traditional Knowledge**

- 5.1. What constitutes traditional knowledge
- 5.2. Components and ingredients of traditional knowledge
- 5.3. Protection of traditional knowledge
  - 5.3.1. Traditional Knowledge and patent law
  - 5.3.2. Traditional knowledge and the convention of biological diversity
  - 5.3.3. Bio-piracy and Bio-prospecting

## **6. Codification of traditional knowledge and protection of community rights**

- 6.1. the biological diversity authorities and their functions
- 6.2. WIPO consultation on traditional knowledge
- 6.3. The EU Directive on the protection of traditional knowledge

## **7. Protection of traditional Knowledge in India.**

- 7.1. Present scenario
- 7.2. Recent trends and issues

### **Books Recommended:**

- Christoph Belman and Graham Dutfield, Trading in Knowledge: development Perspectives on TRIPS, Trade and Sustainability, Earthscan Publications Ltd. (2003)
- Marsha A. Echols, Geographical Indications for Food Products, International Legal and Regulatory Perspectives (2008), Wolters Kluwer
- Silke von Lewinski (Edited), Indigenous Heritage and Intellectual Property, Genetic Resources, Traditional Knowledge and Folklore, 2nd Edition, (2008), Wolters Kluwer
- Law Relating to Intellectual Property, Sreenivasulu N.S, Partridge Publishing
- Narayanan, P., Intellectual Property Rights, Eastern Law House. Calcutta
- Intellectual Property Rights: Text and Cases, By Radhakrishnan, Excel Books



# GROUP D

## ENVIRONMENT LAW

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### **D 01. ENVIRONMENT AND DEVELOPMENT: LAW AND POLICY**

Objective of the course:

The concept of environment is embedded in ancient ethos. Throughout the centuries there were invisible processes working for the maintenance and improvement of environment. Towards the close of the last millennium one finds widening dimensions of environmental consciousness. How do these developments stand reflected in formulation of policies and in following constitutional values in India? This is the thrust of the paper. Sustainable use of resources, natural and man-made, is the desideratum in an environmentally conscious period of human development. Wise use of water, land, forest and other common property resources, such as wet lands, lakes, roads and parks become an important task in this respect. Protection of various energy resources is equally significant element in countering wastage, indiscriminate use and unwise choice.

#### **Syllabus**

##### **1. The idea of environment**

- 1.1. Ancient and medieval writings
- 1.2. Traditions
- 1.3. Natural and biological sciences: perspectives
- 1.4. Modern concept: conflicting dimension

##### **2. Development**

- 2.1. Theories of development
- 2.2. Right to development
- 2.3. Sustainable development – national and international perspectives
- 2.4. Developing economies

##### **3. Policy and law**

- 3.1. From Stockholm to Rio and after
- 3.2. Post – independence India
- 3.3. Role of government
  - 3.3.1. Five year plans
  - 3.3.2. Forest policy
  - 3.3.3. Conservation strategy
  - 3.3.4. Water policy

#### **4. Population, environment and development**

- 4.1. Population explosion and environmental impact
- 4.2. Population and development
- 4.3. Population and sustainable development

#### **5. Constitutional Perspectives**

- 5.1. Fundamental rights
  - 5.1.1. Right to environment
  - 5.1.2. Enforcement of the right
  - 5.1.3. Directive principles and fundamental duties
  - 5.1.4. Legislative power
- 5.2. Environment: emerging concepts and challenges
  - 5.2.1. Polluter Pays Principle: absolute liability of hazardous industry
  - 5.2.2. Precautionary principle
  - 5.2.3. Public trust doctrine

#### **Books Recommended:**

- C.M. Abraham, Environmental Jurisprudence in India (1999), Kluwer
- Madhav Gadgil and Ramachandra Guha, This Fissured Island: an Ecological History of India (1996), Oxford.
- R.B. Singh & Suresh Misra, Environmental Law in India (1996), Publishing Co., New Delhi.
- Kailash Thakur, Environmental Protection: Law and Policy in India (1997), Deep & Deep Publications, New Delhi.
- Richard L. Riversz, et.al. (eds.) Environmental Law, the Economy and Sustainable Development (2000), Cambridge.
- Stuart Bell and Donald McGillivray, Environmental Law (2000), Blackstone Press.
- Charles A.R. Webster, Environmental Health Law (1981).
- Leelakrishnan, P. The Environmental Law in India (1999), Butterworths-India.
- Khotsho, Environmental Concerns and Strategies (1988), Ashish, Delhi.
- Priya Kanjan Trivedi, International Environmental Laws (1996), A.P.H. Publishing Corporation, New Delhi.

## **D02. ENVIRONMENT AND INTERNATIONAL LEGAL ORDER**

### **Objective of the course:**

Through the centuries of their growth, societies had done their best to keep their neighbourhood clean and healthy; industrialisation brought in its wake unprecedented and unpredicted environmental hazards and upset the old ethos and equilibrium. The environmental consciousness is an offshoot of this saga of industrial growth. It is said that the world environmental consciousness had made a radical change in the character of international law from a moral code of ethics among nations to an almost positive law imposing on the states to observe environmental norms. Striking a significant note at the close of the last millennium, areas of international concern on environment are legion. Modes of reconciling the conflicts are also varied. The concept of sustainable development is a significant tool both at the international level and at the domestic system for reconciliation of environmental values and developmental needs. The course attempts to study in depth the concerns and conflicts related to environment protection in the international scenario.

### **Syllabus:**

#### **1. International concern for environment protection**

- 1.1 World environment movement
  - 1.1.1 Stockholm declaration
  - 1.1.2 Brundtland commission
  - 1.1.3 Rio – declaration
  - 1.1.4 Agenda 21
  - 1.1.5 Earth summit plus ten
  - 1.1.6 Rio + 20
- 1.2 Natural and cultural heritage
- 1.3 Role of international and regional organisations
- 1.4 Climate change – green house effect – ozone – global warming.

#### **2. International obligations towards sustainable development**

- 2.1 Principle of state responsibility
- 2.2 Intergenerational financing policy
- 2.3 World environment fund
- 2.4 Intergenerational regulations and supervision
- 2.5 Global environment facility (GEF)
  - 2.5.1 International co-operation
  - 2.5.2 Poverty alleviation
  - 2.5.3 Agenda – 21

#### **3. Marine environment**

- 3.1 Marine resources: conservation and exploitation
- 3.2 Scientific research and exploitation
- 3.3 Antarctic environment
- 3.4 International sea bed authority
- 3.5 Polluter for ships
- 3.6 Dumping of oil and other wastes into the sea

#### **4. Transboundary pollution hazards**

- 4.1 Oil pollution
- 4.2 Nuclear fall outs and accidents
- 4.3 Acid rain
- 4.4 Chemical pollution
- 4.5 Air pollution
- 4.6 Space pollution

#### **5. Control of multinational corporations and environmental hazards**

- 5.1 Problems of liability and control mechanisms
- 5.2 Disaster management at international level
- 5.3 Monopoly of biotechnology by mncs
- 5.4 Disposal and dumping of hazardous wastes: transnational problems and control

#### **Books Recommended:**

- Priya Kanjam Trivedi, International Environment Laws (1996), A.P.H. Publishing Corporation, New Delhi.
- Sir Elworthy and Jane Holder, Environmental Protection : Text and Materials (1997), Butterworths.
- Nathali L.T.J. HORBACH, Contemporary Developments in Nuclear Energy Law (1999), Kluwer.
- Henrick Ringbom (ed.), Competing Norms in the Law of Marine Environmental Protection (1997), Kluwer.
- Claus Bosselmann and Benjamin, J. Richardson, Environmental Justice and Market Mechanism (1999), Kluwer.
- Jean-Pierre Beurier, New Technologies and Law of Marine Environment (2000), Kluwer.
- Richard L. Reversz et.al. (eds.), Environmental Law, The Economy and Sustainable Development (2000), Cambridge.
- Dovor Vidas, Protecting the Polar Marine Environment (2000), Cambridge.
- Aynsley Kellor, International Toxic Risk Management (1999), Cambridge.
- Zhiguo Gao, Environmental Regulation of Oil and Gas (1998), Kluwer.
- Indian Law Institute, Legal Control of Environmental Pollution (1980).
- Varshney, C. K. (ed.), Water Pollution and Management (1983), Wiley Eastern, New Delhi.



## **D03. ENVIRONMENT PROTECTION IN INDIA**

### **Objective of the course:**

Pollution hazards bring the worst harm to the environment. Legal measures are attempted to prevent or control various kinds of pollution and their aftermath. Can land pollution hazards be prevented or controlled effectively by criminal sanctions especially in a developing country like India? What other legal strategies can be adopted at this level? To what extent can corporate civil liability be extended for remedying pollution

maladies particularly mass disasters? One has to be a critic of the existing laws and to look forward to desirable mechanism of control over pollution hazards. This paper aims at shedding light on these areas. Concepts of environmental protection lay scattered in isolated provisions of general legislation in India before world consciousness was aroused by the Stockholm conference in 1972. In the post Stockholm period there were many legislative activism in such areas like control of pollution and forest conservation. This legislative activism culminated in the enactment of environment (Protection) Act 1986 with a plethora of delegated legislation and delegation of powers. The central government has become the guardian of environmental protection and formulated rules and regulations on coastal zones, noise pollution and preparedness on environmental disasters. There are attempts in making laws for implementation of norms laid down in international conferences.

## **Syllabus**

### **1. General law on environmental concern**

#### 1.1. Indian constitution and protection of environment

##### 1.1.1. Directives of the state, obligation of citizens, right to healthy Environment

#### 1.2. Tort law remedies- Nuisance

#### 1.3. Provisions in the Indian penal code

#### 1.4. Code of criminal procedure code : public nuisance

### **2. Environment protection act, 1986**

#### 2.1. Historical background

##### 2.1.1. Bhopal gas tragedy

##### 2.1.2. Stockholm declaration

#### 2.2. Powers of the central government

#### 2.3. Prevention, control and abatement of environmental pollution

#### 2.4. Penalties and procedures

#### 2.5. Delegation of powers

##### 2.5.1. Power to delegate and make rules

##### 2.5.2. Power to issue directions

### **3. Coastal zone management**

#### 3.1. Physical limits of zones

#### 3.2. Prohibitions and conceptions

#### 3.3. Harvesting of ground water

#### 3.4. Construction activities

#### 3.5. Regulation of permissible activities

#### 3.6. Environmental clearance

#### 3.7. Coastal zone management plans

##### 3.7.1. Classification of zones

##### 3.7.2. Guidelines for beach resorts and hotels

##### 3.7.3. Judiciary on coastal zone management

3.7.4. Aquaculture in coastal zones

**4. Laws on hazardous substance**

4.1. Concept of absolute liability of hazardous industries.

**5. Emerging legal controls**

5.1. Eco mark

5.2. Environmental audit

5.3. Environmental impact assessment

5.4. Role of panchayats and municipalities in environmental Protection

5.5. Public participation in environmental decision making

**6. Role of local bodies in the environmental management**

6.1. Constitutional amendments and local bodies - 73rd amendment and 74th amendment

6.2. Municipalities and environmental protection

6.3. Panchayats and environmental protection

6.4. Local bodies – conservation of natural resources

**7. Role of judiciary – environment protection**

7.1. duty of care

7.2. citizen's obligations

7.3. right to wholesome environment

7.4. right to livelihood vis a vis environment

7.5. management of environment in tribal areas

**Books Recommended:**

- Kailash Thakur, Environmental Protection Law and Policy in India (1997), Deep & Deep Publications (New Delhi).
- Enid. M. Barson and Ilga Nielson (eds.), Agriculture and Sustainable Use in Europe (1998), Kluwer.
- John F. Mc.Eldownery and Sharron Mc.Eldowney, Environmental Law and Regulation (2000).
- Leelakrishnan, P. et.al. (eds.), Law and Environment (1990).
- Leelakrishnan, P., The Environmental Law in India (1999), Butterworths.
- Frodorick A. Anderson, et.al. Environmental Improvement Through Economic Incentives (1977).
- David Hughes, Environmental Law (1999), Butterworths, London.
- Daniel R. Mandekar, Environmental and Land Controls Registration (1976), Bobbs-Merrill, New York.

- Indian Law Institute, Mass Disasters and Multinational Liability : The Bhopal Case (1986).
- Inconvenient Forum and Convenient Catastrophe : The Bhopal Case (1986).
- Armin Rozencranz, et.al. (eds.), Environmental Policy and Law in India (2000), Butterworths India.
- Leelakrishnan, P. et.al. (eds.), Law and Environment (1990), Eastern, Lucknow.
- Indian Law Institute, Environment Protection Act : An Agenda for Implementation (1987).
- Indian Journal of Public Administration, Special Number on Environment and Administration, July-September 1988, Vol. XXXV, No. 3.
- Findley, R. W. and Farber, D. A., Environmental Law.
- David Hughes, Environmental Law (1990), Butterworths, London.
- Armin Rozencranz, et. al. (eds.), Environmental Policy and Law in India (2000), Oxford.

## **D04. ENVIRONMENT PROTECTION AND DISASTER MANAGEMENT**

### **Objective of the course:**

The hazards of complex industrial society of our times are numerous. Apart from natural disasters like earthquakes, tsunami, cyclones and storms which cause death, destruction and suffering on a vast scale, our civilization is increasingly getting exposed to hazards arising out of technological progress. The factories of industrial establishments involved in the manufacture, distribution and transportation of hazardous products are under legal obligation to comply with numerous provisions of law to prevent disaster, and to provide information to persons likely to be exposed to the hazards regarding safety measures to be taken.

The legislative and administrative responses have been lacking with the result that such disasters are increasing in magnitude and frequency. Every time adhoc arrangements are made to fact the disaster but not before incalculable damage is done and avoidable hardships suffered. What is needed is an integral approach for prevention and mitigation of sufferings arising out of disasters. A policy oriented approach would need examination of duties and obligations of various persons connected with disaster management.

Victims of disaster, being amorphous body of individuals, look at the bounty of state rather than the court process to vindicate their rights under the law. Inquiries and investigations are conducted only on public demand. There is no uniformity regarding the system of investigating authority, procedures to be followed and the obligatory force of recommendations made by investigating agency. The existing court process is dilatory and cumbersome. Due to obvious reasons the victims do not wish to undergo another ordeal or initiating proceedings for legal redress. The mismanagement and corruption in administering relief has also reached alarming proportions.

The course, is therefore, designed to have an insight into the problem arising out of disasters and inadequacies of the court process. The public law perspectives of this kind litigation will open new vistas of remedial process including risk coverage through public liability insurance.

### **Syllabus**

#### **1. Introduction**

- 1.1. meaning of disaster
- 1.2. distinction between natural and man-made disaster
- 1.3. high potential and low potential disaster
- 1.4. escape of dangerous substances
- 1.5. explosions
- 1.6. nuclear radiation, poisoning
- 1.7. dam bursts, fires, collapse of structures, earth quakes
- 1.8. accidental disasters (rails, air, sea, motor vehicle)

- 1.9. victims of disaster
- 2. Ad-hoc character and inadequacy of legislative responses**
  - 2.1. Laws relating to atomic energy, explosives
  - 2.2. Laws relating to air crafts, insecticides, factories, motor vehicles, railway Ships and petroleum products
  - 2.3. Public liability insurance - national and international
  - 2.4. Disaster management act, 2005 – features, task force – relief and Rehabilitations
- 3. Disaster management**
  - 3.1. State responsibility to provide short term relief
  - 3.2. Legal responsibility of officials of the state
  - 3.3. Role of voluntary organizations
  - 3.4. Disbursement of relief grants and public accountability of official and Other voluntary disbursement agencies
  - 3.5. Participatory management by trade unions
  - 3.6. Right of certain classes of victim; children, women
- 4. Inquiries and investigations for disasters**
  - 4.1. The duty to institute investigations and inquiries to determine causes of Mass disaster
  - 4.2. The investigation process
  - 4.3. Right to hearing to affected individual
  - 4.4. Right to hearing to voluntarily organization and public spirited Individuals
  - 4.5.
- 5. Liability and judicial process**
  - 5.1. Liability for environmental destruction
    - 5.1.1. Statutory liability
    - 5.1.2. Contractual liability
    - 5.1.3. Tortious liability
    - 5.1.4. Criminal liability
    - 5.1.5. Civil nuclear liability
  - 5.2. Litigation
    - 5.2.1. Role of National Green Tribunal (NGT)
    - 5.2.2. Initiation of proceedings
    - 5.2.3. Representative suits
    - 5.2.4. Costs of litigation - court fee, counsel fee
    - 5.2.5. Rules of evidence
    - 5.2.6. Measure of damages
  - 5.3. Bhopal gas leakage case, Chernobyl nuclear disaster case, Fukushima earth quake and nuclear disaster case, tsunami, Lathur and Gujarat earthquakes
  - 5.4. Problems of execution
  - 5.5. Need for reform - dilatory and expensive character of court processes
- 6. Books Recommended:**

- Government of India, Department of Environment, Management of Hazardous Substances Control Act and Structure and Functions of Authority Created there under.
- Indian Chemical Manufacturer's Association and Loss Prevention society of India, Proceedings of the National Seminar on Safety in Road Transportation of Hazardous Materials: (1986)
- Industries Commissioner at Ahmedabad, Task Force Report: 9.J.MEHTA). To oversee safety measures in various industries dealing with Hazardous and Toxic Materials (1986).
- Organization for Economic Co-operation & Development, (Paris), Safety of Consumer Product, Policy & Legislation of OECD Countries.
- Indian Law Institute (Upendra Baxi and Thomas Paul (ed.) Environment Protection Act: An Agenda for implementation (1987).
- Asian Regional Exchange for Prof.Baxi., Nothing to lose but our lives: Empowerment to oppose industrial Hazards in a transnational world (1989)
- Gurudip Singh Environmental Law: International and National Perspectives (1995), Lawman (India) Pvt. Ltd
- Leelakrishnan, P, The Environmental Law in India, Chapters VIII, IX and X (1999), Butterworths, New Delhi
- Chaturvedi and Chaturvedi, The Law on Protection of Environment and Prevention of Pollution (1996)

## D05. CLIMATE CHANGE AND LEGAL ORDER

### **Objective of the course:**

In a remarkably short time span, climate change has become deeply embedded in important areas of the law. As a global challenge calling for collective action, climate change has elicited substantial rulemaking at the international plane, percolating through the broader legal system to the regional, national and local levels. More than other areas of law, the normative and practical framework edicated to climate change has embraced new instruments and softened traditional boundaries between formal and informal, public and private, substantive and procedural; so ubiquitous is the reach of relevant rules nowadays that scholars routinely devote attention to the intersection of climate change and more established fields of legal study, such as international trade law. *Climate Change and the Law* explores the rich diversity of international, regional, national, sub-national and transnational legal responses to climate change. Is climate law emerging as a new legal discipline? If so, what shared objectives and concepts define it? How does climate law relate to other areas of law? This course makes an attempt to answer these questions.

### **Syllabus:**

#### **1. Introduction to climate**

- 1.1. Elements of climate (wind, temp. Humidity, precipitation, pressure)
- 1.2. Different climate zones
- 1.3. Micro macro climate effects

#### **2. Global warming**

- 2.1. Energy issues and climate change – alternate energy sources
- 2.2. Green – house effect as a natural phenomenon, green house gases and their Emission sources

#### **3. Climate change and impact**

- 3.1. Modeling climate change, ozone layer depletion and its control
- 3.2. Impacts of climate change-global and India, temperature rise sea level rise, coastal Erosion and landslides, coastal flooding, wetlands and estuaries loss
- 3.3. Carbon trading – mechanisms various models (European, Indian) Global and Indian scenario
- 3.4. Cleaner development mechanisms – various projects related to co2 emission Reduction

#### **4. Climate change and legal order**

- 4.1. Frame work convention and climate change 1992
- 4.2. Kyoto protocol 1997
  - 4.2.1. Significance and Role
- 4.3. Establishment of IPCC and its reports
- 4.4. Vienna convention 1985



**Books Recommended:**

- Barry R.G. and Chorley R.L. (1992), " Atmosphere, weather and climate " 4th edition Publication
- Bolin B., (ED) (1981), " Carbon Cycle Modeling" , John Wiley and Sons Publications.
- Corell R.W., and Anderson P.A., (Eds.,) (1991) "Global Environmental Change" Springer Verlag Publishers.
- Francis D., (2000), "Global Warming: The Science and Climate Change" Oxford University Press
- Frame B. Medury Y., and Joshi Y., (Eds.) (1992), " Global Climate Change: Science, Impact responses"
- Linden E., (2006). " The winds of change: climate, weather and the destruction of civilization", Simon and shuster Publications.
- Mintzer I.M., (Ed), (1982), "Confronting Climate change, risks, Implications and Responses" Cambridge University Press
- Srivatsava A.K., (2007), " Global Warming", APH Publications.
- Wyman R.L., (Ed.) (1991), " Global Climate Change and Life on Earth", Chapman and Hall Publication.
- Yadav, Chander and Bhan, (2005), " Global Warming": India's Response and Strategy", RPH Publications.
- Phillippe Sands: Principles of International Environmental law- Cambridge Second Edition.
- Syamdivan and Rosencranz – Environmental Law and Policy in India

## **D06. BIOLOGICAL DIVERSITY AND LEGAL ORDER**

### **Objective of the course:**

Biological diversity includes all life forms on the earth and signifies a life supporting order, essential for the normal functioning of eco-systems and the Biosphere as a whole. Dependence of human life on biological diversity is thus no doubt essential. Destruction of bio-diversity, especially of the developing countries is disturbing phenomenon and presents a matter of grave concern. The growth of bio-technology and genetic engineering triggers off numerous issues of ethical and legal significance in relation to experimentation and animals and plants. Apart from being considered as gifts of nature, animals and plants becomes a target of commercial exploitation. Sustainable development envisages country position and lays emphasis on the duty to protect the diverse flora and fauna not only for present generation but also for the succeeding generations to come. With the above perspectives the course focuses on the legal mechanisms of preserving bio-diversity in a sustainable manner.

### **Syllabus**

#### **1. Bio-diversity**

- 1.1. Meaning
- 1.2. Need for protection of bio-diversity
- 1.3. Dependence of human life on the existence in flora and fauna
- 1.4. Significance of wild life
- 1.5. Medicinal plants
- 1.6. Plant and micro-organism

#### **2. Bio-diversity and legal regulation**

- 2.1. Utilization of flora and fauna for bio-medical purposes
- 2.2. Experimentation on animals; legal and ethical issues
- 2.3. General mutation of seeds and micro-organisms
- 2.4. Genetic engineering
- 2.5. Legal mechanisms of control
  - 2.5.1. Convention on bio-diversity (CBD)
  - 2.5.2. Biological diversity act 2002
- 2.6. Recognition of regional and local agencies
- 2.7. Bio-ethics

#### **3. Development projects and destruction of bio-diversity**

- 3.1. Concept of sustainable development
- 3.2. Principles of sustainable development
  - 3.2.1. International & National perspectives
- 3.3. Construction of dams-salient valley and doon valley projects-narmada Bahavandolan-almatti dam project, etc.
- 3.4. Deforestation – coal mining operations – sustainable use of forests

3.5. Protection of wild life.

**4. Problems in legal regulation of medicinal plants**

4.1. Cosmetic plants

4.2. Animal products

4.3. Utilization of flora and fauna for bio-medical purpose by multi-national Corporation: problems of control

4.4. Regulation of trade in wild-life products

**5. Legal framework for development and protection of sanctuaries**

5.1. Parks

5.2. Zoos

5.3. Biosphere resources

5.4. Protection of genetic resources for agriculture

**Books Recommended:**

- Arjun Prasad Nagore – Bibliological Diversity and International Environmental law (1996), A.P.H. Publishing Corporation, New Delhi.
- Project large, Plant Variety Protection and Plant Bio-technology-options for India (1999), Allied.
- M.S.Swaminathan, Gentic Conservation – Microbes to Man, Presidential Address at XV International congress of Genetics, New Delhi, India, December 12-21.1983.
- Wild Genetic Resources, Earthscan Press Briefing Document No.33, Earthscan, London (1982).
- K.L.Mehta and R.L.Arora, Plant Genetic Resources of India; their diversity and Conservation (1982), National Bureau of Plant Genetic Resources, New Delhi.
- P.N.Bhatet.al., Animal Genetic Resources in India (1981).
- P.N.Bhat, “Conservation of Animal Genetic Resources in India, “Animal Genetic Resources, Conservation and Management FAO, Rome, (1981).
- P.Leelakrishnan, “Environmental Law in Inida” –LexixNexis Butterworths (2005)

## 05. TEACHING PEDAGOGY AND ICT IN EDUCATION

### Objective of the course:

Pedagogy is the art (and science) of teaching. Effective teachers use an array of teaching strategies because there is no single, universal approach that suits all situations. Pedagogical practice promotes the wellbeing of students, teachers and the school community - it improves students' and teachers' confidence and contributes to their sense of purpose for being at school; it builds community confidence in the quality of learning and teaching in the school. During the past few years, the world has witnessed a phenomenal growth in communication technology, computer network and information technology. Not only mastering ICT skills, but also utilizing ICT to improve teaching and learning is of utmost importance for teachers in performing their role of creators of pedagogical environments. The objective of this course is to acquaint the students with the various pedagogy skills and ICT applications.

### Syllabus

#### 1. Aspects Of Teaching

- 1.1. Concept and definitions of teaching
- 1.2. Functions of teaching
- 1.3. Teaching skills
- 1.4. Diagnostic testing and Remedial Teaching
- 1.5. Need and importance of :- (i) Annual Plan  
(ii) Unit Plan

#### 2. Effective Teaching

- 2.1. Maxims of teaching
- 2.2. Principles of teaching
- 2.3. Models of teaching
  - 2.3.1. Advance Organizer Model
  - 2.3.2. Concept Attainment Model
  - 2.3.3. Inquiry Training Model
  - 2.3.4. Jurisprudential Inquiry Model
- 2.4. Parameters of effective teaching

#### 3. Advance Pedagogy

- 3.1. Concept, need and significance of Advance Pedagogy
- 3.2. Principles of advance pedagogy
- 3.3. Teaching phases- Philip Jackson Model
- 3.4. Stages of teaching
  - 3.4.1. Pre – active
  - 3.4.2. Inter – active
  - 3.4.3. Post – active
- 3.5. Teacher's role in different teaching phases
- 3.6. Recent pedagogical trends – blended learning, flipped classroom, distance learning

#### **4. Communication Modes in education**

- 4.1. Concepts and process of communication
- 4.2. Principles of communications
- 4.3. Communication and learning
- 4.4. Modes of communication
  - 4.4.1. Speaking and listening
  - 4.4.2. Writing and reading
  - 4.4.3. visualizing and observing
- 4.5. Basis model of communication
  - 4.5.1. Sender – Message – Receiver
  - 4.5.2. Devid Berlo’s SMCR model of communication
  - 4.5.3. Sharon’s model of communication

#### **5. ICT in Education**

- 5.1. Concept, Need and Importance of ICT in Education
- 5.2. Paradigm Shift due to I C T from ‘Teaching’ to ‘Learning’
  - 5.2.1. Curriculum
  - 5.2.2. Methods of Teaching
  - 5.2.3. Role of Teacher
  - 5.2.4. Classroom Environment
  - 5.2.5. Evaluation procedure
  - 5.2.6. Education Management
- 5.3. Challenges and Barrier to integration of I C T in Indian schools Classrooms
- 5.4. ICT Skilled Teacher – ICT Skills and Qualities of ICT teacher
- 5.5. Safe use of ICT – Virus management, Net safety, Nettiquettes, Legal and Ethical Issues

#### **6. ICT supported teaching learning strategies**

- 6.1. E-Learning and Web base learning–concept, features and educational application
- 6.2. Co-operative and Collaborative Learning –concept, features and educational application
- 6.3. Project based Learning –concept, features and educational application
- 6.4. Communication Tools - Mobile, e-mail, chat Online Conferencing, Blog, Wiki, Internet forum, News Groups.
- 6.5. Social Networking as an effective Communication Tool.

#### **7. New trends in ICT**

- 7.1. Virtual Classroom - concept, elements, advantages and limitations
- 7.2. Smart class room – concept, elements, advantages and limitations
- 7.3. Edusat - concept, elements, advantages and limitations
- 7.4. Online Learning Resources: e- Library, Websites, Apps, and Web 2.0 Technology.

#### **Books Recommended:**

- Integrating Technology in the classroom Shelly, Cashman, Gunter and Gunter Publication
- Essentials of Educational Technology, Madan Lal, Anmol Publications
- Online Teaching Tools and Methods, Mahesh Varma, Murari Lal & Sons

- Education and Communication for development, O. P. Dahama, O. P. Bhatnagar, IBH Publishing company, New Delhi
- Information and Communication Technology, N. Sareen, Anmol Publication
- Communication and Education, D. N. Dasgupta, Pointer Publishers
- Education and Communication, O. P. Dham
- Computer fundamentals - Arora Bansal
- Information and communication - Kishore, Chavan
- Information Technology - Dyne, Nandkishore
- Crumlish Christian - ABC o internet
- Fun of computer - Singh and Sukhvir
- ICT strategies for school - Mohenty Laxman

## 06. COMPUTER APPLICATIONS AND LEGAL RESEARCH

### **Objective of the course:**

In the current world, it's almost impossible to imagine that someone can live without computers. Computers have become an electronic device of almost every day use for individuals of every age. They are essential in almost all the business dealings that are made nowadays. Computers have gained significance as they have improved the efficiency and productivity of work done. Large amounts of information in industrial and business sectors as well as in the personal lives are stored on computers. The traditional concept of a lawyer's job is that of a lawyer poring through stacks of paperwork. While paperwork still is a reality, law practice has changed drastically in the past 20 years, mainly because of computer technology. One of the most important uses of computers in the legal profession is conducting legal research. Many legal projects require extensive legal research, including references to previously decided cases. Traditionally, companies such as West printed volumes of case law, requiring attorneys to read through keyword indexes to find relevant cases. Now, online legal databases such as LexisNexis and Westlaw make the process of searching for case law, legal forms and treaties much easier. The purpose of this paper is to acquaint the students with the functioning of the computers and their application in legal profession.

### **Syllabus**

#### **1. Introduction to information and IT**

- 1.1. Changing decision making scenario and role of information needs and information systems
- 1.2. Information generation process
- 1.3. Quality of information – adding value to information
- 1.4. Role of IT in information generation and value addition
- 1.5. Computer hardware and personal computers – an overview

#### **2. Computer system as information processing system**

- 2.1. Types of computer systems
- 2.2. Hardware options – CPU, input devices, output devices, storage devices, communication devices
- 2.3. Configuration of these devices and their applications
- 2.4. Automatic devices for logistic bar coding and management system

#### **3. Software Resources**

- 3.1. Software needs
- 3.2. Operating systems
- 3.3. Application software
- 3.4. Programming languages

#### **4. Internet and World Wide Web**

- 4.1. Internet technologies and access devices
- 4.2. Concept of World Wide Web and Internet browsing
- 4.3. www as a marketplace
- 4.4. Concept of e - commerce and business models of e -commerce.

## **5. Desktop Application**

- 5.1. Word Processing
  - 5.1.1. Meaning and role of word processing in creating of documents
  - 5.1.2. editing, formatting and printing documents
  - 5.1.3. using tools such as spelling check, thesaurus, etc. in word processors
  - 5.1.4. Presentation and graphics on personal computers
- 5.2. Electronic spreadsheet
  - 5.2.1. Structure of spreadsheet and its application to accounting finance and marketing functions of business
  - 5.2.2. creating a dynamic/sensitive worksheet
  - 5.2.3. Concept of absolute and relative cell reference
  - 5.2.4. Using built in function
  - 5.2.5. Goal seeking and solver tools
  - 5.2.6. Using graphics and formatting of worksheet
  - 5.2.7. Sorting data with other desktop applications
  - 5.2.8. Strategies of creating error free worksheet

## **6. Data Base Management System**

- 6.1. Concept of data base management system
- 6.2. Data field, records and files
- 6.3. Sorting and indexing data
- 6.4. Searching records designing queries and reports and linking of data files

## **7. Computer Application in Legal Profession**

- 7.1. E-learning
  - 7.1.1. Meaning and origin
  - 7.1.2. Benefits and Limitations
  - 7.1.3. Forms of e-learning
  - 7.1.4. Online legal research
- 7.2. E-litigation
  - 7.2.1. Meaning, Origin and Development
  - 7.2.2. Advantages and disadvantages
  - 7.2.3. Challenges for lawyers, litigants and judges
  - 7.2.4. E-orders, e-judgments and e-advocacy
  - 7.2.5. Video Conferencing
  - 7.2.6. Witness statement recording - security issues
- 7.3. E-Research
  - 7.3.1. Legal databases and E- Resources
  - 7.3.2. Legal research programs- Lexisnexis, Westlaw, Manupatra etc.
  - 7.3.3. Plagiarism
    - 7.3.3.1. Problems & solutions
    - 7.3.3.2. Consequences of Plagiarism



### 7.3.3.3. Prevention of Plagiarism

#### **Books Recommended:**

- Burch, J. and G. Gary, Information Systems: Theory and Practice, John Wiley and Sons, New York.,
- Eliason, A.L., On-line Business Computer -Application Science Research Associates Chicago.
- Eliason, A. L., On-line Business Computer Applications, Science Research Associates, Chicago.
- Estrada, S., Connecting to the Internet, O'R eilly, Sebastopol.
- Habraken Jeo, Microsoft Office 2000, Prentice Hall of India Private Ltd., New Delhi, 2000.
- Kumar; Muneesh, Business Information Systems, Vikas Publishing, 1999.
- Norton Peter, Introduction to Computers, Tata McGraw Hill, New Delhi, 1999.
- Sanders, D.H., Computers in Business: An Introduction, McGraw Hill, Tokyo, 1983.
- William, B.K. ec al, Using Information Technology: A Practical Introduction to Computers and Communication, McGraw Hill, Ne w York, 2000.

## 07. SOFT SKILLS AND PERSONALITY DEVELOPMENT

### Objective of the course:

Personality Development is a tool through which you bring out your capabilities and your strengths making yourself aware of your inner self and become more confident to face the outside world. As far as students are concerned, effective personality development program can help the students to face and meet the challenges of the outside world more effectively and efficiently, at the same time making it easier for them to climb up the complicated corporate ladder more smoothly.

This course is an attempt to enrich the students with the required tips for personality development and communication skills.

### Syllabus

#### 1. Soft skills

- 1.1. Concept of soft skills and hard skills
- 1.2. Categories of skills
- 1.3. Importance of soft skills
- 1.4. Process of skill acquisition
- 1.5. Soft skills education and training

#### 2. Understanding communication

- 2.1. Meaning and definition
- 2.2. Dimension and Models
- 2.3. Theories of communication
- 2.4. Channels of communication
- 2.5. Forms and processes of communication
- 2.6. Factors influencing communication
- 2.7. Importance of communication in the academic setting
- 2.8. Barriers to communication

#### 3. Introduction to Personality

- 3.1. Basic of Personality
- 3.2. Human growth and Behavior
- 3.3. Theories in Personality
- 3.4. Motivation

#### 4. Techniques in Personality development

- 4.1. Body Language
- 4.2. Communication Skills
- 4.3. Self confidence
- 4.4. Mnemonics

- 4.5. Goal setting
- 4.6. Time Management and effective planning
- 5. Interpersonal Relations
  - 5.1. Introduction to Interpersonal Relations
  - 5.2. Analysis of different ego states
  - 5.3. Analysis of Transactions
  - 5.4. Analysis of Strokes
  - 5.5. Analysis of Life position
- 6. Leadership Skills
  - 6.1. Introduction to Leadership
  - 6.2. Leadership Power
  - 6.3. Leadership Styles
  - 6.4. Team Building and public speaking
- 7. Stress Management
  - 7.1. Introduction to Stress
  - 7.2. Causes of Stress
  - 7.3. Impact of Stress
  - 7.4. Managing Stress
    - 7.4.1. Meditation and concentration techniques
    - 7.4.2. Self acceptance and self growth

Suggested readings:

- Effective Communication and Soft Skills, Nitin Bhatnagar, Mamta Bhatnagar, Pearson Education India
- Introduction to Personality and Intelligence, Nick Haslam, Sage
- Understanding Human Communication, Ronald Brian Adler, George R. Rodman, Alexandre Sévigny Oxford University Press
- Develop Your Leadership Skills, John Adair, Kogan Page Publishers
- Stress Management and Prevention: Applications to Daily Life, David D. Chen, Jeffrey A. Kottler, Routledge

Research methods and legal writing

Comparative public law

Law and justice in a Globalizing world

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE (INDIA)**

MA (Commercial Photography & Cinematography)

Under the Faculty of ARTS (Photography & Cinematography)

COURSE STRUCTURE (PG PROGRAMME) (CBCS 2018 COURSE)

(To be implemented from July 2019)

Name: BVDU Yashwantrao Mohite College of Arts, Science & Commerce

**(DEPARTMENT OF PHOTOGRAPHY) PUNE-43.**

**Objectives of the course:**



**ELIGIBILITY FOR ADMISSION TO FIRST YEAR M.A. Degree Programme**

A candidate who has completed Graduation in any stream.

**Intake Capacity:**

**MA (Commercial Photography & Cinematography) - 10**

**Course Structure and scheme of credits of M.A. Course:-**

The M.A. programme will be of two years duration consisting of 4 semesters and of minimum **110** Credits:

Semester I (30 Credits),

Semester II (28 Credits),

Semester III (30 Credits),

Semester IV (22 Credits).

**Syllabus Structure**

**MA (Commercial Photography)**

F.Y.M.A

A student joining the first year MA course shall offer 5 subjects mentioned below

**Note**

**(T)** After the subject name indicates Theory

**(P)** After the subject name indicates Practical

### F.Y. MA (Commercial Photography & cinematography) Semester I

Subject type	Code	Title of the Paper	Hrs./ Week	Credits	Exam Hrs.	Maximum Marks		
						Internal Assessment	University Exam	Total
Core Courses		Introduction & Orientation Commercial Photography (P)	4	4	3	40	60	100
		Principles of design + Equipment & Processes. (P)	8	8	3	40	60	100
		Commercial Photography - Genre agnostic (P)	8	8	3	40	60	100
		Contemporary practices in commercial photography (T)	4	4	3	40	60	100
		Masterclass Project 1 (P)	8	6	3	40	60	100

### F.Y.M.A. (Commercial Photography & cinematography) Semester II

Subject type	Code	Title of the Paper	Hrs./ Week	Credits	Exam Hrs.	Maximum Marks		
						Internal Assessment	University Exam	Total
Core Courses		Commercial Photography - Genre specific (P)	8	8	3	40	60	100
		Project 1 (Dissertation + Viva Voce)	10	10	3	40	60	100
		Contemporary practices in advertising & design (T)	4	4	3	40	60	100
		Masterclass project 2 (P)	8	6	3	40	60	100

### S.Y. MA (Commercial Photography & cinematography) Semester III

Subject type	Code	Title of the Paper	Hrs./ Week	Credits	Exam Hrs.	Maximum Marks		
						Internal Assessment	University Exam	Total
Core Courses		Practical cinematography – Equipment & processes (P)	8	8	3	40	60	100
		Practical cinematography – popular practices (Dissertation + Viva voce)	4	4	3	40	60	100
		5 C's of cinematography Genre agnostic (P)	8	8	3	40	60	100
		Masters of cinematography (T)	4	4	3	40	60	100
		Masterclass project 3 (P)	8	6	3	40	60	100

### S.Y. MA (Commercial Photography & cinematography) Semester IV

Subject type	Code	Title of the Paper	Hrs./ Week	Credits	Exam Hrs.	Maximum Marks		
						Internal Assessment	University Exam	Total
Core Courses		5 Cs of cinematography – Genre specific (P)	8	8	3	40	60	100
		Business practices & marketing (Dissertation + viva voce)	4	4	3	40	60	100
		Final project (Jury)	10	10	3	40	60	100

**The medium of instruction:**

The medium of instruction and examination shall be English.

**University Terms:**

The University authorities shall fix the dates for the commencement and conclusion of the First and the Second terms. Students, who have registered their names with the University, can keep the terms.

**Scheme of Examination:**

The assessment of students in the academic session 2019-20 and thereafter shall be based on-

- (a) University Examinations (UE)
- (b) Internal Assessment (IA)
- (c) Choice Based Credit System (CBCS) and
- (d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average System (CGPA).

For each paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hour's duration at the end of each semester. The 4 credits will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters. The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

- a) Attendance - 10 Marks
- b) Home Assignment/Tutorial/Test/Presentation - 30 Marks

**Standard of Passing:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, a student must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is atleast 6.0(50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} \leq 80$	A+	9
$60 \leq \text{Marks} \leq 70$	A	8
$55 \leq \text{Marks} \leq 60$	B+	7
$50 \leq \text{Marks} \leq 55$	B	6
$40 \leq \text{Marks} \leq 50$	C	5
Marks Below 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weightage for performance at UE and IA shall be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### **Formula to Calculate Grade Points (GP)**

Suppose that 'Max' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set  $x = \text{Max} / 10$  (since we have adopted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10



$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x) +2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a student in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment to the course. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula  $SGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$ , where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the formula  $CGPA = \frac{\sum C_k \times GP_k}{\sum C_k}$ , where  $C_k$  is the credit-value assigned to a course and  $GP_k$  is the GPA obtained by the student in the course. In the above, the sum is taken over all the courses that the student has undertaken for the study from the time of his/her enrolment to the course and also during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent.

**The CGPA shall be calculated up to two decimal place accuracy.**

**The Formula to compute equivalent percentage marks for specified CGPA:**

% Marks (CGPA) =	$10 \times CGPA - 10$	if $5.00 \leq CGPA \leq 6.00$
	$5 \times CGPA + 20$	if $6.00 \leq CGPA \leq 8.00$
	$10 \times CGPA - 20$	if $8.00 \leq CGPA \leq 9.00$
	$20 \times CGPA - 110$	if $9.00 \leq CGPA \leq 9.50$
	$40 \times CGPA - 300$	if $9.50 \leq CGPA \leq 10.00$

### **Award of Honours:**

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

- Gracing the gracing shall be done as per existing rules of the University.
- Verification and Revaluation There is a provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University

**Rule for ATKT:** - A candidate shall be permitted to proceed further from the First Semester up to Fourth Semester irrespective of his/her failure in any of the Semester examinations subject to the condition that the candidate should register for all the backlog subjects of earlier semesters along with current (subsequent) semester subjects.

#### **• Span Period to Qualify a Master Degree:**

As per the guidelines issued by the University Grants Commission (UGC) on "Determination of Uniform Span Period within which a student may be allowed to Qualify for a **Master** Degree", a student has to qualify for a **Master** degree within the period prescribed by the UGC. If a student could not, he/she will be allowed two more years beyond the prescribed period. In exceptional cases, further extension of one more year may be considered by the University.

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY), PUNE (INDIA)**

**MA (Commercial Photography & Cinematography)**

**Under the Faculty of Arts (Photography & Cinematography)**

**COURSE STRUCTURE (PG PROGRAMME) (CBCS 2018 COURSE)**

(To be implemented from July 2019)

Name: **BVDU DEPARTMENT OF PHOTOGRAPHY PUNE-43.**

**(Under Yashwantrao Mohite College of Arts, Science & Commerce Pune)**

**MA (Commercial Photography & Cinematography)**

Duration: 2 years full time

Eligibility: Graduation in any stream

Proposed intake: 10

Proposed commencement date: September 1, 2019.

Fees: INR 7, 00,000

## Course philosophy

The course has been conceptualized on the assertion that commercial photography & cinematography is a powerful form of mass communication that potentially connects with an audience of millions. What defines it as commercial is that it is conceived and created with a specific audience in mind, conscious of how meaning is affected by socio-economic criteria. It can be utilized in a variety of ways: to stimulate commerce; promote new trends; deliver complex narratives; and inform and express opinions. In the process, opportunities arise for creative practitioners working in commercial contexts to produce innovative work.

**It will be the only Post Graduate course globally to offer, both, commercial photography & practical cinematography.**

The MA Commercial Photography & Cinematography course is structured in such a way that learning develops systematically and with an emphasis on the independent learning abilities required for continuing professional development and the advancement of careers.

The course allows students to undertake advanced study in a wide range of areas including advertising, documentary, editorial, fashion portrait photography & practical cinematography. Through originality in the application of contemporary academic research and professional practices to the production of new complex work, students will challenge the accepted conventions of the genres.

By a combined approach of practice, theory and professionalism, the course will provide a challenging and stimulating environment in which students are able to develop their full potential, with the aim of becoming a practitioner at the forefront of the discipline. They will expand their commercial potential by applying genre practices across contexts; for example, *the aesthetics of documentary can be applied to advertising, editorial, and fashion outcomes.*

This course enables students to develop an in-depth and critically informed understanding of the commercial photography industry. They will engage with key themes in emerging and established critical analyses that underpin each professional genre. This will equip them with the theoretical understanding to progress their practice and effectively articulate concepts through the production of advanced outcomes to specialist and non-specialist audiences.

Students will be encouraged to make industrial links across a broad range of organizations relevant to their chosen professional specialism. Using these links they will learn to manage and exceed client expectations through the application of their new academic understanding to the production of inventive commercial work.

## **Course Aims**

General aims are to produce Master's graduates with:

- \* The ability to apply originality to the production of photographic & cinematographic solutions for commercial contexts that positions them as a future leader in the field.
- \* An in-depth understanding as to how their practice is informed by current and established critical debates in photography/cinematography and applied discourses.
- \* A continuing investment into the methodical investigation of emerging imaging technologies and professional practices in order to be able to respond effectively to creative and entrepreneurial opportunities.
- \* The ability to exercise personal decision making in the production of innovative work that extends their practice, challenges and exceeds stakeholders' expectations, and communicates complex ideas to a wider audience.
- \* A high level of transferable professional skills such as enterprise, networking, self-promotion and small business marketing, and the ability to determine their career progression.
- \* The ability to critically evaluate and develop research and practice to a comprehensive level for the undertaking of advanced employment opportunities or further study at Doctoral level.

**More than anything else, this course is designed to enable practitioners to be able to create & deliver relevant, well researched & well executed high quality content. Content is the new oil/gold in today's context.**

## **Course Outcomes**

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

- \* Produce complex and advanced work that is informed by critical debates at the forefront of the discipline, and evidences originality in the application of ideas.
- \* Demonstrate a comprehensive understanding of photographic / cinematographic genres and commercial contexts, and communicate effectively through the presentation of visual outcomes to targeted and wider audiences.
- \* Demonstrate and apply in-depth conceptual, practical and professional understanding of current practices and techniques to innovative commercial outcomes.
- \* Critically reflect upon work in order to direct and advance professional practice through the development of high-level image making skills.
- \* Act autonomously in the production of solutions to complex problems, and advance careers through the continued development of entrepreneurial skills.

## **Course structure**

The course will consist of the following units over a two year plan.

#### Year 1

1. Introduction & orientation - Practical
2. Principles – Equipment & process - Practical
3. Commercial photography – Genre agnostic – Practical + Dissertation
4. Commercial photography – Genre specific – Practical + Dissertation
5. Project - Elective

#### Year 2

1. Practical cinematography – popular practices – Dissertation + Viva
2. 5 C's of cinematography – Genre agnostic - Practical
3. 5 C's of cinematography – Genre specific - Practical
4. Business practices & entrepreneurship – Dissertation + Viva
5. Project – specialization - Elective

Faculty:-

Chandar Kumar

Mayuresh Moghe

Visiting & guest faculty:

Leading professionals drawn from the industry.



## Course Structure

### Graduation

**Bachelor of Arts (Music) (Choice Based Credit System)**

**Bachelor of Arts (Dance) (Choice Based Credit System)**

**(Semester System – Gurukul Pattern)**

<b>Bachelor of Arts (Music): (Semester system – Gurukul Pattern)</b>	<b>Music:</b> Vocal, Non Percussion, Percussion
<b>Bachelor of Arts (Dance): (Semester system – Gurukul Pattern)</b>	<b>Dance:</b> Bharatnatyam, Kathak
<b>Duration</b>	Three Years Full time Programme (Six Semesters)
<b>No of Seats</b>	50 for Music / Dance
<b>Total number of Courses in the Programme</b>	26 (Total Credits: 150)
<b>Total Credits / Semester</b>	25
<b>Total No. of Theory Papers in the Programme</b>	14
<b>Total No. of Practical Courses in the Programme</b>	06
<b>Total No. of Viva Courses in the Programme</b>	06
<b>Tuition and other fees</b>	Around <b>Rs.21,000/-</b> per year for Indian students. Examination fee would be extra. Fees for hostel accommodation and mess will be additional.

Once the admission is taken in one of the following specialized Programme, students cannot interchange to other course.

## Specialization

<b>Music (Hindustani Classical)</b>	<ul style="list-style-type: none"><li>• <b>Vocal</b> (Khayal / Dhrupad)</li><li>• <b>Instrumental</b> (Harmonium, Sitar, Flute, Violin, Santoor, Sarod, Shehnai, Sundri)</li><li>• <b>Instrumental Percussion</b>(Tabla / Pakhawaj / Drum / Dholak / Dholaki)</li></ul>
<b>Dance</b>	<ul style="list-style-type: none"><li>• <b>Bharatanatyam</b></li><li>• <b>Kathak</b></li></ul>

## Minimum Qualification

- This is a three year full time course. Any student after passing 12th std. HSC can apply for the course.
- The candidate has to undergo a common entrance test followed by performance test before a panel of eminent scholars from the field of Music / Dance.
- This course is not for beginners. Candidates should have basic training in the field of performing arts.

## Minimum Mandatory Experience while applying

### Music

- **Vocal:** Candidate should know at least three Ragas and should be able to sing Chhota Khayal composition with Aalap and Taan or Dhrupad with its Vistar for 10 min.
- **Instrumental (Non Percussion): (Harmonium, Flute, Santoor, Sarod, Shehnai, Sundri, Sarangi, Sitar, Violin.)** Nine streams are available for this course. Candidate should know at least three Ragas and should be able to play Madhya Laya Gat or Bandish with Aalap and Taan for 10 Min.
- **Instrumental (Percussion):** Candidate should know at least two Talas. Candidate should know the components of Tabla / Pakhawaj solo performance and should have basic knowledge of accompaniment. Candidate should be able to perform / play Kayada / Paran, Rela, Tukada etc for 10 Mins.

### Dance

- **Bharatnatyam:** Candidate should be able to perform solo Bharatnatyam with focus on Nritta and Abhinaya (Compositions like Alaripu, Jatiswaram, Kautukam or Shloka)for 10 Mins.
- **Kathak:** Candidate should have knowledge of at least two Taals. Candidate should be able to perform kathak for 10 mins. Showing Vandana, Gatbhav, Thumari, Toda, Tukada etc.



# Post Graduation

**Master of Arts Course (Music) (Choice Based Credit System)**

**Master of Arts Course (Dance) (Choice Based Credit System)**

<b>Master of Arts Course (Music /Dance) (Semester System - Gurukul Pattern)</b>	<b>Music:</b> Vocal, Instrumental, Percussion <b>Dance:</b> Bharatnatyam, Kathak
<b>Duration</b>	Two Years Full time Course (Four Semesters)
<b>No of Seats</b>	80 for Music / Dance
<b>Total number of Courses in the Programmes</b>	12 (Total Credits: 100)
<b>Total Credits / Semester</b>	25
<b>Total No. of Theory Papers in the Programme</b>	04
<b>Total No. of Practical Courses in the Programme</b>	04
<b>Total No. of Viva Courses in the Programme</b>	04
<b>Tuition and other fees</b>	Around <b>Rs.26,000/-</b> per year for Indian students. Examination fee would be extra. Fees for hostel accommodation and mess will be additional.

Once the admission is taken in one of the following specialized Programme, students cannot interchange to other course.

## Specialization

<b>Music (Hindustani Classical)</b>	<ul style="list-style-type: none"> <li>• <b>Vocal</b> (Khayal / Dhrupad)</li> <li>• <b>Instrumental</b> (Harmonium, Sitar, Flute, Violin, Santoor, Sarod, Shehnai, Sundri)</li> <li>• <b>Instrumental Percussion</b>(Tabla / Pakhawaj / Drum / Dholak / Dholaki)</li> </ul>
<b>Dance</b>	<ul style="list-style-type: none"> <li>• <b>Bharatanatyam</b></li> </ul>

	<ul style="list-style-type: none"><li>• <b>Kathak</b></li></ul>
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### **Minimum Qualifications**

- This is a two years full time course. Any student after passing graduation examination from a recognized institute can apply for the course.
- The candidate has to undergo a common audition test before a panel of eminent scholars from the field of Music / Dance.
- This course is not for beginners. Candidates should have basic training in the field of performing arts.

### **Minimum Mandatory Experience while applying**

#### **Music**

- **Vocal:** Candidate should have been trained in at least Seven Ragas. Candidate should be able sing Khayal (Wilambit and Drut) Aalap and Taan or Dhrupad with its proper elaboration by playing his / her own Tanpura for 15 Mins.
- **Instrumental (Non Percussion):(Harmonium, Flute, Santoor, Sarod, Shehnai, Sundri, Sarangi, Sitar, Violin.)** Nine streams are available for this course. Candidate should have been trained in at least Seven Ragas. Candidate should be able to play Masitkhani and Razakhani Gat or Bandish (Wilambit and Drut) with Aalap and Taan for 15 Min
- **Instrumental (Percussion):** Candidate should know at least five Taals, Candidate should know the components of Tabla / Pakhawaj solo performance and accompaniment. Candidate should be able to play Peshkar / Prastar, Kayada, Paran, Rela, Chakradhar , Tukda, etc for 15 Mins.

#### **Dance**

- **Bharatnatyam:**Candidate should be able to perform solo Bharatnatyam with focus on Koutukam, Padam, Varnam, Tillana for 15 Mins.
- **Kathak:**Candidate should know at least three Taals. Candidate should be able to perform solo Kathak for 15 Mins. Showing Vandana, Gatbhav, Tatkar with its specialities, Layakari, Farmaishi Chakradhar, Paran, Thumari, Toda, Tukada etc.

### **Admission Criteria:**

- The candidate has to undergo a common live performance audition test of 15 minutes before a panel of eminent scholars from the field of Music / Dance. Candidates passing the entrance audition test will be admitted to 1st year M.A. (Music) / M.A. (Dance) course

**BHARATI VIDYAPEETH DEEMED UNIVERSITY**  
(Established u/s 3 of UGC Act 1956, vide notification no. F9.  
15.U.3 of Govt. of India )

**COLLEGE OF PHYSICAL EDUCATION**

Dhankawadi, Pune-411 043 (Maharashtra),  
Tel.020-24373741

**REACCREDITED 'A' GRADE BY NAAC**



**Bachelor of Art in Physical Education**  
(B.A. – Physical Education)-3Years

**(6 Semester Programme)**

**CURRICULUM FRAMEWORK**  
**2015-2018**

**GUIDELINES OF REGULATIONS AND SYLLABUS STRUCTURE FOR  
P.E.S -3 years] (Six Semesters)  
CHOICE BASED CREDIT SYSTEM (CBCS)**

**Preamble:** Bachelor of Physical Education and Sports i.e. B.A. (Physical Education) (Six Semesters Choice Based Credit System) for 3 year duration This is a professional programme meant for preparing basics to become teachers of physical education.

B.A. (Physical Education) programme shall be designed to integrate the study of physical activity in childhood, social context of Physical Education, historical development, subject knowledge of psychology, pedagogy, aim of Physical Education, communication language & skills etc. The B.A. (Physical Education) programme comprises of compulsory and optional theory papers as well as physical activity (practical courses).

**Duration, Intake, Eligibility and Admission Procedure:**

The Duration, Intake, Eligibility and Admission Procedure are as per the University norms and standards.

**Duration:** B.A. (Physical Education) programme shall be of duration of three academic years, that is, Six semesters. However, the students shall be permitted to complete the B.A. (Physical Education) programme requirements within a maximum of Five years from the date of admission to the programme. However, if a student fails to complete the degree in 5 years he should take fresh admission.

**Intake:-**

30 seats are approved by University for B.A. (Physical Education) course.

\*No differently-abled candidate is eligible for the admission in B.A. (Physical Education) Course.

**Eligibility**

Candidate should have passed the higher secondary (10+2 standard) or equivalent examination with 40% marks. Relaxation of 5% marks will be given to the candidates belonging to S.C. & S.T. and other notified categories as per Government Rules or for extraordinary sportsman.

**Age:-**

For General category candidates, the upper age limit is 25 years as on 1<sup>st</sup> July of the academic year. Age relaxation for SC, ST and OBC candidate will be

given according to the rules and regulation of Bharati Vidyapeeth University and GOI

**Admission procedure:-**

Admission shall be made on merit on the basis of marks obtained in the entrance examination consisting of 100 marks based on the following.

<b>a- Physical fitness test</b>	<b>50 marks</b>
<b>b- Written test</b>	<b>30 marks</b>
<b>c- Interview</b>	<b>10 marks</b>
<b>d- Sports achievement</b>	<b>10 marks</b>

The total entrance test will be conducted in two days and could be extended, if needed and it will be conducted at Bharati Vidyapeeth Deemed University College of Physical Education

There shall be Physical Fitness Test (modified AAHPER/CNADIAN/OR ANYOTHER fitness test) of 50 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education

- (A)** Theory Paper comprising of 30 multiple-choice questions of 30 minutes duration carrying 30 marks. Questions shall be based on Aptitude Test, Current Affairs and General Knowledge about sports.
- (B)** Interview comprising of 10 marks will be conducted by Internal Examiners of Bharati Vidyapeeth Deemed University College of Physical Education
- (C)** Sports Participation **Weightage :-** Candidate shall be given maximum 10 marks *weight age* on the basis of their sports participation in any one of the following level:

<b>Participation</b>	<b>Marks</b>
<input type="checkbox"/> <b>International:</b>	<b>10</b>
<input type="checkbox"/> <b>Senior National championship/ National Games:</b>	
1st Place :	<b>10</b>
2nd Place :	<b>08</b>
3rd Place :	<b>07</b>
Participation:	<b>05</b>

□ **All India Inter-Zonal Inter University Competitions:**

1st Place :	<b>08</b>
2nd Place :	<b>07</b>
3rd Place :	<b>06</b>
Participation:	<b>05</b>

□ **Zonal Inter University Competitions/Junior National Competitions:**

1st Place :	<b>07</b>
2nd Place :	<b>06</b>
3rd Place :	<b>05</b>
Participation:	<b>04</b>

□ **Senior State Championship/Rural national games/Woman Festival:**

1st Place :	<b>05</b>
2nd Place :	<b>04</b>
3rd Place :	<b>03</b>
Participation:	<b>02</b>

**Note:-**

\*The marks will be given in only those games/sports, which are in the competition list of Association of Indian Universities (**AIU**) and/or School Games Federation of India (**SGFI**).

\*The obtained position must be during last five academic sessions.

\*The school state championship and inter collegiate championship participation shall be considered for eligibility criteria only; the candidate shall not get any marks for sports **weightage**.

**Medical examination:-**

Qualified candidates will have to submit medical certificate by CMO and blood group certificate to the concern office.

## **1. Rules of examination**

### **(i) Eligibility for appearing at B. A. (Physical Education) examination:**

Students should have kept at least 80% attendance in each year for theory and practical.

He/ she must complete all the practical and other work according to the syllabus up to the satisfaction of the Principal. He/ she must obtain such a certificate from the Principal of the college. Unless and until the student obtains such a certificate, he will not be allowed to appear for university examination.

### **(ii) Annual Examination:**

#### **Theory**

An annual examination will be held at the end of each year which shall be called "Annual Examination". This is a 6 semester course in semester-wise distribution of theory marks for each annual examination will be as follows:

1 <sup>st</sup> Semester:	400
2 <sup>nd</sup> Semester:	400
3 <sup>rd</sup> Semester:	400
4 <sup>th</sup> Semester:	400
5 <sup>th</sup> Semester:	400
6 <sup>st</sup> Semester:	400

#### **Practical:**

There shall be practical examination to be conducted at the end of the completion of teaching every year. Year-wise distribution of practical marks for each annual examination will be as follows:

1 <sup>st</sup> Semester:	500
2 <sup>nd</sup> Semester:	500
3 <sup>rd</sup> Semester:	500
4 <sup>th</sup> Semester:	500
5 <sup>th</sup> Semester:	500
6 <sup>st</sup> Semester:	500

- N.B.-** (i) University Exam, Internal assessment & practical will be done by a Panel of two examiners (One Internal And One External )appointed by University
- (ii) For the rationalization of internal marks, the **College shall appoint moderation committee** (keeping the Principal of the college or his nominee as Chairman). The Committee will take the review of the internal marks given by the college faculties and advice the college, if necessary. The college should take the appropriate action as per the advice of the committee and submit the internal marks to the University.

### **3. Standard of Passing**

A candidate should obtain minimum 40% of marks in each theory paper and also he/she should get 40% marks to pass the subject including theory and **sessional**. Similarly, to pass the examination, the candidate should also obtain minimum 40% marks in practical examination.

### **4. A.T.K.T.**

A candidate may be allowed to take admission in succeeding year of the course irrespective of number of papers/ practical events in which he/she fails. It is mandatory that the whole course shall be completed within a period of 5 years from the date of admission.



**SCHEME OF EXAMINATION FOR B.P.E.S**  
**(6SEMESTERS)**  
**(2015-2018)**  
**Semester wise Distribution of Marks & Credits**

		<b>Sem-I</b>	<b>Sem-II</b>	<b>Sem-III</b>	<b>Sem-IV</b>	<b>Sem-V</b>	<b>Sem-VI</b>	<b>Total</b>
<b>Part-A: Theory Courses</b>	<b>Marks</b>	400	400	400	400	400	400	<b>2400</b>
	<b>Credits</b>	16	16	16	16	16	16	<b>96</b>
<b>Part-B: Activity Courses (Games/Sports)</b>	<b>Marks</b>	400	400	300	300	400	400	<b>2200</b>
	<b>Credits</b>	8	8	6	6	8	8	<b>44</b>
<b>Part- C: Game/ Sport Specialization</b>	<b>Marks</b>	100	100	100	100	100	100	<b>600</b>
	<b>Credits</b>	2	2	2	2	2	2	<b>12</b>
<b>Part D -: Teaching Ability and Internship</b>	<b>Marks</b>	--	--	100	100	--	--	<b>200</b>
	<b>Credits</b>	--	--	2	2	--	--	<b>4</b>
<b>Grand Total</b>	<b>Marks</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>900</b>	<b>5400</b>
	<b>Credits</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>26</b>	<b>156</b>

**NOTES:**

- Each Theory Course shall have 4 Units and 3 hrs. Duration final examination except Sports Specialization which will have 3 units in each semester and 2-hour duration semester-end examination.
- The pattern of Semester-end question papers shall be:

**2.1. For papers having Max. Marks- 60: [12+12+12+12+(4x3)=60 marks]**

- For University examination each question paper shall consist of 5 questions (4 long answer questions from each unit and 1 combined question of 4 short notes from all 4 units).

2. The candidate will attempt any one question from each unit. The 5<sup>th</sup> question will be compulsory consisting 4 short notes of 3 marks each.
3. For Internal Assessment of Theory Courses one Mid Semester Test of 30 marks for each course will be conducted by the college. For the mid semester test each question paper (of 30 marks) shall consist of 5 questions (4 long answer questions from first two unit and 1 combined question of 2 short notes from both units). The candidate will attempt any one question from each unit (2 questions of 12 marks each from first 4 questions). The 5<sup>th</sup> question will be compulsory consisting 2 short notes of 3 marks each. In addition, the teacher concerned shall conduct one open book examination consisting of 10 marks and submit the marks to the college exam department.
4. For Semester-end Examination in Activity Courses, the breaks-up of 100 Marks shall be as follows:
  - Skill proficiency/playing ability : 80
  - Diary / Record book : 20
5. For Specialization Sports Practice and Sports Training, the break-up of 100 Marks shall be as follows:
  - Skill proficiency/playing ability : 50
  - **Written Test** : 50
6. For Lesson Plan, student needs to complete perform 10 ground lesson in 3<sup>rd</sup> and 4<sup>th</sup> Semester at college itself.
  - Lesson Plan : 100 marks

**CURRICULUM FRAMEWORK FOR  
B.A. (Physical Education)  
(6 SEMESTERS (2015-2018))**

**B.A. (Physical Education) I-Semester  
(July 2015 to November 2015)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.A. (Phy.Edu) /I/A/HC/01	Fundamental of Physical Education	60	40	100	64	4
B.A. (Phy.Edu) /I/A/HC/02	Anatomy	60	40	100	64	4
B.A. (Phy.Edu) /I/A/HC/03	English	60	40	100	64	4
B.A. (Phy.Edu) /I/A/SC/01	<u>Select anyone of the following:</u> *Historical development of Sports Movements	60	40	100	64	4
B.A. (Phy.Edu) /I/A/SC/02	*First Aid					
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**NOTE: HC-** Hard Core/Compulsory Course; **SC-** Soft Core/Elective Course.

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.A. (Phy.Edu) /I/B/HC/01	Conditioning	100	48	2
B.A. (Phy.Edu) /I/B/HC/02	Track and Field (Running events)	100	48	2
B.A.(Phy.Edu)/I/B/SC/01-04	<b>Select anyone Activity/ Game/ Sport from each Group** (B1 and B2 – the offer shall depends as per the choice of students ).</b>	100X2	48X2	2X2
	<b>Total</b>	<b>400</b>	<b>--</b>	<b>08</b>

**\*\*Groups of Activity/Game/Sport:** (Should be other than sport specialization)

Activity Group-B1		Activity Group-B2	
Activity Code	Activity	Activity Code	Activity
B.A.(Phy.Edu)/I /B/SC/01	Basketball	B.A.(Phy.Edu)/I/B/SC/03	Table Tennis
B.A.(Phy.Edu)/I /B/SC/02	Volleyball	B.A.(Phy.Edu)/I/B/SC/04	Tennis

**PART-C: GAME/SPORT SPECIALIZATION:**

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu)/I/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport- seasonal only)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**NOTE: SCC-** Soft Core Compulsory.

**B.A. (Physical Education)**  
**II-Semester (December 2015 to April 2016)**

**PART-A: THEORY COURSES:**

<b>Subject Code</b>	<b>Courses</b>	<b>University Exam</b>	<b>Internal Assessment</b>	<b>Total</b>	<b>Lecture</b>	<b>Credits</b>
B.A.(Phy.Edu) /II/A/HC/01	<b>Physiology of Exercise</b>	60	40	100	64	4
B.A.(Phy.Edu) /II/A/HC/02	<b>Information Technology</b>	60	40	100	64	4
B.A.(Phy.Edu) /II/A/HC/03	<b>Psychology of Sports</b>	60	40	100	64	4
B.A.(Phy.Edu) /II/A/SC/01	<b>Select anyone of the following:</b> *Fitness and Wellness	60	40	100	64	4
B.A.(Phy.Edu) / II/A/SC/02	*Adapted Physical Education					
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

<b>Activity Code</b>	<b>Name of Activity</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.A.(Phy.Edu) /II/B/HC/01	Track & Field-I (Field Events)	100	48	2
B.A.(Phy.Edu) /II/B/HC/03	Light Apparatus	100	48	2
B.A.(Phy.Edu) /II/B/SC/01-04	<b>Select anyone Activity/Game/Sport from Group-B3* and B4*</b> (the offer shall depends as per the choice of students).	100X2	48X2	2X2
	Total	<b>400</b>	<b>192</b>	<b>08</b>

**\*Group of Activity/Game/Sport:**

<b>Activity Group-B3</b>		<b>Activity Group-B4</b>	
<b>Activity Code</b>	<b>Activity</b>	<b>Activity Code</b>	<b>Activity</b>
B.A.(Phy.Edu) /II/B/SC/01	Handball	B.A.(Phy.Edu) /II/B/SC/03	Kho- Kho
B.A.(Phy.Edu) /II/B/SC/02	Cricket	B.A.(Phy.Edu) /II/B/SC/04	Weight Lifting

**PART-C: GAME/SPORT SPECIALIZATION:(Continued from Semester-I)**

<b>Activity Code</b>	<b>Name of Area</b>	<b>University Exam</b>	<b>Class</b>	<b>Credits</b>
B.A.(Phy.Edu)/II/D/SCC/01	Sports Practice and Sports Training(in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**B.A. (Physical Education)**  
**III-Semester (July 2016 to November 2016)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.A.(Phy.Edu) /III/A/HC/01	<b>Kinesiology</b>	60	40	100	64	4
B.A.(Phy.Edu) /III/A/HC/02	<b>Methods of Teaching in Physical Education</b>	60	40	100	64	4
B.A.(Phy.Edu) /III/A/HC/03	<b>Health Education</b>	60	40	100	64	4
B.A.(Phy.Edu) /III/A/SC/01  B.A.(Phy.Edu) /III/A/SC/02	<b><u>Select anyone of the following:</u></b>  *Sports Entrepreneur  *Professional Preparation in Physical Education	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.A.(Phy.Edu)/III/B/HC/01	Conditioning	100	48	2
B.A.(Phy.Edu)/III/B/HC/02	Judo	100	48	2
B.A.(Phy.Edu)/III/B/HC/03	<b><u>Select anyone Activity/ Game/Sport from Group-B5 &amp; B6</u></b> (the offer shall depends as per the choice of students).	100	48	2
	<b>Total</b>	<b>300</b>	<b>144</b>	<b>06</b>

**\*Group of Activity/Game/Sport:** (Should be other than sports specialization)

Activity Group-B5		Activity Group-B6	
Activity Code	Activity	Activity Code	Activity
B.A.(Phy.Edu)/III/B/SC/01	Yoga	B.A.(Phy.Edu)/III/B/SC/02	Aerobics
B.A.(Phy.Edu)/III/B/SC/03	Boxing	B.A.(Phy.Edu)/II/B/SC/04	Taekwondo

**PART-C: GAME/SPORT SPECIALIZATION:** (continue from Semester - I &II)

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu)/III/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):**

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu)/III/C/HC/01	Teaching Practice	100	48	2



**B.A. (Physical Education)**  
**IV-Semester (December 2016 to April 2017)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.A.(Phy.Edu) /IV/A/HC/01	<b>Event Management</b>	60	40	100	64	4
B.A.(Phy.Edu) /IV/A/HC/02	<b>Sports Sociology</b>	60	40	100	64	4
B.A.(Phy.Edu) /IV/A/HC/03	<b>Environment Science</b>	60	40	100	64	4
B.A.(Phy.Edu) /IV/A/SC/01 B.A.(Phy.Edu) /IV/A/SC/02	<b>Select anyone of the following:</b> • Fitness Instructor • Sports Industry	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.A.(Phy.Edu)/IV/B/HC/02	Weight Training	100	48	2
B.A.(Phy.Edu)/IV/B/HC/03	Gymnastics	100	48	2
B.A.(Phy.Edu)/IV/B/HC/03	Camping/ Hiking /Tracking	100	48	2
	<b>Total</b>	<b>300</b>	<b>144</b>	<b>6</b>

**PART-C: GAME/SPORT SPECIALIZATION:** (Different from Semester- I-II & III)

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu)/IV/D/SCC/01	Sports Practice and Sports Training (in selected/opted Game/Sport)	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**PART-D: TEACHING ABILITY AND INTERNSHIP (ACTIVITY TEACHING):**

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu) /IV/C/HC/01	Teaching Practice	100	48	2

**B.A. (Physical Education)  
V-Semester (July 2017 to November 2017)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.A.(Phy.Edu) /V/A/HC/01	<b>Correctives in Physical Education</b>	60	40	100	64	4
B.A.(Phy.Edu) /V/A/HC/02	<b>Test measurement and Evaluation</b>	60	40	100	64	4
B.A.(Phy.Edu) /V/A/HC/03	<b>Yoga Education</b>	60	40	100	64	4
B.A.(Phy.Edu) /V/A/SC/01 B.A.(Phy.Edu) / V/A/SC/02	<b>Select anyone of the following:</b> <ul style="list-style-type: none"> <li>• Gym Management</li> <li>• Sports Journalism</li> </ul>	60	40	100	64	4
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.A.(Phy.Edu) /V/B/HC/01	Kabaddi	100	48	2
B.A.(Phy.Edu) /V/B/HC/02	Mallakhamb	100	48	2
B.A.(Phy.Edu) /V/B/HC/03	Wrestling	100	48	2
B.A.(Phy.Edu) /V/B/HC/04	Badminton	100	48	2
	<b>Total</b>	<b>400</b>	<b>192</b>	<b>8</b>

**PART-C: SPECIALIZATION:** (Continue from Semester -IV semester)

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu) /V/D/SCC/01	<b><u>SPECIALIZATION</u></b>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

**B.A. (Physical Education)  
VI-Semester (December 2017 to April 2018)**

**PART-A: THEORY COURSES:**

Subject Code	Courses	University Exam	Internal Assessment	Total	Lecture	Credits
B.A.(Phy.Edu) /VI/A/HC/01	<b>Basic of Sports Training</b>	60	40	100	64	
B.A.(Phy.Edu) /VI/A/HC/02	<b>Stress Management</b>	60	40	100	64	4
B.A.(Phy.Edu) /VI/A/HC/03	<b>Education Technology</b>	60	40	100	64	4
B.A.(Phy.Edu) /VI/A/SC/01	<u>Select anyone of the following:</u> <ul style="list-style-type: none"> <li>• Recreation in Physical Education</li> <li>• Art Of Daily Scheduling</li> </ul>	60	40	100	64	4
B.A.(Phy.Edu) /VI/A/SC/02						
	<b>Total</b>	<b>240</b>	<b>160</b>	<b>400</b>	<b>256</b>	<b>16</b>

**PART-B: PRACTICUM / ACTIVITY COURSES (GAMES & SPORTS):**

Activity Code	Name of Activity	University Exam	Class	Credits
B.A.(Phy.Edu) /VI/B/HC/01	Softball	100	48	2
B.A.(Phy.Edu) /VI/B/HC/02	Hockey	100	48	2
B.A.(Phy.Edu) /VI/B/HC/03	Football	100	48	2
B.A.(Phy.Edu) /VI/B/HC/03	Swimming	100	48	2
	<b>Total</b>	<b>400</b>	<b>192</b>	<b>8</b>

**PART-C: SPECIALIZATION :**( continue from Semester -IV& V)

Activity Code	Name of Area	University Exam	Class	Credits
B.A.(Phy.Edu) /VI/D/SCC/01	<b><u>SPECIALIZATION</u></b>	100	48	2

A student shall select/opt for any one Game/Sport from amongst: Basketball, Cricket, Football, Handball, Table Tennis, Tennis, Track & Field, Volleyball, Weight Lifting, Kho-Kho, Kabaddi and Yoga.

## **(Choice Based Credit System)**

### **Standard of Passing:**

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% of marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50 % in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table:

<b>Range of Marks (Out of 100)</b>	<b>Grade</b>	<b>Grade Point</b>
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks ≤ 80	A+	9
60 ≤ Marks ≤ 70	A	8
55 ≤ Marks ≤ 60	B+	7
50 ≤ Marks ≤ 55	B	6
40 ≤ Marks ≤ 50	C	5
Marks ≤ 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA.

### **Formula to calculate Grade Points (GP)**

Suppose that Max is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP. Sex  $x$ -Max/10 (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

<b>Range of marks at the evaluation</b>	<b>Formula for the Grade Point</b>
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate (Marks/x)+2
$4x \leq \text{Marks} \leq 5.5x$	Truncate (Marks/x)+1

Two kinds of performance indicators, namely, the semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester. While the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the B.P.E.S programme is the final result of the learner.

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA)	10x CGPA -10	If $5.00 \leq \text{CGPA} \leq 6.00$
	5x CGPA +20	If $6.00 \leq \text{CGPA} \leq 8.00$
	10x CGPA -20	If $8.00 \leq \text{CGPA} \leq 9.00$
	20x CGPA -110	If $9.00 \leq \text{CGPA} \leq 9.50$
	40x CGPA -300	If $9.50 \leq \text{CGPA} \leq 10.00$

### **Award of Honours:**

A student who has completed the minimum credits specified for the B.P.E.S programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honors are given below.

<b>Range of CGPA</b>	<b>Final Grade</b>	<b>Performance Descriptor</b>	<b>Equivalent Range of Marks (%)</b>
$9.50 \leq \text{CGPA} \leq 10.00$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.00 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.00 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.00 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.00 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.00 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA Below 5.00	F	Fail	Marks Below 40

**Educational Tour/Camp:** In addition to the above rules the student must fulfill the following requirements to acquire the degree which is mandatory. Educational Tour or Leadership Camp organized by the College of Physical Education of at least 07 days. The students shall contribute separately for these activities.

**B.A.**

**(Physical Education)**

**6 semester Credit system**

**Syllabus**

**Semester I**

B.A.(Phy.Edu) /I/A/HC/01: **Fundamental of Physical Education**

Unit I: Introduction

- a. Meaning, Definition, Scope and Functions of Physical Education
- b. Different Interpretations of Physical Education
- c. Concept of Movement Education
- d. Physical Education an Integral Part of Education
- e. Life time Physical Education for Fitness

Unit II: Philosophical Foundations

- a. Meaning of Philosophy, Philosophical basis of Physical Education, Different Schools of Philosophy
- b. History of Physical Education
- c. Objectives of Preprimary, Primary and Secondary School Physical Education Programmes
- d. Concept of Physical Fitness
- e. Cultural aspect of sports and worthy use of Leisure time through Physical Education activities
- f. F) National and International understanding through Sports

Unit III: Contribution of Thinkers & Competitions.

- |                       |                     |
|-----------------------|---------------------|
| a. Swami Kuvalayanand | b. Baren'Dcaubertin |
| c. Shri. Aurobindo    | d. Olympic Games    |
| e. Asian Games        |                     |

Unit IV: Recreations.

- a. Meaning, Definition, Scope & Functions of Recreations
- b. Recreation in Rural, Urban & Industrial Area
- c. Age-Wise Planning & leadership in recreation

**Book Recommended**

- i Principles of Education – R. M. Marathe, MoghePrakashan, Kolhapur
- ii Teacher and Education in Emerging Indian Society – NCERT, New Delhi.
- iii Human Values Education – S. P Rahela
- iv Foundation of Physical Education – Bucher Charles, WCB/McGraw Hill, 1999
- v The Principles of Physical Education – Willam J. E. W. B. Sounders Com. Philadelphia, 1964.

B.A.(Phy.Edu) /I/A/HC/02: **Anatomy**

### **UNIT-I Introduction**

- a. Introduction of Basic concepts of Anatomy
- b. Structure and functions of cell.
- c Tissues and their classification.
- d Basic introduction of body systems.

### **UNIT-II Skeleto Muscular Systems**

- a. Classification of Skeletal system.
- b. Types and structure of bones.
- c. Different types of joints.
- d. Classification of Muscle
- e. . Types of Muscles

### **Unit III Respiratory and Digestive System**

- a) Meaning and types of Respiration, Organs of Respiratory System.
- b) Functions of Respiratory System, Vital capacity and its measurement. Mechanism of Respiration.
- c) Meaning, importance and organs of Digestive System.
- d) Functions, processes, mechanism of Digestive System.

### **UNIT-IV**

- a. Circulatory System and Nervous System
- b. Meaning of the Circulatory System.
- c. Heart, its structure, functions.
- d. Cardiac Cycle. Meaning, functions compositions of Blood,
- e. Maintenance of Blood supply

### **Books Recommended**

1. Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
2. Sedey Rod R.- Anatomy and Physiology
3. Stephens & Tate P. St. lous, Mosby, 1992
4. Tortora G. J. : Introduction to Human Body, Ed. 4<sup>th</sup> California, Addison, Wesley, 1996



B.A.(Phy.Edu) /I/A/HC/03: **ENGLISH**

**UNIT-I : Vocabulary**

- 1.1 Synonyms
- 1.2 Antonyms
- 1.3 Common abbreviations in use
- 1.4 One word substitution
- 1.5 Words Commonly Misspel
- 1.6 Idiomatic Comparisons or Similes
- 1.7 Word Formation by Prefix and Suffix

**UNIT-II : Common Errors & Transformations**

- 2.1 Common errors in sentences especially regarding number, gender, Pronouns, prepositions, articles, degrees etc.
- 2.2 Punctuation
- 2.3 Kinds of sentences - Assertive, Interrogative, Exclamatory, Imperative, Optative
- 2.4 Transformation of sentences
- 2.5 Tenses

**UNIT-III : Correspondence**

- 3.1 Personal Letters
- 3.2 Applications for leave, scholarship etc.
- 3.3 Invitations- Formal and Informal with reply
- 3.4 Notice Writing

**UNIT-IV :- Descriptive Writing**

- 4.1 Paragraph writing (50 words)
- 4.2 Essay writing (250 words)
- 4.3 Comprehension of unseen passage
- 4.4 Summary Writing

**REFERENCES**

- ❖ High School English Grammar – Wren & Martin
- ❖ How to write & speak better English –John Elisson Kahn, D. Phil.
- ❖ Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan
- ❖ Macmillan the Student’s companion – Wilfred D. Best.
- ❖ A remedial English grammar for foreign students – F.T. wood
- ❖ English Vocabulary in use – Michael McCarthy, Felicily O’Dell.
- ❖ Advanced English Grammar – Martin Haurings.
- ❖ G.O.E. Lydall, A practical Guide to précis Writing & indexing, London: Macdonald & Evans Ltd. (1955)

**B.A.(Phy.Edu) /I/A/SC/01: Historical Development of Sports Movements (Elective Subject)**

**UNIT -Introduction**

- A. Physical Education in Ancient Civilization with reference to  
i) India ii) Greece iii) Rome iv) Egypt.
- B. Development of Physical Education & sports during 20<sup>th</sup> Century with special reference to i) U.S.A. ii) Sweden iii) Germany iv) Olympics v) Asian Games.

**UNIT - II Sports Bodies of India**

- Physical Training for teacher working in school & college
- Movement of Akhadash & Vyayam Shalas.
- Central Advisory Board of Physical Education
- Sports authority of India (Sai)
- Awards National & state level.
- All India council of sports
- SNIPES, NSNIS, LNIPE.
- Nehru Yuwak Kendra

**UNIT - III A Study of the development of Physical Education sports & Games in Maharashtra with reference to**

- a) Pune International marathon  
b) The present Organization set up in state.  
c) Important schemes and activities including indigenous activities.  
d) Role of Voluntary Physical Education & sports Bodies in state...

**UNIT - IV Youth welfare & Youth Services:-**

- a) Concept of youth welfare & Youth work.  
b) Youth organization in India  
c) Programmers under youth development  
d) Youth services such as secreting & guiding N.C.C. N.S.S., Civil defense & scout & Guide movement.

**Reference**

1. Manual of Physical Education of India - D.G. Wakharkar
2. A World History of Physical Education - Van Ten Micher
3. History of Physical Education C.W. Hyensmith
4. A Brief History of Physical Education -Emmel A Rice & John L Hutchinson
5. Physical Education in ancient India - Dr. S.H. Deshpande.

B.A.(Phy.Edu) /I/A/SC/01: **First Aid**

**UNIT -I**

- a) Meaning and definition of first aids and its importance in sports
- b) Types of first aids and its objectives
- c) First aids box and its management
- d) Role and qualification of first aider

**Unit-II**

- a) Common sports injuries in different parts of body
- b) First aids for sports injuries
- c) Common causes of sports injuries and its prevention
- d) RICE & Bandage

**UNIT - III**

- a) Definition of safety education and its significant
- b) Aims and objectives of safety education
- c) Identify causes of accidents & List types and sources of accidents
- d) Safety measures at
  - Home
  - Road
  - School
  - Community

**UNIT – IV**

- a) Describe and demonstrate the management of the following:-
  - Stings and Snake bites
  - Fracture
  - Nose bleeding
  - Electric shocks and other shocks
- b) Fevers:-
  - Definition of fever
  - signs of fever
  - first Aid for fever
  - Management of fever.
- c) Fainting- Definition and causes of fainting, first aid for fainting
- d) Drowning/Near-drowning:- Definition of drowning, definition of near-drowning
  - first aid for drowning/near drowning.

**Reference :**

- Guyton, A.C. (1996). Textbook of Medical Physiology, 9th edition. Philadelphia: W.B. Saunders.
- Hunter, M. dictionary for physical educators. In H. M. Borrow & R. McGee, (Eds.), A Practical approach to measurement in Physical Education (pp. 573-74). Philadelphia: Lea &Febiger.

# **Semester II**

B.A.(Phy.Edu) /II/A/HC/01: **Physiology of Exercise**

**UNIT-I Introduction**

- a. Definition and importance of physiology and Exercise physiology
- b. Essential properties of living being.
- c. Effect of exercise on various system of the body.
  - a) Circulatory system
  - b) Respiratory system
  - c) Muscular system

**UNIT-II**

**1. Cardiac functions and Blood**

- a. Cardiac cycle and its function in human body.
- b. Control of cardiac function.
- c. Blood pressure and it's regulation in human body.

**2. Kidney**

- a) Role of kidney in human body
- b) Function of kidney

**3. Physiology terminology**

a) Second wing	b) Second wing
c) Second wing	d) oxygen debt
e) $V_{O_2}$ max	f) Vital capacity
g) Athletic heart	

**Unit III**

**1. Nervous system**

- a) Definition of Nervous system, role of nerve fibers
- b) Parts of Brain & spinal cord its functions,
- c) Central nervous system and peripheral nervous system

**2. Endocrine system**

a) Pituitary gland	b) Thyroid
c) Parathyroid	d) Adrenal
e) Sex organ	

### **3. Environment effect on the body**

- a) High altitude
- b) Hot condition
- c) Cold condition

#### **UNIT-IV**

- a) Physical fitness and its components.
- b) Training, conditioning, and warm-up.
- c) Types of muscle contraction.
- d) Lactic acid and its influence on sports performance.
- e) First aids and sports injuries

#### **Books Recommended**

- Evelyn Pearce: Anatomy and Physiology for nurses. Culcutta, Oxford University press, 1992
- Sedey Rod R.- Anatomy and Physiology
- Stephens & Tate P. St. lous, Mosby, 1992
- Tortora G. J. : Introduction to Human Body, Ed. 4<sup>th</sup> California, Addison, Wesley, 1996
- MariefEsclaine N. Human Anatomy and Physiology Ed. 3<sup>rd</sup> California, The Benjanin Cumming Co. 1991
- Fox Edward – Sports Physiology W B Soundrs Co. 1994

B.A.(Phy.Edu) /II/A/HC/02: **Information Technology**

**Unit I: Introduction of Computer**

1. History, application, characteristics, types of computer (Analog, Digital, Hybrid) and generations of Computer.
2. Physical structure of computer.
3. Role of computer in various fields
4. Need of computer in Physical Education.

**Unit-II Component of Computer System: An Introduction of Hardware and Soft ware**

1. Components of computer system
2. CPU (CU, ALU and Main memory)
3. Input devices (Keyboard, Mouse and Track Ball, Touchpad, Joysticks, Touch Sensitive Screens, Data Scanning Device, Bar Code Readers, Optical Mark Reader (OMR) and Magnetic Ink Character Reader (MICR)
4. Output Devices (Monitor, Printer, LCD)
5. Hardcopy Devices (Printers and Plotter)
6. UPS and types of UPS
7. Operating System Programme Languages translator.
8. Application program/package

**UNIT-III: USE OF COMPUTERS IN SCHOOLS**

1. Functional knowledge of operating computers–on/off, word processing, use of power point, excel
2. Computer as a learning tool
3. Effective browsing of the internet for discerning and selecting relevant information
4. Survey of educational sites based in India
5. Downloading relevant material
6. Cross collating knowledge from varied sources
7. Competencies in developing original software

**UNIT IV: VISUALISING TECHNOLOGY-SUPPORTED LEARNING SITUATIONS**

1. Preparation of learning schemes
2. Interactive use of audio-visual programme
3. Developing PPT slide show for classroom use
4. Use of available software or CDs with LCD projection for subject learning interactions
5. Generating subject-related demonstrations using computer software

B.A.(Phy.Edu) /II/A/HC/03: **Psychology of Sports**

**UNIT- I Introduction to Sport Psychology**

1. Meaning and scope, Importance, relationship with other sport sciences,
2. Development of sport psychology in India.
3. Scope of Sports Psychology

**UNIT-II Concept and meaning of motor learning**

1. Stages of learning transfer of training, assessment of learning and factors affecting of motor learning.
2. Growth & Development: Concept of growth & development,
3. Play and its Theories.

**UNIT III Personality in Sport:**

1. Concept and definition of Personality
2. Modern perspective, (trait, humanistic, social cognitive and biological),
3. Dynamics of personality in sport Anxiety in Sports

**UNIT-IV Psychological Preparation and Competition:**

1. Motivation and Techniques of Motivation
2. Phenomenon of competitive
3. Psychological preparation for competition (arousal regulation, imagery, self-confidence, goal setting, concentration.)
4. Short term psychological preparation (upcoming competition) Mind to muscle and muscle to mind relaxation techniques.

**Reference**

1. Kamlesh, M.L. (2006). Educational Sport Psychology. New Delhi: Friend's publication
2. Cox Richard. (1998) Sports Psychology (W.C.B.)
3. Gill, Diance L. Psychological Dynamics of Sports (Illinois: Human Kinetics Publishers, 1986)
4. Silva, J.M. and Weinberg.(1984). Physiological Foundation of Sports. IL: Kinetics Publishers,
5. Suinn, Richard M. (1982) Psychology in Sports: Methods and Applications. New Delhi: Sujeet Publication.
6. Martens, Rainer. (1987). Coaches Guide to Sports Psychology. IL: Human Kinetics;
7. Roberts Glyn C. and et al. (1986). Learning Experiences in Sports Psychology. IL: Human Kinetics.
8. Alegaonkar, P.M. (1997). Sports Psychology Pune: Pune VidyarthiGriha.



B.A.(Phy.Edu) /II/A/SC/01: **Fitness and Wellness (Elective Subject)**

## **FITNESS & WELLNESS**

### **Unit-I**

- Definition of fitness & wellness, Components of fitness & wellness,
- Benefits of exercise & health, Fitness & wellness strategy,
- Fitness potential for popular sports, Fitness & wellness activities,
- Role of parents & community for the maintenance of fitness & wellness

### **Unit-II –**

- Selection of machines for various parameters of health & wellness,
- Fitness center, Safety in gymnasium & sports field,
- Clothing & accessories, Carriers in fitness & wellness

### **Unit-III –**

- Test, measurements & evaluation of fitness components, Cardiovascular endurance, Muscular strength, Muscular endurance, flexibility, body composition, agility, balance, co-ordination, speed, power, reaction time

### **Unit-IV –**

- Assessment prior to fitness & wellness prescription,
- Principles of training, Training methods
- Diet prescription, Exercise prescription, Prescription for life style changes, Weight management
- Prevention of diseases through fitness & wellness, Diabetes & exercise, Cardiovascular diseases and exercise, Ageing and exercise, Addiction management- sustains abuse controls
- Stress management, Spiritual management

### **Reference**

- Dougherty NJ et al (2002), Sport, Physical Activity and the Law. Sagamore Pub. Champaign. IL.
- Driskell JA and Wolinsky I (2002). Nutritional Assessment of Athletes. CRC Press. Boca Raton. Fla.
- Greenberg JS Diutriman GB and Oakes BM (2004). Physical Fitness and Wellness: Changing the way you look, feel and perform. Human Kinetics. Champaign. IL.
- Hoeger WW & Hoeger S (2007). Fitness & Wellness. Thomson Wadsworth.
- Maughan RJ Burke LM and Coyle EF (2004). Food, Nutrition and Sports Performance II: The International Olympic Committee Consensus on Sports Nutrition. Routledge. New York.
- Siedentop D (2004). Introduction to physical education, Fitness and sports. McGraw Hill. Boston

B.A.(Phy.Edu) /II/A/SC/02: **Adapted Physical Education (Elective Subject)**

**Unit 1:** An Introduction to Adapted Physical Education

- a) Meaning, Need and Importance of Adapted Physical Education and Sports
- b) Purpose, Aims and Objectives of Adapted Physical Education and Sports
- c) Program organization of Adapted Physical Education and Sports
- d) Adapted Sports- Para Olympics

**Unit 2: Development of Individual Education Program (IEP)**

- a) The student with a disability
- b) Components and Development of IEP.
- c) Principles of Adapted Physical Education and Sports
- d) Role of Physical Education teacher
- e) Teaching style, method & approach in teaching Adapted Physical Education

**Unit 3: Developmental Considerations of an Individual**

- 3.1 Motor development
- 3.2 Perceptual Motor development
- 3.3 Early childhood and Adapted Physical Education

**Unit 4: Individual with unique need and activities**

- 4.1 Behavioral and Special learning disability
- 4.2 Visual Impaired and Deafness
- 4.3 Health Impaired students and Physical Education
- 4.4 HRPF and its development for Individual with unique need
- 4.5 Role of games and sports in Adapted Physical Education

**Reference**

1. Beverly, N. (1986). Moving and Learning. Times Mirror/Mosby College Publishing.
2. Cratty, B.J. Adapted Physical Education in the Mainstream. (4th Edition) Love Publishing Company.
3. Houner, L.D. Integrated Physical Education- A guide for the elementary classroom teacher.
4. Winnick, J. P. (2005). Adapted Physical Education and Sports. Human Kinetics (4th Edition).
5. Pangrazi, R.P. and Dauer, V. P. Dynamics Physical

# **Semester III**

B.A.(Phy.Edu) /III/A/HC/01 :**Kinesiology**

### **Unit-I : Introduction To Kinesiology**

1. Meaning, aim & objectives, importance of kinesiology for physical education and sports
2. Fundamental concepts: Centre of gravity, line of gravity, axis and planes of motion, fundamental starting positions,
3. terminology of fundamental movements, and classification of muscles

### **UNIT-II :Location& Action**

1. Types of Joints
2. Location & Action of Muscles at Various Joints:- a) Upper extremity – shoulder girdle, shoulder joints, elbow joint b) Neck, trunk (Lumbothoracic region)
3. Lower extremity – Hip joint, knee joint, ankle joint
4. Muscular analysis of fundamental movements:- Walking, running, jumping, throwing, catching, pulling, pushing, striking, hangine

### **UNIT-III Laws of Motion**

1. Define mass, weight, force, pressure work, power energy, impulse, moments, impact, friction,
2. Newton's laws of motion
3. Angular kinetics: moment of inertias, conservation of moments, transfer of moments, levers, equilibrium

### **UNIT-IV Motion**

1. Meaning, aims, objectives and importance, types of motion, linear motion & angular motion
2. Linear kinematics: Speed, velocity acceleration uniform accelerated motion and projectile motion
3. Angular kinematics: Angular sped, angular velocity, angular acceleration and relationship between linear and angular motion

### **Reference**

- Bartlett, R. (2007). Introduction to Sports Biomechanics.Routledge Publishers, USA.
- Blazeovich, A. (2007). Sports Biomechanics.A& C Black Publishers, USA.
- Breer&Zarnicks (1979).Efficiency of human movement. WIB Sounders Co. USA.
- Hamill, J. and Knutzen, K.M. (2003).Biomechanical Basis of Human Movement.Lippincott Williams and Wilkins, USA.
- Hay (1993). The biomechanics of sports techniques prentice hall inC New Jersey

B.A.(Phy.Edu)/III/A/HC/02: **METHODS OF TEACHING IN PHYSICAL EDUCATION**

**UNIT I : Introduction of Teaching**

1. Meaning of teaching, coaching, officiating and as a career in Physical Education & Sports
2. Meaning and need for methods,
3. Factors effecting teaching method.

**UNIT II Teaching methods**

1. Teaching methods and its Types- command, demonstration, imitation, discussion, part- whole, whole- part-whole, explanation and recitation
2. Techniques of presentation: personal and technical preparation.

**UNIT III Class management**

1. Class management: techniques, formations, command (types and techniques)
2. factors effecting class management
3. Lesson Plan: Need, construction, Introduction development, skill/recreation

**UNIT IV**

1. Qualification and qualities of a coach,
2. Personnel in physical education/sports.
3. Teaching Aids: Need and Importance, Types of teaching aids.
4. Fundamental skills of athletics, aquatics, badminton, basketball, cricket, football, hockey, handball, kabaddi, KhoKho, volleyball and Judo, Yoga Assanas,

**References**

- Capel, S. et al Editors (2006). A Practical Guide to Teaching Physical Education. Routledge Publishers, USA.
- Graham, G.M. (2009). Children Moving : A Reflective Approach to Teaching Physical Education. 8th Ed. McGraw Hill, USA
- Gupta R. (2010). SharirikShiksha Mein ShikhshanPradhyogiki. Friends Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (1999).Lesson Plan in Physical Education &Sports.R.D.P. Publication. New Delhi
- Gupta R. Kumar P. and Sharma D.P.S. (2004).SharirikShiksha Mein Path Yojna.SahyogPrakashan. New Delhi
- Kamlesh ML (2005). Methods in Physical Education.Friends. Delhi.

B.A.(Phy.Edu) /III/A/HC/03: **Health Education**

**Unit-I Health**

1. Health-meaning, dimensions of health and their interrelationships,
2. Importance of health for individual, family, community and nation;
3. Factors influencing health,
4. Spectrum of health

**Unit II Health Education**

1. Health Education- meaning, scope
2. Aims and objectives of Health Education
3. Principles, methods and media used in health education
4. Hygiene- personal hygiene, food hygiene, environmental hygiene-meaning, need and importance; associated practices related to maintenance and promotion of health

**Unit-II Foods and Nutrition-**

1. Misconceptions about food, essential body nutrients- functions, food sources, balanced diet, diet prescription
2. Communicable and Non-communicable diseases- meaning, distinction between communicable and non-communicable diseases.
3. Communicable diseases- their mode of spread and prevention of diarrhea diseases, typhoid, malaria, STD Respiratory disease ; non-communicable diseases- causes and prevention of diabetes, CVD, cancers, renal diseases and respiratory diseases.

**Unit-III Contemporary health problems of college youth-**

1. Alcohol, drugs, use of tobacco (chewing, sniffing, smoking)- their harmful effects substance abuse management
2. National health programmes- components of existing national health programmes

**Unit IV Health Agencies:**

- 1 Introduction to Organizational and Administrative set-up of Health System in India
  - National level
  - State Level
  - District Leve
2. Steps of Planning of Health Education Programme
3. Internationals health agencies- WHO, UNICEF, Red Cross- their constitution and role in promoting health

**Reference**

- Anspaugh DJ Ezell G and Goodman KN (2006).
- Teaching Today's Health. Mosby Publishers. Chicago. USA
- Balayan D (2007). Swasthya Shiksha Evam Prathmik Chikitsa. Khel Sahitya. Delhi.

B.A.(Phy.Edu) /III/A/SC/01: **Sports Entrepreneur (Elective)**

**Unit I: Introduction to Sports Entrepreneurship**

1. Concept of entrepreneurship, innovation & knowledge management in sport
2. Business Planning Process - The business plan as an entrepreneurial tool
3. Elements of Business Plan, Objectives, Market Analysis, Development of product / idea, Marketing, Finance, Organisation & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition, Business Model Canvas and Drafting Business Proposal for Funding Agency.

**Unit II : Introduction to Finance in Sports**

1. The Four Domains of Sports Marketing, Marketing Through Sports
2. Finance, Organization & Management, Ownership, Critical risk contingencies of the proposal, Scheduling and milestones, Value proposition,
3. Business Model Canvas and Drafting Business Proposal for Funding Agency.

**Unit II. Management of Physical Education and sports**

1. Meaning, Need and scope of management of Physical Education
2. Principles of Sports Management
3. Construction, marking and maintenance of play grounds, track & field, gymnasium, swimming pool and athletic track

**Unit IV: Organization of co-curricular activities and Physical Education programmes.**

1. Physical Education Budget : Need, Importance, procedure and principles of budget making,
2. Physical Education and sports programmes for - Primary, secondary and higher secondary School for sports awareness – demonstration, play days, sports rallies, sports exhibitions
3. Organization of National days (15<sup>th</sup> August & 26<sup>th</sup> January)., Organization of mass competition, sports day, hiking, trekking, Scout and Guide Camp and picnics
4. Ceremonies of competition – Opening, closing and victory

**References:**

- Sports Marketing By Melissa Jane Johnson Morgan Jane
- Small Business, Entrepreneurship and Enterprise Development. Harlow: Pearson Education.

B.A.(Phy.Edu)/III/A/SC/02: **Professional Preparation in Physical Education (Elective)**

**Unit I- Foundation OF Professional Preparation**

- 1 Meaning of Professional
- 2 Components of Professional Preparation.
- 3 Contribution of physical education in attaining ideals of Indian democracy.
- 4 Forces and factors affecting educational policies and Programme.

**UNIT-II Historical Perspective**

1. Historical review of Professional Preparation in India.
2. Professional courses being offered in professional preparation colleges in India.
3. Professional Preparation in Physical Education in USA, USSR and UK.
4. Beginning of Professional Preparation in the world.

**UNIT-III Under-Graduate preparation of professional personnel.**

- 1 Purposes, Admission Requirements of Undergraduate preparation.
- 2 Theory, Teaching practice and practical.
- 3 Professional competencies to be developed.
- 4 Post-Graduate Preparation.
- 5 Methods of instruction.
- 6 Professional relations.

**UNIT-IV Teacher and Teaching**

- 1 Teaching as a career.
- 2 Basic Qualities of a successful teacher.
- 3 Preparation of the specialized physical education teacher.
- 4 Types of teaching jobs.
- 5 Types of non-teaching jobs.

**Reference**

1. A Professional Career in Physical Education. (Englewood Cliffs, N.J. Prentice Hall, Inc. 1963.)
2. Jensen, R. Clayne, Administrative Management of Physical Education and Athletic Programmes. (Philadelphia Lea and Febiger, 1983.)
3. Snyder and Scott. Professional Preparation in Health, Physical Education and Recreation. (Connecticut, Greenwood press, Westport, 1971).
4. Bucher, C.A Foundations of Physical Education (Saint Louis) : The C.V. Mosby Company, 1975), Ed. 7.
5. Aahper publication: Professional Preparation in Dance, Physical Education Recreation Education Safety Education and School health Education, Washington, Aahper pub. 1974 Borozne Joseph & Pechar Stanley



# **Semester IV**

## B.A.(Phy.Edu)/IV/A/HC/01: **EVENT MANAGEMENT**

### **Unit-1**

Meaning of Events, classification of events, Event Management, Designing an Event- 5C" s (Conceptualization, Costing, Canvassing, Customization, Carrying out).

Key Elements of Events- (Event Infrastructure, Organizers, Clients, Target Audience, Media, and Venue).

### **Unit-II**

Managing Sports Events- Planning, Organizing, Coordinating and Controlling Pre events,

During the Events & Post Events issues.Sponsors, Sports Management Companies, Spectators, Sports personalities, Media etc. Sports Management Companies- Introduction, Role, Scope of Work, Service rendered to the clients, Ways of Functioning- Team work, Departments etc.

### **Unit-III**

Sources of funds available for sports: Broadcasting:- What is broadcasting, The basics of sports broadcasting rights, Media providers:-Who are the media providers, How do they fund sports

Sponsorship:-Meaning of sponsorship, Sports and sponsorship, Major sponsors in sports

Team sponsors and individual sponsors, Endorsement, Sports and celebrity endorsement

### **Unit-IV**

Sports and advertisements Advertisement Suggested Readings

Advertisement and brand choice Aiming the right target, Top sports ad companies

Firms and their advertisement choices, Effects of advertisement, gate money

Budgetary Control in sports

Role of Mass Media in Event Promotion.- Introduction to different Sports Media (Television channels, Sports Magazines etc.)Popular Sports Channels Operating in India- ESPN STAR SPORTS, ZEE SPORTS,TEN SPORTS, DD SPORTS, and NEO SPORTS etc. Spectators control, Importance of Spectators for Sports & Games. Human resource management.

### **Reference**

- Chakraborty S (1998).Sports Management.Sports Publications. Delhi.
- Kamlesh ML (2000).Management Concept in Physical Education and Sport. Metropolitan Book Co. Pvt. Ltd. New Delhi.
- Kilkenny, S. (2007). The Complete Guide to Successful Event Planning. Atlantic Publishing Co., USA.
- Roy SS (1995).Sports Management.Friends Publications. Delhi.

## B.A.(Phy.Edu)/IV/A/HC/02 : **Sports Sociology**

### **1. Introduction to Social Science**

- 1.1 Introduction & Meaning of Social Sciences.
- 1.2 Scope of Sociology and its relation with other subjects of Social Sciences.
- 1.3 Defining Society, Community, Association, Institutions, Customs;
- 1.4 Man as a Social animal;
- 1.4 Effect of various social forces on personality development;
- 1.5 Origin and growth of society & Culture.

### **2. Social Structure, Organization and Institutions :**

- 2.1 Socialization, social codes and social control, groups (primary and secondary, crowds and public, family, kinship and marriage;
- 2.2 Social stratification, social class and caste, social mobility;
- 2.3 Economical and political institutes for society;
- 2.4 Cultural and religious institutions;
- 2.5 Concept, factors and process of socio-cultural changes.

### **3. Main Features of Indian Society and Rural Scene:**

- 3.1 Demographic profile, social elements;
- 3.2 Religions pluralism – Hindu, Muslim, Christian and Tribal;
- 3.3 Linguistic Pluralism;
- 3.4 Indian policy – secularism, democracy, social justice;
- 3.5 Indian Rural Scene:
  - 3.5.1 Indian village, rural family, rural education;
  - 3.5.2 Indian village community, rural stratification;
  - 3.5.3 Community development projects and Panchayati-Raj;
  - 3.5.4 Trends in Rural change.

### **4. Sport and Society:**

- 4.1 Meaning and definition of sport sociology;
- 4.2 Sport as a social occurrence;
- 4.3 Socialization through games and sports;
- 4.4 Relationship between family and sport participation;
- 4.5 Relationship between politics and sports;
- 4.6 Social Stratification and sports;
- 4.7 Sports as a social phenomenon.

### **Reference**

- ❖ Iyec, Mac. R.M. and Page Charles H. Society (London : McMillan & C., 1974).
- ❖ Ogburn, William F. and Nimkoff, Meyer F., Hand Book of Sociology (New Delhi : Eurasia Publishing House Ltd., 1972).
- ❖ Loy, Lohn W. Dr. and Kenyon, Gerald S. Sports Culture and Society (Philadelphia : The MacMillan Co. 1969).

B.A.(Phy.Edu)/IV / A/ HC/03: **Environment Science**

1. **Introduction:**

- 1.1 Multi – Disciplinary nature of environmental studies.
- 1.2 Definition, Scope and Importance of environmental studies.
- 1.3 Concept of environmental education.
- 1.4 Historical Background of environmental education.

2. **Natural Resources and related environmental issues:**

- 2.1 Forest Resources:
  - 2.1.1 Use and over exploitation, deforestation
  - 2.1.2 Timber extraction, mining, dams and their effects on forests and tribal people.
- 2.2 Water Resources
- 2.3 Flood Resources:
  - 2.3.1 World food problems
  - 2.3.2 Changes caused by agriculture and overgrazing
  - 2.3.3 Effects of modern agriculture
  - 2.3.4 Fertilizer-pesticide problems.
- 2.4 Energy Resources:
  - 2.4.1 Growing energy needs
  - 2.4.2 Renewable and non-renewable energy sources
  - 2.4.3 Use of alternate energy sources.
- 2.5 Land Resources:
  - 2.5.1 Land as a resource
  - 2.5.2 Land degradation
  - 2.5.3 Man induced Land Slides
  - 2.5.4 Soil erosion and desertification
- 2.6 Role of an individual in conservation of Natural Resources.

**3.1 Ecosystem:**

- 3.1.1 Concept, structure and function of an Ecosystem
- 3.1.2 Producers, consumers and decomposers.
- 3.1.3 Energy flow in the ecosystem
- 3.1.4 Food chains, food Webs and ecological pyramids.

## 4.1 Environmental Pollution:

4.1.1 Definition, effects and control measure of:

- 4.1.1.1 Air Pollution
- 4.1.1.2 Water Pollution
- 4.1.1.3 Soil Pollution
- 4.1.1.4 Marine Pollution
- 4.1.1.5 Noise Pollution
- 4.1.1.6 Thermal Pollution
- 4.1.1.7 Nuclear Hazards

4.1.2 Solid Waste Management: causes, effects and control measures of urban and industrial wastes.

4.1.3 Role Disaster Management: Floods, earthquake, cyclone and Land slides.

## **REFERENCES**

- ❖ Agrawal, K.C. Environmental Biology ( Bikaner: Nidhi Publishers Ltd.) 2001.
- ❖ Cunningham, W.P., and others. Environmental Encyclopedia (Mumbai: Jaico Publishers Home) 2001.
- ❖ Hawkins, R.E. Encyclopedia of Indian Natural History (Bombay : Natural History Society)
- ❖ Heywood, V.H. and Watson V.M; Global biodiversity Assessment (U.K: Cambridge University Press), 1995.
- ❖ Jadhav, H. and Bhosale, V.M. Environmental Protection and Laws (Delhi:Himalaya Pub. House), 1995.
- ❖ Mc Kinney, M.L. and school, R.M Environmental Science system and solution (web enhanced Ed.) 1996.
- ❖ Miller T.G. Jr. Environmental Science (Wadsworth Publishing Co.)
- ❖ Odum, E.P. Fundamentals of Ecology (U.S.A: W.B Saunders Co.) 1971.
- ❖ Rao, M.N. &Datta, A.K. Waste Water Treatment (Oxford & IBH Publication Co. Pvt. Ltd.)1987
- ❖ Townsend C.and others, Essentials of Ecology (Black well Science).

## B.A.(Phy.Edu)/IV/A/SC/01: **FITNESS INSTRUCTOR**

### **Unit-I Introduction to health and fitness**

Health goals, fitness goals, performance goals, components of physical fitness and performance, behaviours that support fitness and performance, taking control of personal health and fitness, factors to consider prior to physical activity, exercise requirement for prevention of premature health problems, how to promote physical activity promotion of physical activity adherence

### **Unit-II Foundation to health fitness instructions:**

Energy cost of physical activity, measurement of energy expenditure, significance of cardiovascular fitness, risks of testing cardio respiratory fitness, components of health related and fitness related fitness

### **Unit-III Healthy body composition**

Measurement of body fat calculating target body weight, LBM and Body fat,

Muscular strength and endurance:- health fitness requirements, assessment of strength and muscular endurance

Flexibility: Importance of flexibility in health and fitness, factors affecting range of movement (ROM) spine and hip joint, flexibility and low back function

**Unit-IV Exercise prescription:** foundation of prescribing exercise, general guidelines for cardio-respiratory fitness programmes, determining intensity, general exercise testing, exercise programme selection, exercise prescription for body weight management

Muscular strength and endurance training: fundamental principles, types of strength training, muscular training modes, intensity and frequency. Overreaching and overtraining

Flexibility training: exercise considerations for improving flexibility, prophylactic exercise for improving low back function

### **Reference**

- Anspaugh, D.J. and G. Exell (2004) Teaching To-day" s Health, Pearson Benjamin Cummings. San Francisco. California.USA.
- Bishop JG (2005).Fitness through Aerobics Person- Benjamin Cummings. San Francisco. California.USA.
- Donatelle RJ (2006).Access to Health. Pearson Benjamin Cummings. San Francisco. California.USA.
- Hoeger WW and Hoeger S (2007).Fitness and Wellness.Thomson-Wadsworth, Belmont. California. USA.

B.A.(Phy.Edu)/IV/A/SC/02: **Sports Industry**

## **SPORTS INDUSTRY**

### **Unit-I**

Introduction, history in relation to „sports goods industry“ in India, Industrial relations in India, Peculiar characteristic, i.e. Hand Made Goods, Involving skilled workers-piece rated wages, Policy- five year plans for production, export strategy and potential

### **Unit-II**

Sports Industry in Europe-USA, Canada and ASIA & other parts of the world, Major sports-World wide-Europe, ASIA & India including some local games, development of sports

### **Unit-III**

Future need for mechanization to improve quality, Evaluation of management thought, planning-nature, objective, promises, strategies & tactical plan

### **Unit-IV**

Organizations-Principles, structure, management, levels, quality control, Personnel management- recruitment selection, training, performance

### **Unit-V**

Direction/controlling- production control, material control, quality control, sales distribution-government departments, whole sellers & retailers

## **Reference**

- Field S. (2008). Managing Your Career in the Sports Industry. Checkmark Books. Belmont. California. U.S.A.
- Kaing NH and Sakai K (2001). New Patterns of Industrial Globalisation. OECD Publishers. U.S.A.
- Kraft JP (2009). Leisure Economy 1960-1985; Students in sports Industry & Society. Johns Hopkins University Press. U.S.A.
- Likert R (1961). New Patterns of Management. McGraw Hill. New York. U.S.A.

# **Semester V**



## B.A.(Phy.Edu)/V/A/HC/01: **Correctives in Physical Education**

### **Unit-I**

1. Definition of Remedial, physiotherapy and corrective exercises.
2. Concept of posture, its meaning and characteristics of correct and incorrect posture.
3. Causes of incorrect posture
4. Necessity and importance of correct posture.
5. Principles of correct posture.
6. Tests for correct posture.

### **Unit-II**

1. Classification of posture : a. Good Type b. Bantom Type c. Fatigue Type
2. Postural deformities and their causes : a. Kyphosis b. Lordosis c. Scoliosis d. Bow legs e. Knock knee f. Flat foot
3. Preventive and remedial measures for postural defects :
  - a. Psychological and habitual consideration in preventing and correcting postural defects.
  - b. Corrective exercises for various postural defects.
  - c. Physiotherapist treatment in correcting postural defects.

### **Unit-III**

1. Massage: **a.** Meaning, definition and a brief history of massage.  
**b.** Massage as means of relaxation and points to be considered while giving massage. **c.** General effects of massage.
2. Classification of the manipulation and movements in the massage :
3. Effleurage and stroking i. Petrissage ii. Percussion / Tapotement  
iii. Vibration and shaking.
4. Effects of manipulation and movements on the different systems of human body.

### **Unit-IV**

- Classification of positions : a. Fundamental positions b. Derived positions c. Modified positions
- Classification of exercises along with their practical instructions : a. Free mobility exercises b. Assisted exercise c. Resisted exercises

### **Reference Books:**

1. Smith Lara K. and Others, "Srunnstrem's Clinical Kinesiology", Jaypee Brothers P.B. No- 7193 New Delhi 1998.
2. J.L. Rathoore, "Corrective Physical Education", Philadelphia W.B. Saunders Co. 1968.
3. P.G. Rasch and R.K. Burke, "Kinesiology and Applied Anatomy", Lee and Febriger, Philadelphia 1978.
4. Singh Ajmer et.al, "Essentials of Physical Education", Kalyani Publishers, Ludhiana, Second revised addition 2008.

## B.A.(Phy.Edu)/V/A/HC/02 : **Test measurement and Evaluation**

### **UNIT-I**

- Introduction to test, measurement and evaluation and their importance in the field of physical education
- Test constructions:- a) general consideration b) physical fitness/ efficiency test

### **UNIT – II**

- Meaning and importance of statistics in the field of physical education, “population” and “sample” “random sampling”
- Meaning of data, kinds of data- continuous and discrete Frequency distribution, construction of frequency tables, mean, median and mode.

### **UNIT –III**

- Measures of variability range, quartile, deviation, standard Deviation, co-efficient of variation
- Normal probability curve and meaning, uses its principles, Diagrammatic represent action

### **UNIT-IV**

- Physical fitness testing: components of physical fitness
- Strength test: - Kraus Weber strength test, Muscular Endurance test: Cardiopulmonary test:
- Endurance Test, Harvard step test.
- Anthropometric Measurements:- Weight, height, sitting height, chest circumference, thigh circumference, calf circumference, skin fold biceps, triceps, sub scapular and supra iliac.
- Measurement of skills, games and sports-Johnson badminton test, Brady volleyball test, McDonald soccer test, Cornish Handball test, Hockey skill test- SAI hockey Test

### **Reference**

- Acsm” s (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
- BalyanSunita (2006). Sharirk Shiksha main Parikshanevnmnmaapan. Khel Sahitya. Delhi.
- Barrow &Mc Gee s Practical Measurement and Assessment.
- Barrow H.M. and McGee R. (1979).A Practical Approach to Measurement in Physical Education.Lea&Febiger, Philadelphia. U.S.A.

B.A. (Phy.Edu)/V/A/HC/03: **Yoga Education**

**UNIT- I**

Origin of yoga, definition and scope of yoga, limitations and misconceptions, importance of yoga in physical education and other fields

**UNIT- II**

Historical development of yoga in India.

Types of Yoga:- Hatha yoga, laya yoga, mantra yoga, bhakti yoga, karma yoga, jnana yoga, raj yoga

**UNIT- III**

Patanjali yoga sutras- yama, niyama, asana, pranayama

Pratyahar- Benefits & utilities of these. Astanga yoga- Definition, objectives, dharna, dhyana, Samadhi & their psychological impact.

Shatkarm/cleansing process/ yogic methods and personal hygiene.

**UNIT- IV**

Asanas: Types, importance of asanas in special reference to Physical Education & Sports.

Differentiate between asanas and exercise.

Pranayama and importance of pranayama in special reference to Physiological effects

Bandhas, mudras and their physiological effects.

**UNIT- V**

Disease wise treatment through yoga therapy- Asthma, high & low B.P, diabetes, obesity, heart disease, insomania, arthritis, backache, female disease and importance of vegetarianism in yogic diet

**SUGGESTED READINGS**

- Day P. (1986). Yoga Illustrated Dictionary. Jaico Pub. House. New Delhi.
- Debnath M ( 2007). Basic Core Fitness Through Yoga And Naturopathy. Sports Publication. New Delhi.
- Kumar ER (1988). Heal Yourself With Yoga: Specific Disease. Taraporevala. Bombay.
- Shanti KY (1987).The Science of Yogic Breuthiay (Pranayana). D.B. Bombay.
- Sharma JP and Ganesh S (2007). Yog Kala Ek Prichya. Friends. New Delhi
- Sharma JP (2007).Manavjeevanevamyoga.Friends Pub. New Delhi.
- Sharma Jai Prakash AndSehgalMadhu (2006).Yog-Shiksha.Friends. Delhi.
- Singh MK And Jain P (2008). Yoga aurmanoranjan.KhelSahitya Kendra. New Delhi.

## B.A.(Phy.Edu)/V/A/SC/01: **GYM MANAGEMENT**

### **UNIT-I**

Concept of nutrition and health, balanced diet, dietary aids and gimmicks, Energy and activity, calculating calorie intake and expenditure

Obesity, anorexia and related health problems – measurements and management, Weight management programmes

### **UNIT-II**

Understanding of various forms of aerobics- floor aerobics, step – aerobics, weight, Aerobics and aqua aerobics, Training effects of aerobic fitness on various physiological systems namely skeletal Muscular, circulatory and respiratory

Improvement of aerobic fitness, Aerobic fitness programme

### **UNIT-III**

Location and Establishment of gym (Publicity, policy, reception, information, Registration, offer of programmes), Procurement, placement & maintenance of gym, Equipments , Marketing, clientage, Enrolments, record keeping, social activities, Public Relations, Individualized/group grooming programme, basic concepts of financial management

Gym-instructor – qualification, qualities, pay-roll, Performance – evaluation, grooming and presentation, Introduction to different exercise equipment, Gym management – Costing, Balance sheet, Promotional plans

### **UNIT-IV**

Measurement of Weight and Height, Calculating BMI (Body Mass Index ), Measurement of Fitness Components Flexibility (Sit and Reach Test, Hip Bend and Toe Touch), Strength (Sit-Ups, Leg-Raise for Minimal Strength), Cardiovascular Endurance (One-mile run, Physical Efficiency test, Harvard step test),

Self- evaluation –Personal Health and Well-being

### **UNIT-V**

Exercise schedules – Aerobics, Fitness and Weight Management

### **Reference**

- Carol K A. and Mary M. Y (2009).“Methods of Group Exercise Instruction” McGraw Hill. New York. U.S.A.
- Sheela K (2009).Fitness, Aerobics & Gym Operations.KhelSahitya Kendra. New Delhi.
- Taylor, D. and Nichols, D.S. (2010). The Brand Gym : A Practical Workout. Wiley Publishers, USA.
- Time Life Books..(2004).Gym Workout. London Times Life Books
- Wayne L Westcott (2007).“Strength Training”. Thomas R. Bachle. Benjamin Cummings. U.S.A.

B.A.(Phy.Edu) V/A/SC/02 :**SPORTS JOURNALISM**

**UNIT-I**

Meaning, scope and changing trends of journalism in sports

Historical development & role of print and electronic media in sports promotion

**UNIT-II**

Language – vocabulary, spellings, figure of speech , dialect, grammar, punctuation

Fundamentals of a sports story/ news

**UNIT-III**

Organizational set-up of a news paper- printing, process sequences of operations in the printing of a news paper/journals.

Introduction of various sports organization and agencies- Olympic Games, Asian games, commonwealth games, awards and trophies.

**UNIT-IV**

Theory and principles of advertising in sports

Public relations in sports, press release, conferences

Research tools for developing a sports story

Process of news paper publishing and management

**Reference**

- AamidorA (2003).Real Sports Reporting.Indiana University Press. Valparaiso. Indiana. U.S.A.
- Ahuja, B.N (1988).Theory and Practice of Journalism.Surjeet. Delhi.
- Andrews P (2005). Sports Journalism: A Practical Introduction. Sage Publications Ltd. Delhi.
- Boyle R (2006). Sports Journalism: Context and Issues. Sage Publications Ltd.
- Kamath, MV (1980).Professional Journalism.K.S.K. New Delhi..
- Steen (2007). Sports Journalism: A Multimedia Primer (Paperback). Routledge. London
- Wilstein S (2001).Associated Press Sports Writing Handbook. McGraw-Hill.

# **Semester VI**

## B.A.(Phy.Edu)/VI/A/HC/01: **Basic of Sports Training**

### **UNIT I: Introduction**

- Meaning and Definitions of Sports Training.
- Meaning of terms: Coaching, Teaching, Conditioning and Training.
- Aim and Tasks of Sports Training.
- Characteristics of Sports Training.
- Principles of Sports Training.
- Systematization of Sports Training.
  - Beginner
  - Intermediate.
  - High Performance.

### **UNIT-II: Training Load**

- Definition and Types of Training Load.
- Features/Factors of Training Load
- Principles of Intensity and Volume of Stimulus.
- Over Load.
- Meaning and types of over load.
- Causes of over load.
- Symptoms of over load.
- Tackling of over load.
- Judgment of Training Load.

### **UNIT-III :- Strength**

- Concept and types of Strength.
- Factors determining Strength.
- Methods of strength training.
- Management of strength training programme.

### **Endurance**

- Concept and types of endurance.
- Factors determining endurance.
- Methods of endurance training.

### **Speed**

- Concept and Classification of Speed.
- Factors determining speed.
- Methods of developing speed abilities.
- Reaction speed
- Speed of movement.
- Acceleration speed
- Sprinting speed.
- Speed endurance.

#### **UNIT-IV : Technical Training**

- Definition of Technique and Skill.
- Importance of Technique.
- Process of Skill Learning.
- Methods of Technique Training.

#### **Tactical Training**

- Concept of Tactics and Strategy.
- Methods of Tactical Training.

#### **Planning**

- Concept of Training Plan.
- Principles of Planning.
- Types of Training Plan.

#### **Periodization**

- Meaning and Importance of Periodization.
- Periods of Training Year.
- Aim and Contents of Periods.
- Types of Periodization.

#### **REFERENCES**

- ❖ Dick W. Frank, Sports Training Principles 4<sup>th</sup> ed. (London: A&C Black Ltd.), 2002.
- ❖ Harre, D. Principles of Sports Training (Berlin: Sport Veulag), 1982.
- ❖ Matveyev, L.P. Fundamentals of Sports Training (Moscow :Progress Publishers) 1977.
- ❖ Singh, Hardayal. Science of Sports Training (New Delhi: DVS Publications), 1991.
- ❖ Uppal, A.K. Principles of Sports Training (Delhi: Friends Publication) 2001.
- ❖ Tudor B. Bompa&Mihal C. Carera, Periodiation Training for Sports, Human Kinetics,2005 (IInd Edition)
- ❖ YograjThani, Sports Training, Sports Publication-2003
- ❖ K. Chandra Shekar, Sports Training, KhelSahitya Kendra -2004



## B.A.(Phy.Edu)/VI/A/HC/01: **STRESS MANAGEMENT**

### **Unit-I**

Definition of stress and anger, Causes of stress and anger, two main emotions of stress-fear and anger, Daily life stressors, Process of stress and anger- Psycho Physiology of stress

### **Unit-II**

Adaptation to stress-Reframing of habitual stress resistance, Occupational stress, Peer stress (Students stress), Family stress, Stress & elderly

### **Unit-III**

Stress & drug abuse

Stress related diseases- i) Sleep disorder, ii) Eating disorder, iii) Sexual and emotional disorder, iv) Other stress related diseases, v) Stress & Spirituality

### **Unit-IV**

Self awareness and stress management, Muscular tension reduction, Emotional tension reduction, Stress free living, Stress free examination, Stress management through physical activity, Stress management through recreation

### **Unit-V**

Anger management- Redford William" s 12 steps of anger management

Stress management- behavior modification, time management, coping strategy

Relaxation technique- i) Diaphragmatic breathing, ii) Meditation, iii) Progressive muscle relaxation, iv) Yoga, v) Mental imagery, vi) Music therapy, vii) Massage therapy

## **SUGGESTED READINGS**

- Adrain F & Herrick E. and Sharp P (1998). Anger Management. Routledge Publishing. Florence. Kentucky. U.S.A.
- Allen E (2008). Stress Management for Dummies. For Dummies Publishers. U.S.A.
- Davis M. et al (2008). The Relaxation and Stress Reduction workbook. Harbinger Publications, USA.
- Greenberg J.S. (2008). Comprehensive stress management. McGraw Hill, USA
- Hipp E. (2008). Fighting Invisible Tigers : Stress Management for Teens. Free Spirit Publishing, USA.
- Mac W. (2007). Anger and Stress Management. God"s Way. Calvary Press, USA.
- Petee F (2006). Anger Management. Pentagon. Press. New York. U.S.A.
- Swate Y B (2009). Anger Management. Sage Publication. New Delhi.

**B.A.(Phy.Edu)/VI/A/HC/01: EDUCATIONAL TECHNOLOGY****UNIT-I : Introduction to Educational Technology**

- 1.1 Definition
- 1.2 Educative Process
- 1.3 The Teacher of Yesterday & Today
- 1.4 An outline of Teaching method used then and now
- 1.5 Use of sensory organ in the process of learning and remembering
- 1.6 Communication:
  - 1.6.1 Types of Communication
  - 1.6.2 Communication Cycle
  - 1.6.3 Communication in the Class room

**UNIT-II Teaching Aids:**

- 2.1 Importance of Teaching Aids
- 2.2 Criteria for selecting Teaching Aids
- 2.3 Difference between Teaching Method and Teaching Aid
- 2.4 Broad classification of Teaching Aids
  - 2.4.1 Audio Aids
  - 2.4.2 Visual Aids
  - 2.4.3 Audio-Visual Aids
  - 2.4.4 Effectiveness of Edger Dale's cone classification
- 2.5 Advantage and suggestions for effective use of selected teaching Aids.
  - 2.5.1 Verbal
  - 2.5.2 Chock Board
  - 2.5.3 Charts
  - 2.5.4 Models
  - 2.5.5 Slide Projector
  - 2.5.6 Over Head Projector
  - 2.5.7 Motion Picture
  - 2.5.8 Self Experiment and Projects.

**UNIT-III New Teaching Techniques and Innovations – I:**

- 3.1 Art of questioning and answering
  - 3.1.1 Purpose of Questioning
  - 3.1.2 Classification of Questioning
  - 3.1.3 Techniques of asking questions
- 3.2 Programmed Learning
  - 3.2.1 Concept of Programmed learning
  - 3.2.2 Fundamental Principles of Programmed learning
- 3.2.3 Steps involved in preparation of Programme

- 3.3 Team Teaching
  - 3.3.1 Meaning
  - 3.3.2 Guiding principles of Team Teaching
  - 3.3.3 Advantage of Team Teaching.

#### UNIT-IV **New Teaching Techniques and INNOVATIONS – II :**

- 4.1 Micro Teaching
  - 4.1.1 Concept and Features of Micro Teaching
  - 4.1.2 Micro Teaching Verses Traditional Teaching
  - 4.1.3 Steps in Micro Teaching
  - 4.1.4 Principles of Micro Teaching
  - 4.1.5 Micro Teaching Skills
  - 4.1.6 Limitation of Micro Teaching
- 4.2 Simulation Teaching
  - 4.2.1 Meaning of Simulation
  - 4.2.2 Types of activities in simulation
  - 4.2.3 Steps in Simulation
  - 4.2.4 Advantages of Simulation
  - 4.2.5 Limitations of Simulation

#### **REFERENCES**

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- ❖ Bhatia and Bhatia. The Principles and Methods of Teaching (New Delhi :Doaba House), 1959.
- ❖ Walia, J.S. Principles and Methods of Education (Paul Publishers, Jullandhar), 1999.
- ❖ Kochar, S.K. Methods and Techniques of Teaching (New Delhi, Jullandhar, Sterling Publishers Pvt. Ltd.), 1982
- ❖ Kozman, Cassidy and kJackson. Methods in Physical Education (W.B. Saunders Company, Philadelphia and London), 1952.
- ❖ Singh, Ajmer and other. Modern Text Book of Physical Education, Health and Sports, (KalyaniPublishers,Ludhiana)2000.
- ❖ AmitaBhardwaj, New Media of Educational Planning".Sarup of Sons, New Delhi-2003
- ❖ Prof. Ramesh Chandra, DitelAneja,"Corporate Global Environment", Usha Books, Delhi 2004.
- ❖ MohitChakravarty,"Education in the 4 Century" KalpanPublication' Delhi2005.
- ❖ V.C. Pandey, Educational Technology" Usha Books Delhi -2005.
- ❖ Sarita, Monika Tomar,"Delhi, 2004
- ❖ JagannathMohanty, "Educational Technology' Deep & Deep Publication. Pvt. Ltd. New Delhi.2003
- ❖ Prof. RameshChandra, Technology in the preparation of Teachers," Usha Books, Delhi 2004

B.A.(Phy.Edu)/VI/A/SC/01: **Recreation in Physical Education**

**UNIT-I Introduction to Recreation**

- 1.1 Meaning, Definitions and characteristics of Recreation
- 1.2 Importance of Recreation
- 1.3 Misconceptions about Recreation
- 1.4 Scope of Recreation

**UNIT-II Influence of Recreation in Social Institutions.**

- 2.1 Family
- 2.2 Educational institutions
- 2.3 Community/ Cultural
- 2.4 Religious organizations

**UNIT-III Planning for Recreation**

- 3.1 Planning criteria and objectives of Recreation facilities
- 3.2 Different types of indoor and outdoor Recreation for Urban and Rural population
- 3.3 Operation and maintenance of different Recreation area and facilities
- 3.4 Sources of funding of Recreational activities

**UNIT-IV Programmes in Recreation**

- 4.1 Criteria and principles of selecting a programme
- 4.2 Classification of Recreational activities:
  - 4.2.1 Indoor and outdoor activities
  - 4.2.2 Water activities
  - 4.2.3 Cultural activities
  - 4.2.4 Literary activities
  - 4.2.5 Nature and outing
  - 4.2.6 Social events
  - 4.2.7 Adventure activities
- 4.3 Hobbies – Introduction to hobbies and types of hobbies.
- 4.4 Agencies providing Recreation.
- Camping and leadership**
- 4.5 Aim, objectives and importance of Camping.
- 4.6 Organization and types of Camp.
  - Selection and layout of camp site.
  - Camping leadership.
- 4.7 Types and functions of Recreation leaders.
- 4.8 Qualification, Qualities and training & Recreation leaders.

**REFERENCES**

- ❖ Bright Charles K. and Herold C. Meyer. “Recreational test and readings”. Eaglewood cliff, New Jersey Prentice Hall, Inc. 1953.
- ❖ Ness wed, M.H. and New Meyer E.S. Leisure and Recreation, New York : Ronald Press.
- ❖ VannierMaryhalen, “Methods and Material in Recreation leadership: Philadelphia.” W.B. Sounders company, 1959.

## B.A.(Phy.Edu)/VI/A/SC/02: **ART OF DAILY SCHEDULING**

### **Unit-I**

Introduction:- Meaning and definition of Daily Schedule, art, science, management of time, shortage of time for daily activities

Types of daily activities: requirement of daily activities for various domains of personality, essential categories of daily activities, correct decision making to include all types of daily activities with in fixed 24 hours

### **Unit-II**

Art of living, art of scheduling, art and science of principles of time management, acronym and daily prayers, methods of recalling and rechecking daily activities

Attitudes and art of daily schedules: right knowledge of daily activities, developing correct attitude by learning the art of behaviour change, transdental theory of behaviour changes, relation between attitude and behaviour change

### **Unit-III**

Understanding the concept of perfection of nature, relation between nature known as superpower or god in religious terms, predisposing, enabling and reinforcing factors for strengthening the art of daily schedules

Cognition and daily schedules: necessity of right attitude and right information of essential components of daily schedules. Enlisting activities needed daily, relation between qualitative and quantitative balances

### **Unit-IV**

Alternative daily schedule patterns: effect of culture, race, gender and age on daily schedules, fundamentals of art of daily schedules, listing alternative daily schedules for different categories of human being based on culture, race. Gender, age, and geographical locations

Factors helping adherence to daily schedule: self responsibility, knowledge to body requirements, important body systems requiring daily attention

Analysis of lifestyles: role of active lifestyle and wellness activities, factors helping to promote daily schedules

Barriers to daily schedules – peer pressures, careless environment of , firm no to harmful barriers like smoking, drugs, alcohol and irresponsible sex urge

Wellness and daily schedules: art of inclusion of all wellness parameters to daily schedules, namely meditation, foods, right physical activities, right hygienic habits, right environmental care, right injury preventing behaviours, right decision towards sex, entertainment recreation, rest, sleep

## Reference

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- Ford, J. (2005). Right on Schedule : The Science of Health and Wellbeing. Mason Crest Publishers, USA.
- Gates, T.L. (2008). Daily Planning 50 Worksheets. Power Systems Inc., USA.
- Graham G (2001). Teaching Children Physical Education: Becoming a Master Teacher. Human Kinetics. Champaign. Illinois. USA.
- Hales D (2005). An Invitation to Health. Thomson Wadsworth Publishers. USA.
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- Katz DL and Gonzalez MH (2002). The Way to Eat. Source book. Inc. Naperville. Illinois. USA
- Maxwell, S. (2001). A Practical Guide to Daily Scheduling. Communication Concepts Inc., USA.
- Moss, S., Schwartz, L. and Wertz, M. (2007). Where"s my Stuff? The Ultimate Organizer. Orange Avenue Publishing, USA.
- Robbins G Power D and Burgess S (2002). A Wellness of Way. McGraw Hill Company. Inc. New York. USA.
- Scholastic, W.C. (2009). Daily Schedule. Teachers Friend Publications, USA.

**Bharati Vidyapeeth**  
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**Center for Health Management Studies and Research**

**Post Graduate Diploma  
in Hospital Planning & Design  
(PGDHPD)**

<b>Programme Duration</b>	<b>1 year</b>
<b>Credits</b>	<b>24</b>
<b>Programme Type</b>	<b>CBCS</b>
<b>Programme Fees</b>	<b>INR 36,000 only</b>
<b>Number of seats</b>	<b>15</b>
<b>Eligibility</b>	<b>Any Graduation, MBBS ,BDS , BAMS, BHMS, BUMS, BPTb, OPTb, other Health Sciences Graduates Preferred</b>

**Bharati Vidyapeeth**  
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**Centre for Health Management Studies and Research**

The nature of hospital and healthcare organizations has been diverse and varied in India. Nursing homes, small private hospitals as well as multi specialty tertiary care hospitals have emerged in large numbers over the last decade. However, there is an absence of homogeneity in their functioning or regulation. This can be brought about by way of enhanced governance training and development of healthcare managers who can play a crucial role in setting the background for this change.

With this focus and challenge in mind the Center for Health Management Studies and Research has been set up at the Bharati Vidyapeeth ( Deemed to be University), Pune. The Center for Health Management Studies and Research has rapidly grown into a specialized training facility for a wide variety of cadres related to hospital and healthcare management, with a focus on patient centered care.

**Objectives of the Centre for Health Management Studies and Research:**

- To create a center of excellence in hospital and healthcare management, academics, research and consultancy.
- To empower working professionals enhancing their skill sets in the field to suit the changing needs of their workplace.
- To educate and train in-service personnel in the healthcare system in both private and public sector.
- To participate in health policy development and reform in order to share expertise and create a knowledge base for governance in health care.
- To offer consultancies as part of knowledge sharing and help healthcare organizations and individuals to plan their initiatives for proper implementation.
- To focus attention on the specific healthcare needs of India's growing urban centers and the accessible rural sectors and remote wilderness tracts.
- To develop and disseminate materials to enhance awareness on specific health issues in the public domain.



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# Post Graduate Diploma in Hospital Planning & Design

## Program Objective:

To make professionals aware about various aspects involved in planning, designing and construction of healthcare organisations with an emphasis on sustainability.

POST GRADUATE DIPLOMA IN HOSPITAL PLANNING & DESIGN								
COURSE CODE & COURSE	Theory Credits (Total Hours)	Practical Credits (Total Hours)	Teaching Scheme		Examination Scheme (Marks)			
			Theory	Practical	U/E	I/A	TOTAL	
<b>Semester I</b>								
I - 106	Business Communication	2 (30)	-	2	-	40	20	60
I - 107	Management Accounting	2 (30)	-	2	-	40	20	60
I - 110	Basics Medical Terminology	2 (30)	-	2	-	40	20	60
I - 112	Information and Communication Technology	2 (30)	-	2	-	40	20	60
I - 128	Project Management in Healthcare	2 (30)	-	2	-	40	20	60
I - 109	Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce	-	3 (90)	-	6	60	40	100
<b>TOTAL</b>		<b>10 (150)</b>	<b>3 (90)</b>	<b>10</b>	<b>6</b>	<b>260</b>	<b>240</b>	<b>500</b>
<b>Semester II</b>								
II - 113	Hospital Organization, Structure & Business Plan	2 (30)	1 (30)	3	3	60	40	100
II - 119	Hospital Architecture & Designing	3 (45)	-	3	-	60	40	100
II - 124	Interior Designing & Landscaping	2 (30)	-	2	-	40	20	60
II - 121	Project -I (Viva-Voce)	-	3 (90)	-	6	60	40	100
<b>TOTAL</b>		<b>7 (105)</b>	<b>4 (120)</b>	<b>8</b>	<b>9</b>	<b>220</b>	<b>140</b>	<b>360</b>

1 Credit = 15 Classroom teaching &/or experiential learning hours/ 30 Practical training hours


0.5 Credit = 8 Classroom teaching &/or experiential learning hours/ 15 Practical training hours

**Selection Process:** Students will be selected based on their performance in personal interview.

**\*There would be a separate 20% quota for sponsored professionals working in healthcare organizations. If this quota remains vacant, the seats would be filled through open merit.**

**Special 10% discount for Bharati Vidyapeeth employees**

- There would be 2 assignments per full course (3 credits) & 1 per half course per semester
- One compulsory project per semester to be completed in student's own institute/ workplace/ Bharati Constituent setups as prescribed by CHMSR guide.
- Semester end examination would be conducted aligned with BVDU exam calendar for all courses. Student should have an attendance of 75% to appear for examinations. 60% attendance is allowed when supported with medical certificate along with CHMSR director's approval.
- **Case Study:** Compulsory, Relevant Cases have to be discussed in each course
- **Annexure 1** – Procedure for selection of candidates into Diploma programs
- **Annexure 2** –List of documents to be sent along with application form
- **Annexure 3** –List of the journals, magazines and newspapers
- **Annexure 4** –Academic Calendar Summary


  
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- **Annexure 5** – List of types of organizations for industrial visits, guest lectures and field assignments, projects
- **Annexure 6** – Guidelines for concurrent rotatory practical postings (CRPP), project postings.
- **Annexure 7** – Examination pattern



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## SEMESTER-I



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**Introduction:**

The course has been designed to make students know and apply communication strategies in diverse hospital and healthcare settings. It includes internal communication within staff of various departments, personnel, staff and patients, staff and relatives and external communication.

**Objectives:**

- To give students an overview about different types and settings of communication in a healthcare set up.
- To enable to practice and perform communication skills in different healthcare settings and situations.

<b>Unit-I</b> <b>Types of Communication:</b> <b>Oral Communication:</b> Meaning, nature and scope of oral communication, The art of listening - Principles of good listening. <b>Principles of effective oral communication:</b> Techniques of effective speech, Media of oral communication (Face-to-face conversation, Teleconferences, Press Conference, Demonstration, Radio Recording, Dictaphone, Meetings, Closed circuit TV, Demonstration and Dramatization, Public address system, Rumour, Grapevine, Group Discussion, Oral report). <b>Written Communication :</b> Need and functions of business letters - Planning and layout of business letter, types of business letters e.g. reports, memos, and notices etc., Essentials of effective written communication.	<b>18</b>
<b>Unit-II</b> <b>Barriers of Communication:</b> Lack of planning, semantic distortion, poorly expressed message, poor listening, distrust, threat and fear, improper communication, premature evaluation, insufficient period for adjustment to change, internal and external environment. Communication within the hospital and with external agencies.	<b>6</b>
<b>Unit-III</b> Doctor-Staff communication, Doctor-Patient Communication, Staff- Patient Communication, Staff- relatives communication, Breaking bad news	<b>6</b>

**Books:**

1. Guffey ME. Essentials of business communication. Cengage Learning; 2006 Jan 24.
2. Shirley T. Communication for Business: A practical approach. Pearson Education India; 2005.
3. Wolfe R. Speedmailing: Turn your work enemy into your best work tool. Pearson UK; 2016 Sep 26.
4. Kumar S, Lata P. Communication skills. New Delhi: Oxford University Press; 2011.
5. Mohan RS. Business Correspondence and Report Writing, 3e. Tata McGraw-Hill Education; 2002 Feb 1.
6. Jordan RR. English for academic purposes: A guide and resource book for teachers. Cambridge University Press; 1997 Feb 13.
7. Swales JM, Feak CB. Academic writing for graduate students: Essential tasks and skills. Ann Arbor, MI: University of Michigan Press; 2004 Apr.
8. Zinsser W. On writing well. HarperCollins Publishers; 1991 Sep.
9. Bovee CL, Thill JV, Raina RL. Business communication today. Pearson Education India; 2016.

**Introduction:**

The course focuses on development of fundamental concepts in management accounting. Students develop skills to apply this knowledge in preparation, planning, budgeting, controlling and auditing decisions.


**Objectives:**

- To acquaint students about fundamental concepts in management accounting.
- To equip students to participate and perform in financial planning, budgeting, controlling and auditing decisions in an organization.

<b>Unit I</b> <b>Introduction of Management Accounting:</b> Concept and Characteristics, Financial Accounting Information, Comparison of Financial and Management Accounting, Principles of Accounting, The Accounting Cycle, Basic Accounting, Entries.	<b>4</b>
<b>Unit II</b> <b>Introduction to cost accounting:</b> Purpose, Utility and Interrelationship of financial Accounting and Management Accounting with Cost Accounting.	<b>4</b>
<b>Unit III</b> <b>Understanding basic components of accounting systems</b> Economic entity, Monetary assumption, Depreciation, Accrual basis, Time period, Cost value/ historical value, Disclosure, Going concern, Double entry system.	<b>4</b>
<b>Unit IV</b> <b>Accounting for health care:</b> Types of accounts, Ledgers, Journals, Trial Balance, Profit and Loss accounts, Balance Sheet, Error and Rectification.	<b>4</b>
<b>Unit V</b> <b>Elements of Costs:</b> Fractions and Segment, Classification of Cost: Direct and Indirect Cost Classifications.	<b>3</b>
<b>Unit VI</b> <b>Materials:</b> Purchasing Procedure, Organisation Control and Records, Control over Materials, Inventory Control Techniques, and Accounting for issue of Materials from stores.	<b>4</b>
<b>Unit VII</b> <b>Overhead:</b> Accounting and Control of Overhead, Classification and Absorption of Overheads.	<b>2</b>
<b>Unit VIII</b> <b>Costing Reports:</b> Cost sheet, Ratio analysis.	<b>5</b>

**Books:**

1. Jain PK. Cost accounting. Tata McGraw-Hill Education; 2000.
2. Arora MN. Cost Accounting: Principles & Practice. Vikas publishing house; 2000.
3. Hopwood AG, Miller P, editors. Accounting as social and institutional practice. Cambridge University Press; 1994 Oct 6.

  
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**Introduction:**

The course assists students to develop medical vocabulary used in hospital and healthcare industry. It helps students to understand the correct use of medical terms.

**Objectives:**

- To develop medical vocabulary in students needed to work in hospital and healthcare industry.
- To help students use and understand the correct use of medical terms.

<b>Unit I:</b> Objective, Basic Elements of Medical Terms - Root, Prefixes, Suffixes, Colours, Numeral, Symbols, Abbreviation, Terms pertaining to Body as a whole.	<b>8</b>
<b>Unit II:</b> Terms relate to investigations and operation, treatment of conditions, disorders of: Skin and Breast (integumentary system), Musculoskeletal, Neurological and psychiatric disorder, Cardio-vascular, Blood and blood forming organs, Respiratory, Digestive, Uro-genital, Gynecological, Maternal, Antenatal and Neonatal conditions, Endocrine and Metabolic, Sense organs - Vision & Hearing, Systemic: Infections, diseases, Immunological diseases, diseases of the connective tissue, Geriatrics and Psycho geriatrics.	<b>14</b>
<b>Unit III:</b> Supplementary terms: Selected terms relating: Oncology, Anesthesiology, Physical Medicine and Rehabilitation, Nuclear medicine, Plastic surgery of burns and maxillofacial surgery, Radio- Diagnosis, Radiotherapy.	<b>8</b>

**Books:**

1. Willis MC. Medical terminology: a programmed learning approach to the language of health care. Lippincott Williams & Wilkins; 2007 May 1.
2. Willis MC. Medical terminology: the language of health care. Lippincott Williams & Wilkins; 2006.
3. Steiner SS, Capps NP. Quick medical terminology: a self-teaching guide. John Wiley & Sons; 2011 Aug 23.
4. Henderson B, Dorsey JL. Medical terminology for dummies. John Wiley & Sons; 2015 Jan 27.
5. Chabner DE. Medical Terminology: A Short Course-E-Book. Elsevier Health Sciences; 2014 Sep 30.
6. Leonard PC. Quick & Easy Medical Terminology-E-Book. Elsevier Health Sciences; 2015 Dec 4.



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**Introduction:**

The course would develop hands on experience in MS word, MS power point, MS excel and other basic computer operations.


**Objectives:**

- To acquaint students about fundamental computer operations.
- To allow students to practice and perform various computer applications.

<b>Unit I</b> <b>Introduction to computers and Information Technology:</b> Fundamentals of computer, Introduction, Input / Output and Processing (CPU), Memory Device, Types of computers, Characteristics of Computer, History and Generation, Applications of Computer generation of computers, input and output devices: memory and operating systems, Concepts of Hardware and Software, data processing, information processing.	<b>6</b>
<b>Unit II</b> <b>Numbering System Representation of data/problem solving techniques and database:</b> Introduction to Number systems, Decimal arithmetic, Binary arithmetic, Algorithms, Flowchart, and Programming Languages. Introduction to Database, DBMS, and Database model.	<b>6</b>
<b>Unit III</b> <b>Computer Communication and Internet:</b> Basic of Computer networks, LAN / WAN, Concept of Internet , Application of Internet , Service on Inter Net , WWW and web-sites , Electronic mails , Communication on Internet , WWW and Web Browsers , Web Browsing software, Surfing the Internet, Chatting on Internet, Email, Virus.	<b>8</b>
<b>Unit IV</b> <b>Windows and MS Office :</b> MS Word: Word, Editing and formatting documents, macro commands, Presentation of documents, Excel and Power Point applications.	<b>10</b>

**Books:**

1. O'Brien JA, Marakas G. Introduction to information systems. McGraw-Hill, Inc.; 2005 Oct 26.
2. Elias M. Awad, System Analysis and Design, Galgotia Publications, New Delhi, 1998.
3. V.Rajaraman. Fundamentals of Computers Prentice Hall India, New Delhi 1996.

  
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**Introduction:**

This course gives an overview about the components and various aspects involved in planning, budgeting, marketing, commissioning etc., of hospital and healthcare projects.

**Objectives:**

- To give students an overview about various components of project management.
- To enable students to develop their skills in handling hospital and healthcare projects.

<p><b>Unit I</b>  <b>Overview of Project Management</b>                  Project Management Framework, Project Life cycle, Project Management Roles, Overview of Projects</p>	<p><b>3</b></p>
<p><b>Unit II</b>  <b>Project Integration Management</b>                  Project Plan Development, Project Manager Skills, Project Charter, Project Sponsors</p>	<p><b>2</b></p>
<p><b>Unit III</b>  <b>Project Scope Management</b>                  Work Breakdown Structure (WBS) , Project Planning and Cost Controls, Statement of Work (SOW), Customer Approvals and Reviews, Scope Change Control</p>	<p><b>2</b></p>
<p><b>Unit IV</b>  <b>Project Time Management</b>                  Activity List, Project Network Diagram Methods, Duration Estimating Methods, Critical Path, Pert, Schedule Development , Crashing, Fast Tracking, Resource Allocation, Slack/Float, Schedule Control , Dependencies</p>	<p><b>2</b></p>
<p><b>Unit V</b>  <b>Project Resource Management</b>                  Resource Requirements, Cost Estimating Methods, Cost Budgeting, Budgets, Contingency/Management, Reserve Funds, Earned Value Concepts, Earned Value Analysis, Human resource Management Processes, RAM (Responsibility Assignment Matrix), Project communication management, MS Project formats,</p>	<p><b>3</b></p>
<p><b>Unit VI</b>  <b>Project Quality Management</b>                  Project Quality Management Processes, Overview of Quality Concepts, Quality Planning /Assurance/Control, PDCA Model, Flowcharting/Control Chart, monitoring and control</p>	<p><b>2</b></p>
<p><b>Unit VII</b>  <b>Project Risk Management</b>                  Project Risk Management Processes, Risk Defined, Types of Risk, Risk Factors , Risk Identification, Sources of Risk, Risk Quantitative Analysis, Risk Qualitative Analysis, Risk Response Strategies, Prioritizing Risk, Workarounds, Expected Value, Decision Trees</p>	<p><b>2</b></p>
<p><b>Unit VIII</b>  <b>Project Procurement Management</b>                  Project Procurement Management Processes, Make / Buy Decisions o Elements of a Contract, Contract Types, Statement of Work / Contracts</p>	<p><b>4</b></p>

  
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<b>Unit IX</b> <b>Hospital Project :</b> Introduction to planning of various department of hospital Guiding principles in planning, Conception of idea, hospital planning team, architecture and design brief, Financial planning of hospitals, Conception to commissioning: site development, equipment planning, bed distribution, space allocation, Tender process	<b>6</b>
<b>Unit X</b> <b>Miscellaneous:</b> Root cause analysis, Role of hospital executive in project management and decision making, Role of stakeholders in the project management, Carbon foot print, LEEDS	<b>4</b>


**Books:**

1. David Shirley. Project Management for Healthcare. CRC Press, 2011
2. S Choudhury. Project Management. Tata McGraw Hill, 1988
3. Prasanna Chandra. Projects: Planning, Analysis, Selection, Financing, Implementation, and Review. Tata McGraw Hill, 2010
4. Erik Larson & Clifford Gray. Project Management: The Managerial Process. McGraw Hill, 2010
5. Harold Kerzner. Using the Project Management Maturity Model: Strategic Planning for Project Management. Wiley, 2005



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## SEMESTER- II



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Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

**Introduction:**

This course helps to develop basic awareness of management functions of hospital departments. It highlights the need of operative planning, organizational structure and performance in hospital and healthcare set ups.

**Objectives:**

- To develop awareness of management functions of hospital departments in the students.
- To help students know the need of operative business planning, organization structure in healthcare set ups.

<b>Unit I</b> <b>Hospital – An Introduction</b> History and development of hospitals, Role of hospital in society, Functions of hospital, Role in health care delivery system, Hospitals in India today- their number, growth of hospitals & classification of types, size, distribution, ownership, hospitals utilization, issues & trends	6
<b>Unit II</b> <b>Hospital Management as a Specialty</b> Peculiarities of health care organisations, Factors influencing care, Role and functions of hospital administrators, Differences and Issues in administration of teaching, corporate, charitable, PHC, government hospitals etc.	2
<b>Unit III</b> <b>Organisation Structures</b> Hierarchy, Role of all departments in various hospital settings, Governing authority, Channels of communication, Systems Approach to Hospitals The function, responsibility and role of Governing body, Chief Executive (Administrator) and Medical Staff and relationship among them, Medical staff organization. Co-ordination, Communication, and Decision making in Health Care .Organizational productivity-input and evaluation of productivity, System policy, Procedure.	4
<b>Unit IV</b> <b>Overview of departments in the hospital</b> Organization of hospital, Clinical, Administrative, Support services Recent Trends: Ethical issues, Challenges to administrators, Expectations of community from hospitals	4
<b>Unit V</b> Operative Planning- Characteristics, Objective goal, strategic and long term planning. Hospital Utilization & its evaluation, Use of modern tools and techniques for improvement of operational efficiency. Emerging Trend in Health Care.	4
<b>Unit VI</b> Organizational Performance, Assessment of strengths and weakness, strategic thinking and preparation of long term plan. Analysis of organization structure, role analysis, role clarity, system of accountability, Organizational dynamics. Operational and management control in health care, Management By Objective	4
<b>Unit VII</b> Continuous quality improvement, defining standards, use of advanced quality	6

management techniques, Review and Evaluation – continuous review of system, policy, procedure, process of updating, working out indexes and indexes for evaluation of various services. Productivity study, development of productivity standards, work standards, utilization standards and indices, Latest changes and development in Health Management. Managed Care / Health Maintenance Organization (H.M.O)

**Books:**

1. Kunders GD. Hospitals: facilities planning and management. Tata McGraw-Hill Education; 2004.
2. Goel SL, Kumar R, editors. Hospital Administration and Management. Deep & Deep Publications; 2002 Aug 1.
3. Goel KR, editor. Hospital supportive services. Deep and Deep Publications; 2004.
4. Sakharkar BM. Principles of Hospital Administration and Planning, Jaypee Brothers Medical publishers (P) Ltd. New Delhi. 1999.



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**Introduction:**

The course will give an overview to students about architectural planning, design according to operation of hospital. All facets of hospital planning activities like survey, MEP, HVAC planning, LEED certifications etc. are included in the course.

**Objectives:**

- To give students an overview about architectural planning, design of a hospital.
- To introduce students to the tools of hospital planning, like survey, MEP, HVAC planning, LEED certifications etc.

<p><b>Unit I</b>  <b>Surveying the community</b>                  Area wide planning, Planning for general hospital service, Determining the logical centers for hospital location, Determining the area served by them, Estimation of occupancy and bed ratios, Determining the size and kind of hospital service</p>	<p><b>6</b></p>
<p><b>Unit II</b>  <b>Hospital Planning</b>                  Changing system of health services, Concepts in planning, designing &amp; space, An overview of hospital buildings, Quality of facilities and services, Evaluation of all resources needed</p>	<p><b>6</b></p>
<p><b>Unit III</b>  <b>Architectural Planning</b>                  Functional plans for hospital construction , Role of hospital consultant, Planning stage: role of architect, working drawings, legal formalities, the hospital site, design considerations, environments regulations, equipment planning, bed distribution, space requirements, their relationships, construction costs, External architectural aspects, Internal arrangements, HVAC Planning, Electric supply, water supply plumbing and sanitation, Medical gas supply and pipelines</p>	<p><b>6</b></p>
<p><b>Unit IV</b>  <b>Design &amp; Hospital Hygiene</b></p>	<p><b>4</b></p>
<p><b>Unit V</b>  <b>Recent Trends</b>                  Green Buildings, LEED certification, NBC regulations</p>	<p><b>8</b></p>
<p><b>Unit VI</b>                  Planning of 30,100,250 bedded hospital(general/specialty)                  Planning of 500, 750 and above bedded hospital(teaching/super-specialty/non-teaching specialty hospitals)                  Project cost and total budget : Feasibility and viability study of Hospital                  Project conceptualization, functional requirements. Implementation.                  Environmental Control and Safety: General environmental control; infection control                  Addition/alteration of existing hospitals</p>	<p><b>15</b></p>

**Books:**

1. McCullough CS, editor. Evidence-based design for healthcare facilities. Sigma Theta Tau; 2010.
2. Rebel Roberts.Specialised Hospitals Design and Planning, Design Media Publishing Limited,2013
3. Richard Lyle Miller.New Directions in Hospital and Healthcare Facility Design, McGraw Hill,1995
4. Sangeet Sharma .Step by Step Hospital Designing and Planning.Jaypee Publication,2010

**Introduction:**

The course focuses on development of skills needed for planning and designing interiors, explore available options for landscaping in various healthcare set ups.

**Objectives:**

- To give students an overview about planning and designing interiors of hospitals.
- To introduce students to landscaping in various healthcare set ups.

<p><b>Unit I</b>  <b>Interior Designing</b>                  Principles and Elements of Design, Colour Theory, Digital Sketching, Usage of Space, Overview of Construction Materials, Functionalities of Interior Elements</p>	<b>4</b>
<p><b>Unit II</b>                  Converting Floor Plans to 3D Interiors, Creating Detailed Digital Drawings, Image-Editing Techniques, 3D Modelling, Texturing, Lighting &amp; Rendering</p>	<b>4</b>
<p><b>Unit III</b>  <b>Landscaping</b>                  Introduction and need, Benefits of natural environments within hospitals</p>	<b>4</b>
<p><b>Unit IV</b>  <b>Outdoor hospital spaces</b>                  Landscaped grounds, Landscaped setbacks, Front porches, Entry gardens, Courtyards, Plazas, Roof terraces, Roof gardens, Healing gardens, Meditation gardens, Viewing gardens, The viewing/walk-in garden, Edible gardens</p>	<b>6</b>
<p><b>Unit V</b>  <b>Outdoor design criteria for hospitals</b>                  Accessibility, Visibility, Feeling of Control, Feeling of security, Physiological comfort, Quiet, Familiarity, Flexibility, Sustainability</p>	<b>4</b>
<p><b>Unit VI</b>  <b>Hard landscape design</b>                  Gateways and entrances, Parking areas, Paths, Childrens' gardens, Dining areas</p>	<b>4</b>
<p><b>Unit VII</b>                  Art, Water, Site furniture, Seating, Signage, Lighting, Receptacles, Planting design</p>	<b>4</b>

**Books:**

1. Setola N, Borgianni S. Designing public spaces in hospitals. Routledge; 2016 Apr 14.
2. Panero J, Zelnik M. Human dimension and interior space: a source book of design reference standards. Watson-Guption; 2014 Jan 21.



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## Annexure 1


### PROCEDURE FOR SELECTION OF CANDIDATES INTO PGDHPD:

1. Candidate can get the application form and other details regarding the programme from our website **www.chmsr.net / or other revised web address**.
2. Interested candidate can download the application form and **post** the duly filled application form along with the processing fee and photocopies of required documents to below mentioned address.

**Center for Health Management Studies and Research,  
Bharati Vidyapeeth( Deemed to be University),  
2<sup>nd</sup> floor of College of Physical Education,  
Dhankawadi, Katraj, Pune 411043**

**Admission fees of Rs. 1500 has to be sent with application form in form of Demand Draft to "Director, Centre for Health Management Studies and Research"**

3. Selection process comprises of personal interview. The applications received will be scrutinized further and all the eligible candidates will be notified regarding the interview.
4. Personal interview will be held on 2<sup>nd</sup> or 4<sup>th</sup> Saturday in the month of March/ April/ May/ June or as needed.
5. Students will be selected based on their previous qualification, experience and performance in personal interview.
6. The selected candidates will be notified through email/ telephone.
7. The selected candidates are required to pay **full** fees within 15days of their selection.

  
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## Annexure 2

### LIST OF DOCUMENTS TO BE SENT ALONG WITH APPLICATION FORM

Attested photocopies of following documents need to be attached with application form:

1. Aadhar Card
2. Caste Certificate (if applicable)
3. 10<sup>th</sup> and 12<sup>th</sup> passing certificate
4. Graduation certificate along with mark list
5. Transfer certificate
6. Bonafide certificate
7. Migration certificate
8. Gap certificate (if applicable)
9. Experience certificate (if applicable)
10. Medical Fitness Certificate

Original documents of the above mentioned list should be submitted during 1<sup>st</sup> week of college re-opening.



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## Annexure 3

### LIST OF THE JOURNALS AND MAGAZINES NEWS PAPERS

#### JOURNALS


Sr. no	
1.	Health Policy and Planning
2.	Journal of Health Care Management
3.	Bulletin of WHO
4.	International Journal of Healthcare Technology & Management (IJHTM)
5.	Health Facilities Management
6.	Health Leaders.
7.	Hospital and Health Network / H&HN
8.	Journal of Public Health Management and Practice
9.	Indian Journal of Marketing
10.	Consumer Behaviour
11.	Service Marketing
12.	Indian Journal of Human Development
13.	Training and Development Journal
14.	Journal of Soft Skills
15.	British Medical Journal
16.	Lancet
17.	Indian Journal of Community Medicine

#### MAGAZINES

18.	Time
19.	The Economists
20.	E- Health
21.	Economic and Political Weekly
22.	Express Healthcare
23.	Yojana
24.	Seminars
25.	Marketing Mastermind
26.	4Ps

#### NEWS PAPERS

27.	Economics Times
28.	Hindu
29.	Times of India
30.	Business Standards
31.	Indian Express

  
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## Annexure 4

### ACADEMIC CALENDAR SUMMARY

In each term, apart from the regular classes following activities are included in the academic calendar:

- Field Visits
- Guest Lectures
- Regular Field Postings
- Conferences
- Extracurricular events

<b>Tentative Academic Calendar as Applicable to the Program</b>	
<b>For Every Admission Cycle</b>	
<b>First Year</b>	
<b>1<sup>st</sup> Semester</b>	July – October
Semester end Examinations	November
Diwali Holidays	As announced by Bharati Vidyapeeth( Deemed to be University)
Semester break	After semester examinations (2 weeks).
<b>2<sup>nd</sup> Semester</b>	
	December – March
Semester end Examinations	April
Summer Vacation	After semester examinations (4 weeks).
<b>Second Year</b>	
<b>3<sup>rd</sup> Semester</b>	July – October
Semester end Examinations	November
Diwali Hoildays	As announced by Bharati Vidyapeeth( Deemed to be University)
Semester break	After semester examinations (2 weeks).
<b>4<sup>th</sup> Semester</b>	
	December – March
Semester end Examinations	April

  
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## Annexure 5


### LIST OF TYPES OF ORGANIZATIONS FOR INDUSTRIAL VISITS, GUEST LECTURES AND FIELD ASSIGNMENTS, PROJECTS AND POSTINGS

Project, Field visits, postings and Guest Lecture for MHA students will be organized in/from the following areas:

- Hospitals
  - Teaching
  - Private
  - Corporate
  - Government
  - Charitable etc
- Pharmaceutical Industries
- NGOs
- Public Health Department
- Emergency preparedness and disaster management agencies
- Biomedical waste disposal units
- Health Insurance companies and TPAs
- Hospital administration & Healthcare consultancies
- Health informatics and Telemedicine and relevant related fields
- Hospital architecture consultancies
- Event management organizations
- Law firms
- Maintenance agencies
- Focused logistics agencies
- Disaster mitigation agencies

For these activities liaisoning and formal contacts with various organizations would be initiated

Students would be granted leave to attend conferences/ workshops related to the course

  
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## Annexure 6

### GUIDELINES FOR CONCURRENT ROTATORY PRACTICAL POSTINGS (CRPP), PROJECT POSTINGS

Various training programmes are designed to help students to simplify the formal and informal steps involved in successful administration and operation. In this training the focus will be on description of role, the necessary documents needed to formalize monitor and complete the training process and some pearls of wisdom from other preceptors.

**Objective 1: To gain practical experience in health services administration or planning.**

**Objective 2: To apply knowledge learned in the classroom/ field and to analyze organizational activities.**

**Objective 3: To learn the key aspects of a health services delivery system, including location of resources.**

**Objective 4: To develop a professional identity, including communication and time management skills.**

#### **Details of Concurrent Rotatory Practical Postings (CRPP),**

Hospital and Healthcare organizations would be chosen as per the following criteria:

- Any hospital should be minimum of 30 bed capacity.
- The hospital should be a multispecialty hospital or a single specialty hospital with atleast 50 beds.
- The healthcare organizations should be of repute and with substantial experience and work in the domain.
- Student will have to submit project reports in the areas of Hospital/ Healthcare Administration in problem areas identified by the respective departments/companies during their training period.
- Projects will be carried out concurrently with academic sessions.

**\*Student will have to submit project reports in the areas of Healthcare Administration in problem areas identified by the respective departments/companies during their training period. Projects will be carried out concurrently with academic sessions daily 3 hours (2.00 pm-5.00pm).**

Students are supposed to study the following areas as relevant to the course, of the organization as a part of training and are required to maintain the Journal specifying the detailed procedures of below mentioned areas:

#### **I Hospital Administration:**

##### **1 OPD Services**

Involvement in:-

- 1) Layout of Reception Desk in OPD
- 1) Registration and department wise OPD Card segregation
- 2) Location of the concerned Department
- 3) Reception of patients
- 4) Physical facilities in OPDs
- 5) Close supervision of Doctor's Chamber for the followings:-
  - Availability of
    - a) Prescription Pad,
    - b) Stethoscope
    - c) View Box,
    - d) Bed Trolley
    - e) Weigh Machine
    - f) Torch Light
    - g) Gloves
    - h) Liquid soap and towel
  - 5) Records maintenance of OPD
  - 6) Supervision of patient waiting area and its seating arrangement
  - 7) Adequate communication with other departments / units / wards etc.
  - 8) Public Addressing System
  - 9) Deployment of Staff like Jr. Doctor, Para Medical Staff, Receptionist, Assistant etc.

## 2 Reception

Participation in the process of:-

- 1) Receiving patients and providing information
- 2) Providing information of availability of doctors
- 3) Fixing appointment with doctors
- 4) Arrangement of direct admission for urgent cases
- 5) Public Address System
- 6) Supervising internal transportation system
- 7) No. of Receptionist required to handle the Desk

## 3 Registration

Participation in the process of:-


- 1) Infrastructure – Lay out, Physical facilities,
- 2) Patient registration
- 3) Assisting in collection of hospital charges
- 4) Transmitting information to respective doctor
- 5) Assisting in sending patient to the respective departments
- 6) Computer based functional activity by Receptionist

## 4 Admission Desk

Involvement in the process of:-

- 1) Documentation of registration for Admission of patients
- 2) Preparation of files with relevant papers
- 3) Observing the process of receiving advance payment during admission either by cash or credit card
- 4) Formalities of procedures for ensuring availability of payee's fund
- 5) Distribution of visiting card, literatures, brochure etc. to the client
- 6) Transfer of Patient to ward
- 7) Ambulance management and billing
- 8) Deployment of no. of Receptionist-cum-Office Assistant
- 9) Foreign Exchange facilities

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## 5 Billing & Discharge

Involvement in the process of:-

- 1) Assimilation of information through LAN from the different departments
- 2) Checking of data in the computer
- 3) Observation of different billing system like;
  - a) Cash Billing – As per hospital's prevailing rate schedule
  - b) TPA Billing – As per hospital's prevailing rate schedule
  - c) Copt. Billing – Tailor-made billing as per agreement
- 4) Handing over the bill to the patient party
- 5) Providing Birth Certificate, Amputated Certificate, Death Certificate, Referral Letter, as and when required
- 6) Providing discharge certificate in original along with all relevant documents for cash payee patient and photo copy of discharge certificate to the corporate and TPA patients
- 7) Deployment of no. of Receptionist-cum-Office Assistant
- 8) Facilities – Computer, Swapping Machine, Note Counting Machine, Communication facility

## 6 Pharmacy Services

Involvement in:-

- 1) Space requirement as per act
- 2) Lay out
- 3) Storage facility – different set up for different type of drugs
- 4) Equipments
- 5) Organizational structure (role and function)
- 6) Purchase of drugs – disposables, consumables etc.
- 7) Purchase of food items
- 8) Quality control
- 9) Proper storage of drugs
- 10) Sales policy
- 11) Record maintenance
- 12) Preparation of Accounts
- 13) Pharmacy Audit

## 7 Laboratory Services

Observation of:-

- 1) Location
- 2) Structural facility
- 3) Administrative Area
- 4) Laboratory equipment
- 5) Lighting in laboratory
- 6) Laboratory furniture
- 7) Special mechanical and electrical equipments
- 8) Various functional units
  - a) Clinical pathology
  - b) Hematology
  - c) Bio Chemistry
  - d) Histology
  - e) Bacteriology and Serology
- 9) Auxiliary service area
- 10) Collection of samples and delivery of reports
- 11) Requirements for various quality accreditation systems
- 12) Organization



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## 8 Imaging Services

Observation of:-

- 1) Layout of X-ray rooms
- 2) Various types of imaging machines and its usages
- 3) Maintenance of imaging machines
- 4) Protective gears
- 5) Precaution taken for Hazardous radio activity
- 6) Licenses required
- 7) General and special investigations
- 8) Layout of Reception area
- 9) Dress changing area of patient
- 9) Film processing room
- 10) Analysis of developed film and preparation of report
- 10) Storing of developed film
- 11) Delivery of film to patient / ward
- 12) Roll of Radiologist, Technicians, and Office Assistant of Radiology Dept.

## 9 Emergency

Observation of:-

- 1) Location of Emergency in hospital
- 2) Basic layout of Emergency
  - (a) Receiving patients
  - (b) Patient examination zone
  - (c) Patient investigation zone
  - (d) Procedure room
  - (d) Cardio Pulmonary Resuscitation Unit
  - (e) Dead patient barrier
  - (f) EMO's Office
  - (g) Nursing Station
- 3) Infrastructural facilities
  - a) Office of EMO
  - b) Nursing Office
- 4) Equipments
- 5) Legal procedure system
- 6) Emergency Operation Theatre
  - (a) Arrangement of instruments and oxygen for minor Operation
  - (b) Sterilization and fumigation of O.T. Room
- 7) Admission procedure
- 8) Billing for day care procedure in Emergency Dept.
- 8) Staffing
  - i) Medical
  - ii) Para Medical
- 9) Security

## 10 Critical Care Unit

Observation / involvement in:-

Physical structure and facilities

- 1) Organizational structure
- 2) Bed orientation pattern
- 3) Lighting system
- 4) Monitoring system including connection to centralized monitoring system
  - (a) Invasive



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- (i) Central Venous Pressure (CVP)
- (ii) Arterial Blood Pressure monitoring
- (iii) Cardiac output monitoring
- (iv) Pulmonary Arterial monitoring

(b) Non-invasive

- (i) Heart beat rate
- (ii) Blood Pressure
- (iii) Respiratory rate

(iv) Intake & output monitoring

Maintenance of sterility and general cleanliness

- 1) Maintenance of sterility of the ward
- 2) Maintenance of sterility of clothing used in CCU
- 3) General sterilizing procedures before examination of the patient

Administration of CCU

- 1) Qualified doctor having experience in CCU (as per WHO ratio)
- 2) Qualified nurse having experience in CCU (as per WHO ratio)
- 3) Deployment of qualified paramedical staff (as per WHO ratio)

Workflow

In flow of patient

- 2) Type of patients commonly admitted in CCU
- 3) Pattern of treatment patient receive in CCU
- 4) Type of patient actually needs life saving support
- 5) Out flow of patient
- 6) Counselling with outside visitors / patient party

Equipment maintained in CCU

- 1) Monitor
- 2) Ventilator
- 3) Defibrillator
- 4) ECG and other equipments used in CCU

Equipment maintained in specialized CCU

- 1) Intra Aortic Balloon Pump
- 2) Photo Therapy Machine

Maintenance of uninterrupted gas and power supply system and their utilization

1) Continuous wall flow oxygen

Compressed air

- 3) Suction Apparatus (Vacuum Pump)
- 4) Uninterrupted Power Supply (UPS) line

## 11 Operation Theatre

Observation / involvement in:-

- 1) Location
- 2) Zoning of Operation Theatre
- 3) Infrastructural facilities
- 4) Centralized and decentralized Operation Theatres
- 5) Equipment requirement
- 6) Procurement and maintenance including annual maintenance contract
- 7) Functions and policies of Operation Theatres
- 8) Manpower requirement
  - a) Medical Superintendent
  - b) In-charge
  - c) Anaesthetist
  - c) Nursing personnel



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- d) Technician
- e) Ward Boy
- 9) Duties and responsibilities including standard operation procedures
- 10) Safety procedures
- 11) Methods of checking operating rooms for readiness to receive patient
- 12) Periodical sterilization / fumigation
- 13) Sterile supply
- 14) Equipments procurement and maintenance

## 12 Wards

Observation of:-

- 1) Ward Composition - Beds Patient Ratio
  - 1) Lay out
  - 3) Types of ward
  - 4) Physical facilities
    - a) Nursing Station
    - b) Doctor's room
    - c) Dirty utility room
    - d) Dress Changing room
    - e) Sanitary facilities
    - f) Dressing room for minor treatment
    - g) Isolation room
    - h) Ward Pantry
    - i) Day room
    - j) Barrier Nursing
    - k) Other facilities
      - i) Ward side Laboratory
      - ii) Linen Store
      - iii) Drug Store etc.
  - 5) Other Equipment facilities
    - a) Electronic Monitoring Devices
    - b) Ventilation Devices – Natural & Mechanical
    - c) Ward Lighting
    - d) Calling Bell
    - e) Fire Alarm System
  - 6) Organization
  - 7) Communication facilities
  - 8) Methods of patients' record keeping in wards / technical / medical details
  - 9) Admission and Discharge procedures
  - 10) Billing system / generation of bills based on bed head ticket entry
  - 11) Cleanliness
  - 12) Duty arrangement of various medical and para medical staff

## 13 Burn Unit

Observation / involvement in:-

- 1. Location
- 2. Infrastructural facility
- 3. Special equipment requirement for Burn Unit
- 4. Attached Laboratory facility
- 5. Communication facility
- 6. Maintenance of Asepsis
- 7. Manpower



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## 8. Mechanism for specialized training need assessment

### 14 Blood Bank

Observation / involvement in:-

- 1) Location
- 2) Reception
- 3) Special arrangements for voluntary donors
- 4) Administrative Office
- 5) Record Keeping
- 6) Servicing rooms
- 7) Bleeding Room
- 8) Storage Room
- 9) Storage equipment
- 10) Regulatory requirement
- 11) Blood safety procedures
- 12) Receive and delivery of blood
- 13) Triple screening and check method
- 14) Record keeping
- 15) Medico-legal aspects
- 16) Physical facilities
- 17) Waiting facilities
- 18) Laboratory facilities
- 19) Other facilities
- 20) Issuance of Blood Donor Card
- 21) Safety devices
- 22) Liquid waste management
- 23) Procedure for discarding
- 24) Staffing

### 15 Central Sterile Supply Department (CSSD)

Observation of

- 1) Location
- 2) Name and function of equipments
- 3) Items processed by Central Sterile Supply Department
- 4) Sterilization technique
  - a) Heat
  - b) Gas
  - c) Liquid
  - d) Ionizing radiation
  - e) Others
- 5) Work flow
- 6) Clean zone, dirty zone
- 7) Pooling of materials, equipments
- 8) Function of different equipments used for sterilization
- 9) Process of receiving and distribution of materials
- 10) Technique of Gauge folding
- 11) Cleaning, drying and packing of sterilized materials
- 12) Segregation of Dirty zone and clean zone
- 13) Process of receiving and distribution of materials
- 14) Quality control checking of sterilization in collaboration with Micro-biology Lab.
- 15) Organization
- 16) CSSD Committee



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## 16 Medical Records Department

Observation / involvement in

All elements of physical records maintenance plus

- 1) Alphanumerical data
- 2) Machine generated data
- 3) Image data
- 4) Interpretation of data
- 5) Derived data
- 6) Storage process of electronic data
- 7) Data classification
- 8) ICD – 10 System and its use in electronic records maintenance system.

## 17 Maintenance Department

Observation of

- a) Location of different maintenance department
- b) Lay out
- c) Power Generation and supply
- d) Water Treatment Plant and distribution system
- e) Demineralization Plant with R.O. facility for Dialysis unit
- f) Oxygen Plant
- g) Effluent Treatment Plant
- h) Air Condition Plant and distribution system
- i) Maintenance of the medical equipments, calibration
- j) Maintenance of total hospital building – civil, electrical and mechanical
- k) Organization
- l) Bio Medical equipment and their function
- m) Observation of Bio-Medical Equipments
- n) Knowing the name of the Bio-Medical Equipments
- o) Importance and fundamental functions of Bio-Medical Equipments
- p) Maintenance procedures of Bio-Medical Equipments
- q) Need assessment and procurement procedure
- r) Periodical audit of Bio Medical Equipment
- s) AMC of Bio Medical Equipments

## 18 Personnel / H. R. Department

Observation of:-

- a) Present employee status
- b) Selection and recruitment procedure
- c) Employee appraisal system
- d) Employee training and development system
- e) Retirement and retirement benefit system
- f) H. R. Audit
- g) Wage Administration

## 19 Marketing

Observation / involvement in:-

- 1) Office Lay out
- 2) Different types of advertisement for projection
- 3) Fixture required for marketing
  - (a) Banner
  - (b) Leaflet
  - (c) Hoarding



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- (d) CD / VCD / DVD
- 4) Media Management (Print, Electronic)
- 5) Event Management (Camp, Seminar, CME)
- 6) Institutional / Corporate marketing
- 7) Direct marketing
- 8) Channel / Franchise marketing
- 9) Data analysis
- 10) Patient feed back
- 11) Organization

## 20 Laundry & Linen Services

Observation of

- 1) Location
- 2) Work flow
- 3) Physical facilities of Laundry
  - a) Receiving, Storing, Sorting, washing area
  - b) Central Disinfection Area
  - c) Cleaned Linen processing room
  - d) Laundry Manager's Office
  - e) Staff Room
  - f) Sewing and inspection area
  - g) Supply storage room
  - h) Solution Preparation area
  - i) Cleaned Linen issue area
  - j) Natural ventilation and light
  - k) Free Linen movement area
- 4) Other facilities
  - a) Adequate Water supply
  - b) Drainage system
  - c) Adjacent power supply
  - d) Steam
  - e) Compressed air
- 5) Arrangement of equipments
- 6) Soiled linen receiving from ward, OT, other areas
- 7) Process of sorting and cleaning, washing, drying, ironing
- 8) Collection and storing process of cleaned linen
- 9) Sorting of discarded linen and sending them to the Store
- 10) Process of linen distribution
- 11) Maintenance of hygiene
- 12) Infection control process
- 13) Process of staff training
- 14) Process of co-ordination among the related departments
- 15) Manpower

## 21 Kitchen & Dietary Services

- 1) Overview of kitchen lay out and its adjacent areas
- 2) Physical facilities
  - a) Receiving area
  - b) Washing area
  - c) Preparation area
  - d) Cooking area
  - e) Storing area



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- f) Food Distribution area
- g) Garbage disposal area
- h) Office of Kitchen Manager
- i) Office Kitchen Staff
- 3) Work Flow
- 4) Patient visit and observation of the diet chart preparation
- 5) Observation and process of:-
  - i) Coordination with Dietitian before preparing process of food for patient
  - ii) Receiving and storage of perishable and non-perishable food
  - iii) Process of calculation the quantity of perishable & non-perishable items to be cooked
  - iv) Washing, cutting, preparation and cooking process
  - v) Storage of cooked food and precaution to be taken
  - vi) Delivery process of hot food (Hot Trolley) to patient according to diet chart
  - vii) Process of distribution of food in the cafeteria and dining hall
  - viii) Maintenance of hygiene by kitchen staff
  - ix) Safety measure
  - x) Receiving of soiled utensils and left over food
  - xi) Collection of utensils and washing process
  - xii) Garbage disposal system
  - xiii) Maintenance of Accounts
  - xiv) Pest control system
  - xv) Process of supervision and leadership style
  - xvi) Educational programme, research, dietary counseling etc.
  - xvii) Periodical audit
- 6. Organization

## 22 Security Services

Observation of:-

- 1) Security room and posts
- 2) Security services in the hospital
- 3) Role of Security during patient visiting hours
- 4) Traffic control inside the hospital
- 5) Maintenance of fire precautions
- 6) Process of medico legal activities

## 23 Transportation Services

Observation of:

- a) Different internal and external transport
- b) Different ambulances
- c) Ambulances enmarked for communicable disease
- d) Facilities given in the emergency ambulance
- e) Maintenance of ambulance
- f) Maintenance of internal transportation

## 24 Mortuary

Observation / involvement in:-

- 1) Location
- 2) Physical facilities
- 3) Body refrigerator
- 4) Walk in refrigerator
- 5) Capacity decision of Mortuary
- 6) Autopsy facility



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- 7) Requirement for autopsy room
- 8) Preservation / identification/leveling of viscera / body fluids and other materials for medicolegal purposes
- 9) Embalming procedures
- 10) Methods of long distance transport of dead bodies
- 11) Arrangements for religious rites
- 12) Mortuary traffic control
  - a) Internal
  - b) External
- 13) Identification of bodies using triple check system
- 14) Maintenance of records
- 15) Various legal requirements
- 16) Disposal of unclaimed bodies
- 17) Various religious rites

## **25 Library in Hospital**

Observation the functioning of:-

- 1) Library work flow
- 2) Physical facilities
- 3) Procurement of books and journals as per Good Office Committee (GOC) norms
- 4) Receiving the purchased books / periodicals, audio visual journals etc.
- 5) Preservation of books in the Shelves
- 6) Catalogue preparation
- 7) Process of issue and collection of books
- 8) Updating of catalogue annually
- 9) Library rules and regulations
- 10) Preparation of Membership Card
- 11) Repair of damaged books
- 12) Ascertaining of lost books and journals
- 13) Arrangement of educational programme through Video Satellite system
- 14) Stock verification of Library items periodically

## **II Telemedicine**


1. Infrastructure – both end – (1) Hospital end (2) Nodal Centre
2. Requirement
  - a) Computer Monitors
  - b) Cameras
  - c) Internet connection
3. Observation of telemedicine techniques and taking part in the process
4. Manpower

## **III Health Informatics**

1. Infrastructure Requirement
  - a) Computer Monitors
  - b) Cameras
  - c) Internet connection
2. Observation of informatics techniques and taking part in the process
3. Manpower requirement
4. Transmission modes

## **IV Medical Transcription**

1. Observation of techniques and taking part in the process
2. Infrastructural requirement

  
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3. Trained manpower
4. Transmission modes

**V Health Insurance company**

**VI Biomedical Waste Disposal Units**

**VII Clinical Research Organization**

**VIII Pharmaceutical Industry**

**IX Non-Governmental Organization**

**X Public Health Department**

**XI Emergency Preparedness & Disaster Management Agency**

**XII Healthcare Consultancies**

**XIII Event management organizations**

**XIV Law firms**

**XV Maintenance agencies**

**XVI Focused logistics agencies**

**XVII Other Scope Areas of Healthcare Administration**



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## Annexure 7

### EXAMINATION PATTERN

Attendance of 75% is mandatory to appear for examinations. Students will be evaluated throughout the two years programme as under:

- Ongoing internal assessments (which include students' attendance and participation in classroom &/ or experiential learning activities, interactive activities and assignments, field visit, tests in form etc.)
- Semester end University Examinations.
- Journal submissions.
- Project Reports and Viva-Voce.

The performance of student is evaluated on Cumulative Grade Point Average (CGPA) system.

Theory, Practical, University and Internal examinations should be passed separately.

#### Internal & University Examination Details

For each paper of 100 marks (3 credit courses), there will be an Internal Assessment (IA) for 40 marks and the University Examination (UE) for 60 marks. The UE will be of three hours duration.

For each paper of 60 marks (2 credit courses), there will be an Internal Assessment (IA) for 20 marks and the University Examination (UE) for 40 marks. The UE will be of two hours duration.

#### Marks Allocated for Internal and University Exams


Course Credits	Internal Assessment	University Exam	Total
3	40	60	100
2	20	40	60

#### Marks Allocation in Internal Assessment

Credits	Assignments	Class Tests( Written and /or Oral)	Participation*
3	10 marks	20 marks (1 per every course)	10 marks
2	5 marks	10 marks (1 per every course)	5 marks

\*Students participation in classroom &/ or experiential learning, discipline, group discussions, assignments, tests, field activities, performance reports, pro-activeness, field work and classroom &/ or experiential learning attendance etc.

For passing in the subject, student has to score minimum **40% marks separately in UE's & IA's**. Student should clear all the subjects of **I Semester** and would also be allowed to carry forward **maximum 3 subjects from II Semester to get admission into second year**. In this scenario, the student will be allowed **admission only in winter session (July - October) of the subsequent academic year/s only after** clearing all (I & II Semester) backlog subjects.


  
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Framework of University Examination			
Course Credits	Questions	Marks	University Total
3	<b>Section -I</b>		60 marks
	Out of 3 long answers (each carrying 10 marks), 2 should be answered.	10 x 2 = 20	
	Out of 3 short notes (each carrying 5 marks), 2 should be answered.	5 x 2 = 10	
	<b>Section -II</b>		
	Out of 3 long answers (each carrying 10 marks), 2 should be answered.	10 x 2 = 20	
	Out of 3 short notes (each carrying 5 marks), 2 should be answered.	5 x 2 = 10	
2	Two long answers (each carrying 11 marks) should be answered. There is no choice.	10 x 2 = 20	40 marks
	Out of 5 short notes (each carrying 5 marks), 4 should be answered.	5 x 4 = 20	

### Journal

Handwritten journal should be submitted in uniform format, as instructed by CHMSR faculty in I (administrative departments) and III (clinical/ specialization departments) semesters.

Journal Format	
S.No	Content
1	Certificate signed by Director, CHMSR
2	Certificate of Attendance signed by hospital/ healthcare organization authority
3	Organization Profile
4	Introduction to Department
5	Layout
6	Organization Structure
7	Department Work Details
8	Enlisting of Processes with Flowcharts of each process in the Department
9	Equipment List

  
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## Guidelines:

1. Title page & certificate should be colour printed.
2. The Journal should be hand written with hand drawn diagrams, however students can paste relevant photographs wherever needed by them.
3. The Journal should be spiral bound.
4. Certificate should signed by HOD of the department/institute where the student is posted.
5. Journal marks would be included in internal assessment under participation in each course of the semester.

## Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce

### Marks Distribution :

Sr.No	Seat No	Internal Assessment (40 Marks) <ul style="list-style-type: none"><li>• Organizational feedback about student<ul style="list-style-type: none"><li>○ General Behaviour-10</li><li>○ Punctuality-10</li><li>○ Efficiency -10</li></ul></li><li>• Posting Completion Certificate-10</li></ul>	Project Report and Viva-Voce (out of 60)
1			
2			
3			
4			
Seal			
Signature of Co-ordinator			

  
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## Project Marks Distribution

Sr.No	Seat No	Internal Assessment (40 Marks) <ul style="list-style-type: none"><li>• Proactiveness - 10</li><li>• Proposal – 10</li><li>• Progress Report – 10</li><li>• 2<sup>nd</sup> Progress Report – 10</li></ul>	Project Report and Viva-Voce (out of 60)
1			
2			
3			
4			
Seal			
Signature of Co-ordinator			

## Guidelines for Project Report


Students will start working on their project I simultaneously along with their academic sessions from the commencement of first semester.

Students will start working on project II simultaneously from the commencement of third semester.

For all the projects they would be posted in relevant organization daily for five hours (as needed) throughout the semester.

Students are supposed to submit the project report in the below mentioned format.

The evaluation of this will be at the end, the break up of which is mentioned above in tables.

  
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## Format of Project Report

S.No	Content	Project
i	Title Page	1 Page
ii	Acknowledgements	1 Page
iii	Certificate from CHMSR	
iv	Certificate from Organisation	
v	Executive Summary (Abstract)	2 Pages
vi	Contents	1 Page
vii	List of Tables	
viii	List of Graphs	
ix	List of Figures	
x	Abbreviations	1 Page
1	Introduction 1.1. Organization Profile(where project is done) 1.2. Definition and Purpose of the Project 1.3. Aim and Objectives of the Project 1.4. Value Addition to Existing System/ Set up	Max. 7 Pages
2	Review of Literature	Max. 15 Pages
3	Research Methodology 1.1 Method of Research 1.2 Type of Research 1.3 Objectives (with Justification) 1.4 Data Type – Primary & Secondary 1.5 Data collection 1.6 Sampling 1.7 Processing and Analysis of Data	Max. 5 Pages
4	Data Analysis and Interpretation	Min. 20 Pages
5	Conclusion	1-2 Pages
6	Limitations	1-2 Pages
7	Recommendations	
xi	Annexure	
xii	Bibliography	

### Standard of Passing:

In order to pass in a course, the student must obtain a minimum GP of 4.5 at UE and also a minimum Grade Point of 4.5 IA separately. Otherwise, he/she will have to reappear for the subject till he/she passes.

The Grade Point Index (GPI) for a course will be calculated by using the formula  $0.6 * GP (UE) + 0.4 * GP (IA)$ . At the end of each semester, a Cumulative Grade Point Average (CGPA) and also Semester Grade Point Average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A student shall be permitted to proceed from first semester to second semester irrespective of his/her back-log in any number of subjects.

Permission to third semester will be given on clearance of all first semester and atleast five courses of second semester.

A student shall be permitted to final semester irrespective of his/ her back-log in any number of subjects, once the student is permitted to third semester.

A student who passes in all the courses will be declared to have passed Masters in Hospital Administration (MHA) with the following honors:

CGPI in [4.00, 4.99]	Pass Class
CGPI in [5.00, 5.49]	Second Class
CGPI in [5.50, 5.99]	Higher Second Class
CGPI in [6.00, 7.99]	First Class
CGPI in [8.00, 10.00]	First Class with Distinction

### Grace marks & Mercy Marks

As per Bharati Vidyapeeth (Deemed to be University) guidelines.

### 10 Grade Point Scheme:-

The 10 point scale would be used to convert marks out of 100 to grades and grade points according to the following table:-

Range in % of marks	Range of CGPA	Letter grade
[75.0 - 100]	[9.00 - 10.00]	O
[70.0 - 74.9]	[8.00 - 8.99]	A+
[65.0 - 69.9]	[7.00 - 7.99]	A
[60.0 - 64.9]	[6.00 - 6.99]	B+
[55.0 - 59.9]	[5.50 - 5.99]	B
[50.0 - 54.9]	[5.00 - 5.49]	C+
[45.0 - 49.9]	[4.50 - 4.99]	C
[40.0 - 44.9]	[4.00 - 4.49]	D
[00.0 - 39.9]	[0.00 - 3.99]	F

### Structure of the Transcript:

At the end of each semester, student will be given a transcript showing the performance and result in each course. The transcript shows, for each course the title of the course, credit values, grade in University examination, grade in internal assessment, Grade point index, result as pass or fail. Also, the semester grade point average and cumulative grade point average will be shown. Further, the equivalent percentage of marks corresponding to SGPA and CGPA will be shown. The formula to convert SGPA or CGPA to equivalent percentage is given by:


$$10 \times \text{CGPA if CGPI/SGPI is in } [4.00, 6.00]$$

$$\text{Equivalent percentage marks} = 05 \times \text{CGPA} + 30 \text{ if CGPI/SGPI is in } [6.00, 9.00]$$

25 × CGPA-150 if CGPI/ SGPI is in [9.00, 10.00]

The percentage of marks can be obtained by using the following table:

CGPA	% of marks	CGPA	% of marks	CGPA	% of marks	CGPA	% of marks
4.0	40.0	5.5	55.0	7.0	65.0	8.5	72.5
4.1	41.0	5.6	56.0	7.1	65.5	8.6	73.0
4.2	42.0	5.7	57.0	7.2	66.0	8.7	73.5
4.3	43.0	5.8	58.0	7.3	66.5	8.8	74.0
4.4	44.0	5.9	59.0	7.4	67.0	8.9	74.5
4.5	45.0	6.0	60.0	7.5	67.5	9.0	75.0
4.6	46.0	6.1	60.5	7.6	68.0	9.1	77.5
4.7	47.0	6.2	61.0	7.7	68.5	9.2	80.0
4.8	48.0	6.3	61.5	7.8	69.0	9.3	82.5
4.9	49.0	6.4	62.0	7.9	69.5	9.4	85.0
5.0	50.0	6.5	62.5	8.0	70.0	9.5	87.5
5.1	51.0	6.6	63.0	8.1	70.5	9.6	90.0
5.2	52.0	6.7	63.5	8.2	71.0	9.7	92.5
5.3	53.0	6.8	64.0	8.3	71.5	9.8	95.0
5.4	54.0	6.9	64.5	8.4	72.0	9.9	97.5
						10.0	100

  
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**Center for Health Management Studies and Research**

**Masters in Hospital Administration (MHA)**

<b>Programme Duration</b>	<b>2 years</b>
<b>Credits</b>	<b>100</b>
<b>Programme Type</b>	<b>CBCS</b>
<b>Programme Fees</b>	<b>INR 1,65,000 only</b>
<b>Number of seats</b>	<b>30</b>
<b>Eligibility</b>	<b>Any Graduation, MBBS ,BDS , BAMS, BHMS, BUMS, BPTth, OPTth, other Health Sciences Graduates Preferred</b>



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## **Bharati Vidyapeeth**

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### **Centre for Health Management Studies and Research**

The nature of hospital and healthcare organizations has been diverse and varied in India. Nursing homes, small private hospitals as well as multi specialty tertiary care hospitals have emerged in large numbers over the last decade. However, there is an absence of homogeneity in their functioning or regulation. This can be brought about by way of enhanced governance training and development of healthcare managers who can play a crucial role in setting the background for this change.

With this focus and challenge in mind the Center for Health Management Studies and Research has been set up at the Bharati Vidyapeeth( Deemed to be University), Pune. The Center for Health Management Studies and Research has rapidly grown into a specialized training facility for a wide variety of cadres related to hospital and healthcare management, with a focus on patient centered care.

#### **Objectives of the Centre for Health Management Studies and Research:**

- To create a center of excellence in hospital and healthcare management, academics, research and consultancy.
- To empower working professionals enhancing their skill sets in the field to suit the changing needs of their workplace.
- To educate and train in-service personnel in the healthcare system in both private and public sector.
- To participate in health policy development and reform in order to share expertise and create a knowledge base for governance in health care.
- To offer consultancies as part of knowledge sharing and help healthcare organizations and individuals to plan their initiatives for proper implementation.
- To focus attention on the specific healthcare needs of India's growing urban centers and the accessible rural sectors and remote wilderness tracts.
- To develop and disseminate materials to enhance awareness on specific health issues in the public domain.

#### **Objectives of Masters in Hospital Administration**

- To provide a knowledge base for individuals who are interested in hospital and health care management.
- To help professionals develop analytical skills to face various issues in management of healthcare organizations.
- To enhance professional knowledge through theoretical, practical and on field training.
- To contribute trained and qualified personnel to ever growing field of hospital and healthcare management.

MHA -2018 program


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SEMESTER I – HEALTHCARE MANAGEMENT BASICS									
Course Code & Course		Theory Credits (Total Hours)	Practical Credits (Total Hours)	Teaching scheme			Examination Scheme (Marks)		
				Theory	Practical	*Tut/Sem	U/E	I/A	TOTAL
<b>CORE COURSES</b>									
I-101	Organizational Behaviour	2 (30)	1 (30)	3	3	1	60	40	100
I-102	Management Principles	2 (30)	1 (30)	3	3	1	60	40	100
I-103	Human Resource Management	2 (30)	1 (30)	3	3	1	60	40	100
I-104	Hospital Information System	2 (30)	-	2	-	0.5	40	20	60
I-105	Marketing Management	2 (30)	-	2	-	0.5	40	20	60
I-106	Business Communication	2 (30)	-	2	-	0.5	40	20	60
I-107	Management Accounting	2 (30)	-	2	-	0.5	40	20	60
I-108	Finance Management & Health Economics	3 (45)	-	3	-	1	60	40	60
I-109	Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva - Voce	-	3 (90)	-	6	-	60	40	100
<b>ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)</b>									
I-110	Basics Medical Terminology	2 (30)	-	2	-	-	-	100	100
I-111	Essential English	2 (30)	-	2	-	-	-	100	100
I-112	Information and Communication Technology	2 (30)	-	2	-	-	-	100	100
<b>TOTAL</b>		21 (315)	6 (180)	24	15	6	460	480	940
1 theory credit = 15 classroom &/or experiential learning hours				*Tut/Sem: Tutorial/ Seminar					
1 practical credit = 30 practical training hours									

  
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SEMESTER II – HOSPITAL MANAGEMENT BASICS									
Course Code & Course		Theory Credits (Total Hours)	Practical Credits (Total Hours)	Teaching scheme			Examination Scheme (Marks)		
				Theory	Practical	*Tut/Sem	U/E	I/A	TOTAL
<b>CORE COURSES</b>									
II-113	Hospital Organization, Structure & Business	2 (30)	1 (30)	3	3	1.5	60	40	100
II-114	Epidemiology & Public Health	2.5 (38)	0.5 (15)	3	3	1.5	60	40	100
II-115	Research Methodology & Biostatistics	2 (30)	-	2	-	1	40	20	60
II-116	Hospital Support Services Management	1 (15)	1 (30)	2	1	1	40	20	60
II-117	Clinical Services Management	1 (15)	1 (30)	2	1	1	40	20	60
II-118	Emergency Preparedness & Disaster Management	1 (15)	1 (30)	2	1	1	40	20	60
II-119	Hospital Architecture & Designing	3 (45)	-	3	-	1.5	60	40	100
II-120	Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva - Voce	-	3 (90)	-	6	-	60	40	100
II-121	Project I Viva-Voce	-	3 (90)	-	6	1	60	40	100
<b>ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)</b>									
II-122	Medical Transcription	2 (30)	-	2	-	-	-	100	100
II-123	Hospital Maintenance	1 (15)	1 (30)	2	-	-	-	100	100
II-124	Interior Designing & Landscaping	1.5 (23)	0.5(15)	2	-	-	-	100	100
II-125	Wellness Spa management	2 (30)	-	2	-	-	-	100	100
<b>TOTAL</b>		16.5 (248)	10.5 (315)	21	21	9.5	460	480	940
1 theory credit = 15 classroom &/or experiential learning hours						*Tut/Sem: Tutorial/ Seminar			
1 practical credit = 30 practical training hours									



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SEMESTER III – HOSPITAL MANAGEMENT COROLLARIES									
Course Code & Course	Theory Credits (Total Hours)	Practical Credits (Total Hours)	Teaching scheme			Examination Scheme (Marks)			
			Theory	Practical	Tut/Sem	U/E	I/A	TOTAL	
<b>CORE COURSES</b>									
III-126	Ethics, Medico Legal Systems in Hospital	2 (30)	-	2	-	1.5	40	20	60
III-127	Biomedical Waste Management, Nosocomial Infections & Biosafety	1.5 (23)	1.5 (45)	3	3	1	60	40	100
III-128	Project Management in Healthcare	2 (30)	-	2	-	1.5	40	20	60
III-129	Health & Labour Laws	2(30)	-	2	-	1.5	40	20	60
III-130	Industrial Relations	2(30)	-	2	-	1.5	40	20	60
III-131	Operations Management& Research	1.5 (23)	1.5 (45)	3	3	1	60	40	100
III-132	Quality Management & Accreditation	2 (30)	1(30)	3	3	1	60	40	100
III-133	Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce	-	3(90)	-	6	-	60	40	100
<b>ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)</b>									
III-134	Customer Relationship Management	2 (30)	-	2	-	0.5	-	100	100
III-135	Medical Records & Database Management	2 (30)	-	2	-	0.5	-	100	100
III-136	Telemedicine Management	2 (30)	-	2	-	0.5	-	100	100
<b>TOTAL</b>		17 (255)	7 (210)	21	15	9	400	440	840
1 theory credit = 15 classroom &/or experiential learning hours						*Tut/Sem: Tutorial/ Seminar			
1 practical credit = 30 practical training hours									

  
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SEMESTER IV – HEALTHCARE ADMINISTRATION									
Course Code & Course		Theory Credits (Total Hours)	Practical Credits (Total Hours)	Teaching scheme			Examination Scheme (Marks)		
				Theory	Practical	Tut/Sem	U/E	I/A	TOTAL
<b>CORE COURSES</b>									
IV -137	Health Insurance Management	1.5 (23)	0.5 (15)	2	2	1.5	40	20	60
IV -138	Clinical Research Management	1.5 (23)	0.5 (15)	2	2	1.5	40	20	60
IV -139	Medical Tourism Management	02(30)	-	2	-	1.5	40	20	60
IV -140	Healthcare NGO Management	1.5 (23)	0.5 (15)	2	-	1.5	40	20	60
IV -141	Medical Writing	02 (30)	-	2	2	1.5	40	20	60
IV -142	CSR operations Management	02 (30)	-	2	-	1.5	40	20	60
IV -143	Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce	-	3 (90)	-	6	-	60	40	100
IV -144	Project II Viva-Voce	-	3 (90)	-	6	2	60	40	100
<b>ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)</b>									
IV -145	Health Event Management	1.5 (23)	0.5(15)	2	-	1.5	-	100	100
IV -146	ICD – 10 Coding System	2 (30)	-	2	-	1.5	-	100	100
IV -147	Health Informatics Management	2 (30)	-	2	-	1.5	-	100	100
IV -148	Entrepreneurship in Healthcare	2 (30)	-	2	-	1.5	-	100	100
IV -149	Pharmaceutical Management	2 (30)	-	2	-	1.5	-	100	100
<b>TOTAL</b>		<b>13 (195)</b>	<b>09 (270)</b>	<b>16</b>	<b>18</b>	<b>14</b>	<b>360</b>	<b>400</b>	<b>760</b>
1 theory credit = 15 classroom &/or experiential learning hours				*Tut/Sem: Tutorial/ Seminar					
1 practical credit = 30 practical training hours									

### TOTAL MHA PROGRAMME CREDITS – 100

**1 Credit = 15 Classroom &/or Experiential learning hours/ 30 Practical training hours**

**0.5 Credit = 8 Classroom teaching hours &/or Experiential learning / 15 Practical training hours**

\*For semester I, II, III, IV (as applicable), all practical credits and project credits are included in concurrent hospital/ healthcare sector postings during each semester. Elective courses would be allotted to students after filling minimum of five students per course.

Number of Seats at entry level: 30 (\*There would be a separate 20% quota for sponsored professionals working in healthcare organizations. There would be a separate 10% institutional quota and 10% quota for NRI/ Foreign/ PIO students. If these seats are not filled through the quota, same would be made available to open merit candidates)



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**Programme Duration: 2 years**

**Eligibility: Any Graduation, MBBS, BDS, BAMS, BHMS, BUMS, BPT, OPT, other Health Sciences Graduates Preferred**

**Selection Process:** Through University Bharati Vidyapeeth Healthcare Management Aptitude Test (BVHMAT) entrance test of open merit candidates. Students will be selected based on their performance in entrance examination and personal interview.

**Fees:**

**MHA - INR 1,65,000\***

**Fees calculated @ INR 1500 /credit**

**(Special 10% discount for Bharati Vidyapeeth employees)**

\* Charged higher than credit hour rate of INR 1500/credit, considering the mode of delivery and demand for the course

- One compulsory project per year to be completed in student's own institute/ workplace/ Bharati Constituent setups as prescribed by CHMSR guide.
- Semester end examination would be conducted aligned with BVDU exam calendar for all courses. Student should have an attendance of 75% to appear for examinations OR 60% attendance would be allowed when supported with medical certificate along with CHMSR director's approval.
- **Case Study:** Compulsory, Relevant Cases have to be discussed in each course

<b>List of Annexures</b>		
<b>Annexure Number</b>	<b>Title of Annexure</b>	<b>Page no.</b>
1	Procedure for selection of candidates into MHA	89
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**Semester 1**  
**HEALTHCARE MANAGEMENT BASICS**  
**CORE COURSES**



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MHA -2018 program

## I-101 Organizational Behaviour

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

### Introduction:

This course helps to understand behaviour of employees working in an organisation. It trains students how to expect, evaluate and motivate an employee/s towards organizational goals which is an important part of manager's day to day activities.

### Objectives:

- To impart knowledge about general principles of employee behavior working in an organization.
- To equip students with the skills to expect, evaluate and motivate an employee/s towards organizational goals.

<b>Unit-I</b> <b>Introduction to Organization Behaviour:</b> Meaning, Definition, Significance, Models of Organization Behaviour.	<b>5</b>
<b>Unit-II</b> <b>Foundations and determinants of Individual and Organizational Behaviour:</b> Personality and personality traits- determinants, Perception and factors affecting perception, Attitude and types of attitude, Transactional Analysis: different states of Ego, JOHARI window, <b>Learning:</b> Meaning, Learning theories.	<b>6</b>
<b>Unit-III</b> <b>Motivation:</b> Definition, Significance. Motives: Characteristics, Classification of motives: Primary and Secondary motives. Theories of Motivation: Maslow's theory, Herzberg's theory, Two Factor theory, ERG theory, Vroom's Expectancy theory, Reinforcement theory.	<b>8</b>
<b>Unit-IV</b> <b>Group Dynamics:</b> Concept of Group, Types of groups: Formal and Informal Groups, Advantages and disadvantages of group. Team work in the hospital.	<b>4</b>
<b>Unit-V</b> <b>Leadership in the hospital:</b> Meaning and definition of supervisor, leader and manager, Difference between a leader and a manager. Characteristics of a successful leader. Difference between roles of supervisors, managers and leaders. Different styles of leadership, Types of leadership: Vertical and Horizontal leadership, Mint berg model, Malcolm Bald ridge. Seven habits of highly Effective people.	<b>2</b>
<b>Unit-VI</b> <b>Conflict management:</b> Definition. Traditional vis-à-vis Modern view of conflict, Types of conflicts: Intrapersonal, Interpersonal, and Organizational. Constructive and Destructive conflict. Conflict management, Core quadrant model, 7 S framework. <b>Stress Management:</b> Definition, Causes, Effects of Stress, Advantages and disadvantages of a stress, Managing stress, work life balance. <b>Negotiation</b>	<b>3</b>
<b>Unit-VII</b> <b>Change Management:</b> Concept of change, Change as a natural process, Importance and Causes of change: social, economic, technological, organizational.	<b>2</b>



**Books:**

1. Newstrom JW, Davis K. Human behavior at work. New York, NY. 1986.
2. Luthans F. Organisational Behaviour McGraw-Hill.
3. Robbins SP. Organizational Behavior, 13/E. Pearson Education India; 2009 Sep 1.
4. Lang R. Peter G. Northouse: Leadership-Theory and Practice. Organization Studies. 1999 Mar 22;20(2):354-.
5. Hersey P, Blanchard KH. Management of organizational behavior: Utilizing human resources. Prentice-Hall, Inc; 1993.
6. Thompson LL, Thompson M. Making the team: A guide for managers. Upper Saddle River, NJ: Prentice Hall; 2000.
7. Singh N. Organisational Behaviour: Concepts, Theory and Practices: Managing People and Organisations in the 21st Century. Deep and Deep Publications; 2001.
8. Singh N. Motivation: theories and practical applications. Deep and Deep Publications; 2005.
9. Singh N. Human Relations and Orgaisational Behavior. Deep and Deep Publications; 2000.



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## I-102 Management Principles

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

### Introduction:

This course provides knowledge about the role and functions of a manager. It gives an idea about what is management, how it evolved, along with functions and techniques involved.

### Objectives:

- To impart knowledge about the roles and functions of a manager and the principles guiding his/her conduct in an organization.
- To enable students to perform and practice managerial principles, functions and techniques.

<b>Unit-I</b> <b>Concept of Management:</b> Definition of management, Difference between management and administration, Functions and Responsibilities of Managers, Mintzberg theory, Principles of Management, Management Thoughts: The Classical School, The Human Relations School-Systems theory, Contingency Management	9
<b>Unit II</b> <b>Overview of Functions of Management</b> Introduction to Planning, Organizing, Staffing, Directing and Controlling	2
<b>Unit III</b> <b>Overview of Planning Process</b> Nature and Purpose of Planning, the Planning Process, Principles of Planning, Types of Planning, Advantages and Limitations of Planning. Concept & Nature of Objectives, Types of Objectives, Importance of Objectives, Setting objectives, Management by Objectives (MBO), Benefits and weaknesses of MBO. Decision Making Process, Individual Decision Making Models.	4
<b>Unit IV</b> <b>Organizing</b> Nature and Purpose of Organizing and staffing, Organization Structure, types & Importance, Significance of staffing Span of Management, Determinants of Span of Management, Bases of Delegation, Comparison between Delegation and Decentralization	6
<b>Unit V</b> <b>Directing</b> Meaning and Nature, Leadership styles, Theories of Motivation	6
<b>Unit V</b> <b>Control</b> Concept of control, Types of Control, Importance of control	3

### Books:

1. Koontz H. Essentials of management. Tata McGraw-Hill Education; 2010.
2. Govindarajan M, Natarajan S. Principles of management. PHI Learning Pvt. Ltd.; 2005.
3. Tripathi PC. Principles of management. Tata McGraw-Hill Education; 2008.
4. McFarland DE. Management: Principles and practices. Macmillan Pub Co; 1974.
5. David FR. Strategic management: Concepts and cases. Peaeson/Prentice Hall; 2011.

## I-103 Human Resource Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

### Introduction:

Human resource is the core of healthcare business. This course helps to know about various processes of human resource department. It gives an overview of job design, recruitment and selection, training, compensation, job design, enrichment, etc.

### Objectives:

- To impart knowledge about general principles and processes of human resources management.
- To equip students to participate and perform job design, recruitment and selection, training, compensation, job design, enrichment etc of employees.

<p><b>Unit I</b>  <b>Introduction to HRM:</b> Evolution of HRM, meaning, and scope, HRM functions and objectives, difference between HRM and Personnel Management. Human Resource Development in India, role of HR managers, manpower planning.</p>	<b>2</b>
<p><b>Unit II</b>  <b>Job evaluation:</b> Concept, methods and types. Job description, job specification. Recruitment and selection, methods and procedures, Difference between recruitment and selection process.  <b>Job analysis:</b> Introduction, Definitions, Job Analysis Process, Legal Aspects of Job Analysis, Job Analysis in a Changing Environment. Job Design and Job description of various medical and paramedical and nursing staff. Role and responsibilities of various Medical, Paramedical and administrative staff of the hospital  <b>Performance appraisal:</b> Introduction, definition, purpose of appraisal, procedures and techniques, Role of Performance Management, Conducting Effective Performance appraisal, Various Methods of Performance Appraisal, Management Interviews.</p>	<b>8</b>
<p><b>Unit III</b>  <b>Training, Development and Knowledge Management</b>            Introduction Training, Development and Knowledge Management, Various methods of training and development for healthcare professionals, teaching methodologies. Training and development purpose, methods and issues of training and management development program, mentoring and coaching, training and Development program in hospital, Need for continuous professional development of staff in hospitals.</p>	<b>6</b>
<p><b>Unit IV</b></p>	

<b>Job Enrichment:</b> promotion, transfer and separation: promotion – purpose, principles and types. Transfer: reasons, principles and types. Separation: lay-off, resignation, dismissal, retrenchment. Job enrichment, job enlargement, job rotation.	<b>4</b>
<b>Unit V</b> <b>Healthcare Professionals and HRM</b> Introduction, Professionalization, Healthcare Professionals, Considerations for Human Resources Management, Changing Nature of the Healthcare Professionals	<b>2</b>
<b>Unit VI</b> <b>Recruitment, Selection, and Retention</b> Problems and strategies of Recruitment, Selection, and Retention of hospital personnel. Stress and burnout in health care professionals.	<b>4</b>
<b>Unit VII</b> <b>Compensation Management</b> Role of compensation in organization: economic and behavioral theories related to compensation; strategic perspectives of compensation; compensation as motivational tool; compensation policy. Internal and external equities in compensation system; determining the worth of jobs; understanding inter and intra-industry compensation differentials, designing pay structure and administering compensation package; understanding different components of compensation package like fringe benefits, incentives and retirement plans; pay for performance plans	<b>4</b>

#### Books:

1. Reiche BS, Mendenhall ME, Stahl GK, editors. Readings and cases in international human resource management. Taylor & Francis; 2016 Nov 8.
2. Storey J. Human resource management: A critical text. Cengage Learning EMEA; 2007.
3. Pareek U. Designing And Managing Human Resource Systems, 3/E. Oxford and IBH publishing; 2006.
4. Jackson SE, Schuler RS, Werner S. Managing human resources. Mason, OH: South-Western Cengage Learning; 2009.
5. Rao TV. Performance Management and Appraisal Systems: HR tools for global competitiveness. SAGE Publications India; 2004 May 15.
6. Rao T. Readings in human resource development. Oxford and IBH Publishing; 1991.
7. Suri RK, Chhabra TN. Managing Human Resource: Techniques And Practices. Pentagon Press; 2009.
8. Bhattacharyya DK. Human resource planning. Excel Books India; 2009.



## I-104 Hospital Information System

(Credits: 2, Hours: 30)

### Introduction:

This course focuses on the importance of transfer of data and information in today's hospital and healthcare industry using modern technology and IT. There is a lot of change in business management with the intrusion of IT. The course educates students regarding the need, opportunities and challenges faced during implementation of MIS in a healthcare set up.

### Objectives:

- To give students an overview about Management Information System used in today's hospitals.
- To enable students to judge and manage the need, opportunities and challenges faced during implementation of MIS in a healthcare set up.

<b>Unit –I</b> <b>Information System</b> Introduction to MIS: information and data, structure of MIS specific to hospital, information for control, decision and decision making process, statutory needs, feedback; hierarchy of management activity, document preparation, data capture, MS –Access.	<b>6</b>
<b>Unit –II</b> <b>Project Life Cycle</b> SDLC, Physical systems design, physical data base design; programmed development, procedure development, input-output design, online dialogue, design of files, data communication, Project life cycle, installation and operation, conversion, operation, documentation, training, Maintenance, post audit system evaluation.	<b>6</b>
<b>Unit- III</b> <b>Approaches to HIS</b> System Study: Patient based, functional organization based, user department based, clinician based HIS, medical records, nursing information system, appointments scheduling, dissemination of diagnostic tests and diagnostic information, general administration, productivity.	<b>8</b>
<b>Unit-IV</b> <b>Decision Support System</b> Concepts, DSS software, applications for hospital activities. Expert System Concepts, applications in healthcare management, dedicated software packages.	<b>6</b>
<b>Unit-V</b> <b>Recent trend in Hospital Information Technology</b> Telemedicine, Knowledge management, IT integration, Telemetry, HL7, EMR, Claude computing, IT and hospital management Quality	<b>4</b>

## Books:

1. Laudon KC, Laudon JP. Management information system. Pearson Education India; 2016.
2. Laudon KC, Traver CG. E-commerce. Pearson; 2013.
3. O'Brien JA, Marakas GM. Management information systems. McGraw-Hill Irwin; 2006.
4. Turban E, Leidner D, McLean E, Wetherbe J. INFORMATION TECHNOLOGY FOR MANAGEMENT, (With CD). John Wiley & Sons; 2008 May 1.
5. Jawadekar WS. Management Information Systems: Text and Cases: a Global Digital Enterprise Perspective. Tata McGraw-Hill Education; 2013.
6. Sprague Jr RH, McNurlin BC. Information systems management in practice. Prentice Hall PTR; 1993 Jan 1.
7. Haag S, Cummings M, Dawkins J. Management information systems for the information age. McGraw-Hill; 1998.
8. Haux R, Winter A, Ammenwerth E, Bigl B. Strategic information management in hospitals: an introduction to hospital information systems. Springer Science & Business Media; 2013 Mar 9.
9. Kuperman GJ, Gardner RM, Pryor TA. HELP: a dynamic hospital information system. Springer Science & Business Media; 2013 Mar 12.



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## I-105 Marketing Management

(Credits: 2, Hours: 30)

### Introduction:

Being customer-centric is the need of today's healthcare industry. The course focuses on developing this mindset among students helping them understand patient and client needs, design quality services, to devise pricing strategy, promotion of services and to achieve financial objectives of the organization.

### Objectives:

- To acquaint students about principles and processes of health services marketing.
- To help students participate in analyzing patient and client needs, designing quality services, devising pricing strategy, promotion of services.

<b>Unit-I</b> <b>Introduction to Marketing</b> : Basic concept of marketing management, Difference between Marketing and Selling, Marketing process, Marketing environment, Marketing Orientation, Different Ps in marketing, Segmentation, Targeting, Positioning, Qualities of Marketing Managers, Branding	<b>7</b>
<b>Unit-II</b> <b>Marketing of hospital services:</b> Conceptual framework of service marketing: Holistic Marketing of Services, Characteristics of Services, Importance of Internal and Interactive Marketing Services Marketing Mix, Promotion, Importance and Types of Promotion, Concept of Promotion for hospital Services. Marketing of health services in India and abroad, Corporate Marketing and its importance	<b>7</b>
<b>Unit –III</b> <b>Price strategies:</b> Setting and adapting price, initiating and responding to price changes	<b>6</b>
<b>Unit IV</b> <b>Marketing Channels:</b> Meaning, Concept, Types, Importance and Need, Designing marketing channels, Channel management and channel dynamics.	<b>4</b>
<b>Unit –V</b> <b>Ethics in marketing:</b> Overview of ethics in health care marketing	<b>3</b>
<b>Unit –VI</b> <b>Public Relations</b> : Definition, Need in hospital, essentials of good public relations, public relations towards global professionalism and major areas of public relations activity like medical tourism, Co-ordination of press relations, publications and different media.	<b>3</b>

## Books:

1. Kotler P. Kotler on marketing. Simon and Schuster; 2012 Dec 11.
2. Kotler P. Marketing in the public sector. Pearson Education India; 2007.
3. Cutlip SM. Effective public relations. Pearson Education India; 1962.
4. Graham H. Marketing strategy and competitive positioning. Pearson Education India; 2008.
5. Andreasen AR, Kotler P, Parker D. Strategic marketing for nonprofit organizations. Upper Saddle River, NJ: Prentice Hall; 2003.
6. Cateora PR. International Marketing 13E (Sie). Tata McGraw-Hill Education; 2008.
7. Lovelock CH, Lovelock CH. Services marketing. Englewood Cliffs, NJ: Prentice Hall; 1991 Jan.
8. Kashyap P, Raut S. The rural marketing book (Text & Practice)(With Cd). Dreamtech Press; 2005 Jul 4.
9. Cheng H, Kotler P, Lee N. Social marketing for public health: global trends and success stories. Jones & Bartlett Learning; 2011.
10. Berry LL, Seltman KD. Management lessons from Mayo clinic. McGraw-Hill Professional Publishing; 2008.
11. Malhotra NK. Marketing research: An applied orientation, 5/e. Pearson Education India; 2008 Sep 1



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**I-106 Business Communication****(Credits: 2, Hours: 30)****Introduction:**

The course has been designed to make students know and apply communication strategies in diverse hospital and healthcare settings. It includes internal communication within staff of various departments, personnel, staff and patients, staff and relatives and external communication.

**Objectives:**

- To give students an overview about different types and settings of communication in healthcare setups.
- To enable to practice and perform communication skills in different healthcare settings and situations.

<b>Unit-I</b> <b>Types of Communication:</b> <b>Oral Communication:</b> Meaning, nature and scope of oral communication, The art of listening - Principles of good listening. <b>Principles of effective oral communication:</b> Techniques of effective speech, Media of oral communication (Face-to-face conversation, Teleconferences, Press Conference, Demonstration, Radio Recording, Dictaphone, Meetings, Closed circuit TV, Demonstration and Dramatization, Public address system, Rumour, Grapevine, Group Discussion, Oral report). <b>Written Communication :</b> Need and functions of business letters - Planning and layout of business letter, types of business letters e.g. reports, memos, and notices etc., Essentials of effective written communication.	<b>18</b>
<b>Unit-II</b> <b>Barriers of Communication:</b> Lack of planning, semantic distortion, poorly expressed message, poor listening, distrust, threat and fear, improper communication, premature evaluation, insufficient period for adjustment to change, internal and external environment. Communication within the hospital and with external agencies.	<b>6</b>
<b>Unit-III</b> Doctor-Staff communication, Doctor-Patient Communication, Staff- Patient Communication, Staff- relatives communication, Breaking bad news	<b>6</b>

**Books:**

1. Guffey ME. Essentials of business communication. Cengage Learning; 2006 Jan 24.
2. Shirley T. Communication for Business: A practical approach. Pearson Education India; 2005.
3. Wolfe R. Speedmailing: Turn your work enemy into your best work tool. Pearson UK; 2016 Sep 26.
4. Kumar S, Lata P. Communication skills. New Delhi: Oxford University Press; 2011.
5. Mohan RS. Business Correspondence and Report Writing, 3e. Tata McGraw-Hill Education; 2002 Feb 1.
6. Jordan RR. English for academic purposes: A guide and resource book for teachers. Cambridge University Press; 1997 Feb 13.
7. Swales JM, Feak CB. Academic writing for graduate students: Essential tasks and skills. Ann Arbor, MI: University of Michigan Press; 2004 Apr.
8. Zinsser W. On writing well. HarperCollins Publishers; 1991 Sep.
9. Bovee CL, Thill JV, Raina RL. Business communication today. Pearson Education India; 2016.

**I-107 Management Accounting****(Credits: 2, Hours: 30)****Introduction:**

The course focuses on development of fundamental concepts in management accounting. Students develop skills to apply this knowledge in preparation, planning, budgeting, controlling and auditing decisions.

**Objectives:**

- To acquaint students about fundamental concepts in management accounting.
- To equip students to participate and perform in financial planning, budgeting, controlling and auditing decisions in an organization.

<b>Unit I</b> <b>Introduction of Management Accounting:</b> Concept and Characteristics, Financial Accounting Information, Comparison of Financial and Management Accounting, Principles of Accounting, The Accounting Cycle, Basic Accounting, Entries.	<b>4</b>
<b>Unit II</b> <b>Introduction to cost accounting:</b> Purpose, Utility and Interrelationship of financial Accounting and Management Accounting with Cost Accounting.	<b>4</b>
<b>Unit III</b> <b>Understanding basic components of accounting systems</b> Economic entity, Monetary assumption, Depreciation, Accrual basis, Time period, Cost value/historical value, Disclosure, Going concern, Double entry system.	<b>4</b>
<b>Unit IV</b> <b>Accounting for health care:</b> Types of accounts, Ledgers, Journals, Trial Balance, Profit and Loss accounts, Balance Sheet, Error and Rectification.	<b>4</b>
<b>Unit V</b> <b>Elements of Costs:</b> Fractions and Segment, Classification of Cost: Direct and Indirect Cost Classifications.	<b>3</b>
<b>Unit VI</b> <b>Materials:</b> Purchasing Procedure, Organisation Control and Records, Control over Materials, Inventory Control Techniques, and Accounting for issue of Materials from stores.	<b>4</b>
<b>Unit VII</b> <b>Overhead:</b> Accounting and Control of Overhead, Classification and Absorption of Overheads.	<b>2</b>
<b>Unit VIII</b> <b>Costing Reports:</b> Cost sheet, Ratio analysis.	<b>5</b>

**Books:**

1. Jain PK. Cost accounting. Tata McGraw-Hill Education; 2000.
2. Arora MN. Cost Accounting: Principles & Practice. Vikas publishing house; 2000.
3. Hopwood AG, Miller P, editors. Accounting as social and institutional practice. Cambridge University Press; 1994 Oct 6.

## I-108 Finance Management & Healthcare Economics

(Credits: 3, Hours: 45)

### Introduction:

The course helps students to understand the fundamental concepts in finance management and its applications in healthcare organizations and Healthcare Economics would develop basics of health economics in allocating scarce resources to maximize health benefits to the population.

### Objectives:

- To impart knowledge about general principles and processes of finance management In healthcare set ups.
- To acquaint students about fundamental concepts of health economics at all levels of implementation in the community.

<b>Unit I</b> <b>Introduction to financial management.</b> Concept of Business Finance, role, functions and objectives. of finance management in healthcare sector. Profit maximization Vs Wealth Maximization, financial planning. Time value of money. Financial management - principals, Stakeholders in Hospital Finance	4
<b>Unit II</b> <b>Investment Decision.</b> Capital budgeting - estimation of cash flows for hospital projects, project selection criteria: Payback period, ARR, NPV, IRR, Profitability Index methods - Introduction to quantification of risk in capital budgeting, role of obsolescence in capital budgeting. Financial strategies for monetary growth.	6
<b>Unit III</b> <b>Financing Decision:</b> Leverages and cost of capital. Economic Value Added (EVA) Concept. Money market, capital market and their instruments, working capital management analysis and interpretation of financial statements	4
<b>Unit IV</b> <b>Liquidity Decision</b> Cash management, Inventory and revenue cycle management. Sources of working capital, risk return trade-off, bank financing for working capital and guidelines for borrowing.	4
<b>Unit-V</b> <b>Time Value Of Money :</b> Compounding – the calculation of future value, Discounting – The calculation of present value Annuities, Valuing assets, Value, Approaches to valuation, Cost behavior, Costs, Costs Classification, Responsibility Centers, Cost allocation, Allocation Criterion, Separating Fixed and variable costs	4
<b>Unit-VI</b> <b>Short Term Assets And Liabilities And Short -Term Financing :</b> Current Assets, Current liabilities, Working capital and its management Money and credit, The cash conversion cycle, Controlling liquidity, Managing cash, marketable securities and patient accounts, The cash budget, Inventory Management	4
<b>Unit-VII</b> <b>Frontiers Of Healthcare Financial Management :</b> Strategic financial planning, Financial structure and restructuring, Leveraged buyout, Mergers and acquisitions, Joint ventures	4

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<b>Healthcare Economics</b>	
<b>Unit I</b> Overview of health economics, Introduction to economics, scope, methods, Demand, Need, Supply, Cost and Price, theory of pricing, Market, Scarcity, Marginal Analysis, Margin, Opportunity cost, Efficiency, Equity, Resources, Inflation and deflation Basics of health economics: Definition, Healthcare and principles of economics, Nature of medical care as commodity, Structure of health economics, Health economics – Indian scenario	<b>3</b>
<b>Unit II</b> Analyzing Medical Care Markets, Cost of Care, Access to Care, Medical Outcomes, Competitive Markets Model, Market Failure in Medical Markets, Economics of medical tourism and health insurance, FDI in healthcare	<b>2</b>
<b>Unit III</b> Demand for Health & Medical Care, Production of health, Measure of Health Status, Determinants of Health, Medical Care as an investment, Factors influencing demand, Measuring demand- elasticities	<b>2</b>
<b>Unit IV</b> Supply Side Considerations, Market for Health Care profession, Market for Physicians' Services, Models of Physicians Behavior, Market for Hospital Services--For profit and Not for profit hospital, Alternative Models of Hospital Behavior, Trend towards Multi hospital Systems	<b>2</b>
<b>Unit V</b> Medical care Systems Worldwide, Healthcare economy comparison: Developed and developing country Canada, France, Germany, Japan, U.K, NHS, International Comparison	<b>2</b>
<b>Unit VI</b> Economic Evaluations in Health Care, Importance, Meaning and types of Economic Evaluation, Approaches to Modelling in Economic Evaluation, Lessons for public policy, Economic Appraisal and Health Indicators, Techniques of Economic Appraisal, Cost Effective Analysis, Cost Benefit Analysis, Cost Utility Analysis, Physical Quality of Life index (PQLI), QALY (Quality Adjusted Analysis of Life), Disability-adjusted life year (DALY)	<b>4</b>

**Books:**

1. Eun CS, Resnick BG. International Financial Mgmt 4E. Tata McGraw-Hill Education; 2010.
2. Van Horne James C. Financial Management & Policy, 12/E. Pearson Education India; 2002 Sep 1.
3. McMahan R, Holmes S, Hutchinson P, Forsaith D. Small enterprise financial management: Theory and practice. 1993.
4. Pandey IM. Essentials of Financial Management, 4th Edition. Vikas publishing house; 1995.
5. Chandra P. Financial management. Tata McGraw-Hill Education; 2011.
6. Pandey IM. What Drives the Shareholder Value?. Indian Institute of Management; 2005 Sep
7. Sherman F. The economics of health and health care. Pearson Education India; 2008 Sep 1
8. Folland S, Goodman AC, Stano M. The Economics of Health and Health Care: Pearson International Edition. Routledge; 2016 May 23.
9. Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. Methods for the economic evaluation of health care programmes. Oxford university press; 2015 Sep 24.
10. Phelps CE. Health economics. Routledge; 2017 Dec 1.
11. McGuire A, Henderson J, Mooney G. The economics of health care: an introductory text. Routledge & Kegan Paul; 1988.
12. Donaldson C, Mugford M, Vale L, editors. Evidence based health economics. Blackwell Pub.; 2002.

I-109 Concurrent Rotatory Practical Postings (CRPP) with  
Comprehensive Viva - Voce (Credits: 3)

## ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)

### **I-110 Basics Medical Terminology**

(Credits: 2, Hours: 30)

#### **Introduction:**

The course assists students to develop medical vocabulary used in hospital and healthcare industry. It helps students to understand the correct use of medical terms.

#### **Objectives:**

- To develop medical vocabulary in students needed to work in hospital and healthcare industry.
- To help students use and understand the correct use of medical terms.

<b>Unit I:</b> Objective, Basic Elements of Medical Terms - Root, Prefixes, Suffixes, Colours, Numeral, Symbols, Abbreviation, Terms pertaining to Body as a whole.	<b>8</b>
<b>Unit II:</b> Terms relate to investigations and operation, treatment of conditions, disorders of: Skin and Breast (integumentary system), Musculoskeletal, Neurological and psychiatric disorder, Cardio-vascular, Blood and blood forming organs, Respiratory, Digestive, Uro-genital, Gynecological, Maternal, Antenatal and Neonatal conditions, Endocrine and Metabolic, Sense organs - Vision & Hearing, Systemic: Infections, diseases, Immunological diseases, diseases of the connective tissue, Geriatrics and Psycho geriatrics.	<b>14</b>
<b>Unit III:</b> Supplementary terms: Selected terms relating: Oncology, Anesthesiology, Physical Medicine and Rehabilitation, Nuclear medicine, Plastic surgery of burns and maxillofacial surgery, Radio- Diagnosis, Radiotherapy.	<b>8</b>

#### **Books:**

1. Willis MC. Medical terminology: a programmed learning approach to the language of health care. Lippincott Williams & Wilkins; 2007 May 1.
2. Willis MC. Medical terminology: the language of health care. Lippincott Williams & Wilkins; 2006.
3. Steiner SS, Capps NP. Quick medical terminology: a self-teaching guide. John Wiley & Sons; 2011 Aug 23.
4. Henderson B, Dorsey JL. Medical terminology for dummies. John Wiley & Sons; 2015 Jan 27.
5. Chabner DE. Medical Terminology: A Short Course-E-Book. Elsevier Health Sciences; 2014 Sep 30.
6. Leonard PC. Quick & Easy Medical Terminology-E-Book. Elsevier Health Sciences; 2015 Dec 4.

## I-111 Essential English

(Credits: 2, Hours: 30)

### Introduction:

Today's /hospital healthcare managers face a dual challenge of being competitive as well as being global. They not only have to be master in their professional skills but also, they must have various soft skills competencies to be suitable for their job.

### Objectives:

- To impart essentials of English language needed by the students to enter & sustain today's job market.

<b>Unit I:</b> <b>The elements of Communication</b> The importance of communication through English at the present time, The process of communication and factors that influence communication sender, receiver, channel, code, topic, message, context, feedback, noise, filters & barriers, The importance of audience and purpose, The information gap principle: given and new information, information overload, Verbal and non-verbal communication: body language	<b>8</b>
<b>Unit II :</b> <b>The sounds of English</b> Vowels, diphthongs, consonants, consonant clusters, The International Phonetic Alphabet (IPA): Phonemic transcription, Problem Sounds, Syllable division and word stress, Sentence rhythm and weak forms, Contrastive stress in sentences to highlight different words, Intonation: Falling, rising and falling-rising tones, Varieties of Spoken English: Standard Indian, American and British	<b>12</b>
<b>Unit III :</b> <b>Review of English grammar</b> Static and Dynamic Verbs, The auxiliary system: finite and non-finite verbs, Time, tense and aspect, Voice: Active and passive, Modality, Negation, Interrogation: reported and tag questions, Phrasal Verbs	<b>10</b>

### Books:

1. Wren PC, Martin H. English Grammar & Composition. S. Chand & Company Ltd. 2000.
2. Jones L, Alexander R. New International Business English Updated Edition Teacher's Book: Communication Skills in English for Business Purposes. Cambridge university press; 2000 Feb 17.
3. Schibsbye K. A modern English grammar. London: Oxford University Press; 1965.
4. Rizvi MA. Effective technical communication. Tata McGraw-Hill; 2005.
5. Leech G, Svartvik J. A communicative grammar of English. Routledge; 2013 Nov 14.
6. Corder SP. An intermediate English practice book. Orient Blackswan; 1969.
7. Jordan RR. English for academic purposes: A guide and resource book for teachers. Cambridge University Press; 1997 Feb 13.
8. Swales JM, Feak CB. Academic writing for graduate students: Essential tasks and skills. Ann Arbor, MI: University of Michigan Press; 2004 Apr.

## I-112 Information and Communication Technology

(Credits: 2, Hours: 30)

### Introduction:

The course would develop hands on experience in MS word, MS power point, MS excel and other basic computer operations.

### Objectives:

- To acquaint students about fundamental computer operations.
- To allow students to practice and perform various computer applications.

<b>Unit I</b> <b>Introduction to computers and Information Technology:</b> Fundamentals of computer, Introduction, Input / Output and Processing (CPU), Memory Device, Types of computers, Characteristics of Computer, History and Generation, Applications of Computer generation of computers, input and output devices: memory and operating systems, Concepts of Hardware and Software, data processing, information processing.	<b>6</b>
<b>Unit II</b> <b>Numbering System Representation of data/problem solving techniques and database:</b> Introduction to Number systems, Decimal arithmetic, Binary arithmetic, Algorithms, Flowchart, and Programming Languages. Introduction to Database, DBMS, and Database model.	<b>6</b>
<b>Unit III</b> <b>Computer Communication and Internet:</b> Basic of Computer networks, LAN / WAN, Concept of Internet , Application of Internet , Service on Inter Net , WWW and web-sites , Electronic mails , Communication on Internet , WWW and Web Browsers , Web Browsing software, Surfing the Internet, Chatting on Internet, Email, Virus.	<b>8</b>
<b>Unit IV</b> <b>Windows and MS Office :</b> MS Word: Word, Editing and formatting documents, macro commands, Presentation of documents, Excel and Power Point applications.	<b>10</b>

### Books:

1. O'Brien JA, Marakas G. Introduction to information systems. McGraw-Hill, Inc.; 2005 Oct 26.
2. Elias M. Awad, System Analysis and Design, Galgotia Publications, New Delhi, 1998.
3. V.Rajaraman. Fundamentals of Computers Prentice Hall India, New Delhi 1996.



SECOND SEMESTER

HOSPITAL MANAGEMENT BASICS

CORE COURSES



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## II-113 Hospital Organization, Structure & Business Plan

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

### Introduction:

This course helps to develop basic awareness of management functions of hospital departments. It highlights the need of operative planning, organizational structure and performance in hospital and healthcare set ups.

### Objectives:

- To develop awareness of management functions of hospital departments in the students.
- To help students know the need of operative business planning, organization structure in healthcare set ups.


<b>Unit I</b> <b>Hospital – An Introduction</b> History and development of hospitals, Role of hospital in society, Functions of hospital, Role in health care delivery system, Hospitals in India today- their number, growth of hospitals & classification of types, size, distribution, ownership, hospitals utilization, issues & trends	<b>6</b>
<b>Unit II</b> <b>Hospital Management as a Specialty</b> Peculiarities of health care organisations, Factors influencing care, Role and functions of hospital administrators, Differences and Issues in administration of teaching, corporate, charitable, PHC, government hospitals etc.	<b>4</b>
<b>Unit III</b> <b>Organisation Structures</b> Hierarchy, Role of all departments in various hospital settings, Governing authority, Channels of communication, Systems Approach to Hospitals The function, responsibility and role of Governing body, Chief Executive (Administrator) and Medical Staff and relationship among them, Medical staff organisations. Co-ordination, Communication, and Decision making in Health Care .Organizational productivity-input and evaluation of productivity, System policy, Procedure.	<b>5</b>
<b>Unit IV</b> <b>Overview of departments in the hospital</b> Organization of hospital, Clinical, Administrative, Support services Recent Trends: Ethical issues, Challenges to administrators, Expectations of community from hospitals	<b>5</b>
<b>Unit V</b> Operative Planning- Characteristics, Objective goal, strategic and long term planning. Hospital Utilization & its evaluation, Use of modern tools and techniques for improvement of operational efficiency. Emerging Trend in Health Care.	<b>5</b>

**Unit VI**

Organizational Performance, Assessment of strengths and weakness, strategic thinking and preparation of long term plan. Analysis of organization structure, role analysis, role clarity, system of accountability, Organizational dynamics. Operational and management control in health care, Management By Objective

**5****Books:**

1. Kunders GD. Hospitals: facilities planning and management. Tata McGraw-Hill Education; 2004.
2. Goel SL, Kumar R, editors. Hospital Administration and Management. Deep & Deep Publications; 2002 Aug 1.
3. Goel KR, editor. Hospital supportive services. Deep and Deep Publications; 2004.
4. Sakharkar BM. Principles of Hospital Administration and Planning, Jaypee Brothers Medical publishers (P) Ltd. New Delhi. 1999.



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## II-114 Epidemiology & Public Health

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2.5	38	0.5	15

### Introduction:

This course helps students to understand the concept of health and disease, to apply the same to monitor, control health problems by implementation of effective public health programmes and policies.

### Objectives:

- To impart knowledge about the concept of health and disease in the community.
- To apply the knowledge to monitor and control health problems in the community through effective implementation public health programmes and policies.

<b>Unit I</b> <b>Concept of health and disease</b> Concept of health, Definitions of health, Dimensions of health, Definition & aim of epidemiology, Measurements in epidemiology, Spectrum of health, Health determinants, Health indicators, Concept of disease, Concept of control, Modes of intervention, Disease transmission, Disease prevention and control, Investigation of an epidemic, Public health, Disease classification, International classification of disease, Disease surveillance	<b>13</b>
<b>Unit II</b> <b>Health programmes in India</b> National vector borne disease control programme, National leprosy eradication programme, Revised national tuberculosis control programme, National aids control programme, National programme for control of blindness, Iodine deficiency disorders programme, Universal immunization programme, National rural health mission, Reproductive and child health programme, National cancer control programme, National mental health programme, National programme for prevention of lifestyle diseases, Current government health schemes	<b>10</b>
<b>Unit III</b> <b>Health education</b> Concept of health education, Approach to health education, Models of health education, Contents of health education, Principles, Practice	<b>7</b>
<b>Unit IV</b> <b>Health planning and management</b> Health planning, Management, Management methods and techniques, National health policy, Health planning in India	<b>8</b>

### Books:

1. Park JE. Textbook of preventive and social medicine.(A treatise on community health.). 1970.
2. Hodges BC, Videto DM. Assessment and planning in health programs. Jones & Bartlett Publishers; 2011 Aug 24.
3. Dever GA. Managerial epidemiology: practice, methods and concepts. Jones & Bartlett Learning; 2006.
4. Jekel JF, Katz DL, Elmore JG, Wild D. Epidemiology, biostatistics and preventive medicine. Elsevier Health Sciences; 2007 Jun 26.
5. Petersen A, Lupton D. The new public health: Health and self in the age of risk. Sage Publications, Inc; 1996.
6. Baum F. The new public health. Oxford University Press; 2016.
7. Lupton D. The imperative of health: Public health and the regulated body. London: Sage Publications; 1995 Aug.

## II-115 Research Methodology & Biostatistics

(Credits: 2, Hours: 30)

### Introduction:

The course will help students understand the research process by familiarizing to the quantitative and qualitative approaches, methods, techniques, writing etc. It also helps to learn techniques to gather informative data, extract meaningful information and analyze it to draw useful interpretations.

### Objectives:

- To develop research acumen in the students by imparting about research, qualitative and quantitative research methods and techniques.
- To equip students with research skills to be applied in their academic projects and in their future operations.

<b>Unit I</b> Introduction to Research, Foundations of Research: Meaning, Objectives, Motivation, Research Ethics, Research Terminologies, Overview of research methodology	2
<b>Unit II</b> Problem Identification & Formulation of research problem, Identifying Research problem, Defining research problem	2
<b>Unit III</b> Review of Literature, Meaning, Purpose, Need, Peer review	2
<b>Unit IV</b> Hypothesis formulation, Characteristics of Hypothesis, Role of hypothesis, Framing of Hypothesis Qualities of a good Hypothesis, Null Hypothesis & Alternative Hypothesis, Hypothesis Testing - Logic & Importance	2
<b>Unit V</b> Research Design, Concept of Qualitative, Quantitative, Mixed methods Concept of Exploratory, Descriptive, Experimental Designs; Concept of Variables, Meaning and types	2
<b>Unit VI</b> Data Collection, Meaning, Types (Primary, Secondary), Detailed Methods of Data Collection, Preparation of tool, Validity and Reliability, Confidentiality and Anonymity of Data collected, Data Entry	4
<b>Unit VII</b> Sampling, Meaning, Types, Applications, Determination of sample size	2
<b>Unit VIII</b> Data Analysis, Data Preparation, Data Presentation, Analysis of qualitative and quantitative data, Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations	2
<b>Unit IX</b> <b>Writing</b> , Project Report writing, Research paper, Bibliography, Citation	1
<b>Unit X</b> <b>Technological Support in Research Methodology</b>	1

Use of available softwares for review of literature, Analysis, Bibliography	
<b>Biostatistics</b>	
<b>Unit XI</b> <b>Introduction to Statistics</b> Utility and limitations of Statistics, Measures of Central tendencies, Measures of Dispersion, Variation. Introduction to Applied Statistics, Identifying the dependent and independent variables, Confidence levels, Math that manipulates data, Test of significance	<b>2</b>
<b>Unit XII</b> <b>Descriptive Statistics</b> Summarizing and describing a collection of data, Percentages and Ratios, Histograms, Identifying randomness and uncertainty in data	<b>2</b>
<b>Unit XIII</b> <b>Inferential Statistics</b> Drawing inference from data, Modeling assumptions , Identifying Patterns, Regression analysis, T-test, Analysis of Variance, Correlations, Chi-square	<b>6</b>

**Books:**

1. Kothari CR. Research methodology: Methods and techniques. New Age International; 2004.
2. Bhattacharyya DK. Research methodology. Excel Books India; 2006 Dec 1.
3. Goddard W, Melville S. Research methodology: An introduction. Juta and Company Ltd; 2004.
4. Graziano AM, Raulin ML. Research methods: A process of inquiry . HarperCollins College Publishers; 1993.
5. Patton MQ. Qualitative evaluation and research methods. SAGE Publications, inc; 1990.
6. Patton MQ. Qualitative research. John Wiley & Sons, Ltd; 2005 Oct.
7. Taylor SJ, Bogdan R, DeVault M. Introduction to qualitative research methods: A guidebook and resource. John Wiley & Sons; 2015 Oct 19.
8. Gummesson E. Qualitative methods in management research. Sage; 2000.
9. Coffey A, Atkinson P. Making sense of qualitative data: Complementary research strategies. Sage Publications, Inc; 1996.
10. Gill J, Johnson P. Research methods for managers. Sage; 2010 Jan 21.
11. Sekaran U, Bougie R. Research methods for business: A skill building approach. John Wiley Sons; 2016 Jun 27.
12. Pagano M, Gauvreau K, Pagano M. Principles of biostatistics. Pacific Grove, CA: Duxbury; 2000 Mar.
13. Kumar R. Research methodology: A step-by-step guide for beginners. Sage; 2014 Jan 14.
14. Newman I, Benz CR. Qualitative-quantitative research methodology: Exploring the interactive continuum. SIU Press; 1998.
15. Mugenda OM, Mugenda AG. Research methods: Quantitative and qualitative approaches. Acts press; 1999.

## II-116 Hospital Support Services Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1	15	1	30

### Introduction:

The course will enable students to gain knowledge about various aspects like importance, types, functions, physical facilities, location, layout, policies and procedures, managerial issues, monitoring and evaluation of support services in a hospital.

### Objectives:

- To make students aware about composition and operations of various support services in hospitals.
- To enable students to practice and participate in procedures of various hospital support services.

<b>Unit I</b> <b>Overview of Support Services</b>	<b>1</b>
<b>Unit II</b> <b>Radiology services</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>2</b>
<b>Unit III</b> <b>Medical Records Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>2</b>
<b>Unit IV</b> <b>Blood Bank</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>2</b>
<b>Unit V</b> <b>Central Sterile Supply Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>2</b>
<b>Unit VI</b> <b>Medical Waste Management</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>2</b>
<b>Unit VII</b> <b>Housekeeping Services</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>1</b>
<b>Unit VIII</b> <b>Dietary Services</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout ,	<b>1</b>



Policies and Procedures, Managerial Issues, Monitoring and Evaluation	
<b>Unit IX Hospital Stores</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>1</b>
<b>Unit X Laboratory</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	<b>1</b>

**Books:**

1. Kunders GD. Hospitals: facilities planning and management. Tata McGraw-Hill Education; 2004.
2. Goel SL, Kumar R, editors. Hospital Administration and Management. Deep & Deep Publications; 2002 Aug 1.
3. Goel KR, editor. Hospital supportive services. Deep and Deep Publications; 2004.
4. Sakharkar BM. Principles of Hospital Administration and Planning, Jaypee Brothers Medical publishers (P) Ltd. New Delhi. 1999.

## II-117 Clinical Services Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1	15	1	30

### Introduction:

The course will enable students to gain knowledge about various aspects like importance, types, functions, physical facilities, location, layout, policies and procedures, managerial issues, monitoring and evaluation of clinical services in a hospital.

### Objectives:

- To impart knowledge about various clinical services in hospitals.
- To enable students to practice and participate in procedures of various clinical services in hospitals.

<b>Unit I</b> <b>Overview of Clinical Services</b> Types of clinical services available in a hospital, Organisation of various services, Medical monitoring, Isolation of patients	1
<b>Unit II</b> <b>Outpatient Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	3
<b>Unit III</b> <b>Emergency Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	2
<b>Unit IV</b> <b>Operating Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	2
<b>Unit V</b> <b>In - patient Department</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation	3
<b>Unit VI</b> <b>Critical care units</b> Introduction, Types, Importance, Functions, Physical Facilities, Location, Layout , Policies and Procedures, Managerial Issues, Monitoring and Evaluation Multidisciplinary intensive care units	2
<b>Unit VII</b> Recent Trends, Overview of Super Specialty Services, Ambulatory surgery services, Geriatric care, Pediatric care, Wellness centres, Evaluation of hospital services	2

**Books:**

1. Kundurs GD. Hospitals: facilities planning and management. Tata McGraw-Hill Education; 2004.
2. Goel SL, Kumar R, editors. Hospital Administration and Management. Deep & Deep Publications; 2002 Aug 1.
3. Goel KR, editor. Hospital supportive services. Deep and Deep Publications; 2004.
4. Sakharkar BM. Principles of Hospital Administration and Planning, Jaypee Brothers Medical publishers (P) Ltd. New Delhi. 1999.

## II-118 Emergency Preparedness & Disaster Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1	15	1	30

### Introduction:

This course helps students to develop theoretical and conceptual understanding of disaster management. It allows students to develop skills needed to manage and work in mass casualty, CBRN incidents and other crisis situations.

### Objectives:

- To help students develop theoretical and conceptual understanding of disaster management.
- To facilitate students to develop skills needed to manage and work in mass casualty, CBRN incidents and other crisis situations.

<b>Unit I</b> <b>Introduction to Disasters</b> Meaning of Disaster, Types of Disaster, Concept of risk, hazard, vulnerability, Need for Disaster Management, Disaster profile of India	<b>2</b>
<b>Unit II</b> <b>Disaster Management</b> Introduction to Disaster Management, NDMA, Disaster Management Act, Disaster Management Cycle (Sustainable & Humanitarian Actions)	<b>3</b>
<b>Unit III</b> <b>Preparedness Planning</b> Disaster scenarios, Roles and responsibilities, Organisational management and coordination, Response priorities, Objectives and tasks, Incident Command System, Planning levels, Contingency planning	<b>4</b>
<b>Unit IV</b> <b>Disasters and Hospitals</b> Mass casualty management systems, Mass Casualty Incident, Medical care in MCI, Rescue chain, Activities at site of disaster, Triage and types, Transfer organisation, Organization of hospitals, Reception of victims, Treatment areas, Resource Planning NDMA guide for hospital safety	<b>4</b>
<b>Unit V</b> <b>CBRN Management</b> Meaning of CBRN incidents, WMD, Need for CBRN Management, Zoning	<b>2</b>

## Books:

1. Hodgkinson PE, Stewart M. Coping with catastrophe: A handbook of disaster management. Taylor & Frances/Routledge; 1991.
2. Turner BA, Pidgeon NF. Man-made disasters. Oxford: Butterworth-Heinemann; 1997 Jan.
3. Christen HT, Maniscalco PM. The EMS incident management system: EMS operations for mass casualty and high impact incidents. Brady; 1998.
4. Haddow G, Bullock J, Coppola DP. Introduction to emergency management. Butterworth-Heinemann; 2017 Jan 9.
5. Kaszeta D. CBRN and Hazmat Incidents at Major Public Events: Planning and Response. John Wiley & Sons; 2014 Oct 1.
6. Dave PK. Emergency medical services and disaster management: A holistic approach. Alpha Science Int'l Ltd.; 2003.
7. Kreimer A, Arnold M, editors. Managing disaster risk in emerging economies. World Bank Publications; 2000.



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**II-119 Hospital Architecture and Designing****(Credits: 3, Hours: 45)****Introduction:**

The course will give an overview to students about architectural planning, design according to operation of hospital. All facets of hospital planning activities like survey, MEP, HVAC planning, LEED certifications etc. are included in the course.

**Objectives:**

- To give students an overview about architectural planning, design of a hospital.
- To introduce students to the tools of hospital planning, like survey, MEP, HVAC planning, LEED certifications etc.

<b>Unit I</b> <b>Surveying</b> Area wise planning, Planning for general hospital service, Determining the logical centers for hospital location, Determining the area served by them, Estimation of occupancy and bed ratios, Determining the size and kind of hospital service	<b>6</b>
<b>Unit II</b> <b>Hospital Planning</b> Changing system of health services, Concepts in planning, designing & space, An overview of hospital buildings, Quality of facilities and services, Evaluation of all resources needed	<b>6</b>
<b>Unit III</b> <b>Architectural Planning</b> Functional plans for hospital construction , Role of hospital consultant, Planning stage: role of architect, working drawings, legal formalities, the hospital site, design considerations, environments regulations, equipment planning, bed distribution, space requirements, their relationships, construction costs, External architectural aspects, Internal arrangements, HVAC Planning, Electric supply, water supply plumbing and sanitation, Medical gas supply and pipelines, Hospital Hygiene	<b>10</b>
<b>Unit IV</b> <b>Recent Trends-Green Buildings, LEED certification, NBC regulations</b>	<b>8</b>
<b>Unit V</b> Planning of 30,100,250 bedded hospital(general/specialty) Planning of 500, 750 and above bedded hospital(teaching/super-specialty/non-teaching specialty hospitals) Project cost and total budget : Feasibility and viability study of Hospital Project conceptualization, functional requirements. Implementation. Environmental Control and Safety: General environmental control; infection control Brownfield Hospitals	<b>15</b>

**Books:**

1. McCullough CS, editor. Evidence-based design for healthcare facilities. Sigma Theta Tau; 2010.
2. Rebel Roberts.Specialised Hospitals Design and Planning, Design Media Publishing Limited,2013
3. Richard Lyle Miller.New Directions in Hospital and Healthcare Facility Design, McGraw Hill,1995
4. Sangeet Sharma .Step by Step Hospital Designing and Planning.Jaypee Publication,2010


I-120 Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva -  
Voce (Credits: 3)



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## ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)

### **II-122 Medical Transcription**

(Credits: 2, Hours: 30)

#### **Introduction:**

The course helps students to get an overview and develop their skills about tools of transcription, ethical and legal responsibilities, keyboard kinetics, healthcare documentation, pharmacology etc.

#### **Objectives:**

- To introduce students to the components of process of medical transcription, keyboard kinetics, healthcare documentation, pharmacology etc.
- To enable students to participate and practice tools of Medical Transcription.

<b>Unit I</b> Focus on medical specialties: Introduction to medical transcription, Medical Transcription Process	<b>4</b>
<b>Unit II</b> Tools of Transcription, Transcription Skill	<b>4</b>
<b>Unit III</b> Technology and medical professional Ethical & Legal Responsibilities, Confidentiality	<b>4</b>
<b>Unit IV</b> Keyboard kinetics, Following Verbal Instructions, Medical word building Grammar and Punctuation	<b>6</b>
<b>Unit V</b> Healthcare documentation : General Principles for complete documentation in Medical Records	<b>6</b>
<b>Unit VI</b> Pharmacology Diagnostic reports	<b>6</b>

#### **Books:**

1. Burns L, Maloney F. Medical Transcription & Terminology: An Integrated Approach. Cengage Learning; 2003.
2. Blake RS. Delmar's Medical Transcription Handbook. Cengage Learning; 1997.
3. Marcy Diehl : Medical Transcription Guide: Do & Don'ts, Paperback; 2004

## II-123 Hospital Maintenance

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1	15	1	30

### Introduction:

The course helps students to know the types, operation, monitoring and maintenance of hospital equipments; all of which play a vital role in smooth functioning of today's hospitals.

### Objectives:

- To make students aware about the types, operation, monitoring and maintenance of various hospital equipments.

<b>Unit I</b> Nomenclature of medical equipments, Division of Hospital Diagnostic, Therapeutic, Imaging, Laboratory Equipments; Study of each equipment under, Principle of operation, Block Diagram, Applications, Limitations if any, Preventive Maintenance, Breakdown maintenance Equipment management information system; Introduction to maintenance issues/ equipment management in hospital, Benefits of equipment management, Components of management cycle	8
<b>Unit II</b> Organizing the maintenance operation, Provision of budgets and finance, Biomedical equipment procurement procedure, Technology assessment and selection, Installation and commissioning	6
<b>Unit III</b> Training and skill development, Operation & Careful usage, Occupational Safety Maintenance and repair	4
<b>Unit IV</b> Maintenance policy: Medical equipment-maintenance protocol, Preventive maintenance planning, Measures for breakdown maintenance. Testing and Calibration of Medical equipments. Clinical Engineering Department-functions, responsibilities, design criteria. Policies and procedures, work record	6
<b>Unit V</b> Maintenance programmes: Maintenance of equipment-In-house and Contract-Variety types of contracts. Contract management- Legal aspects, Annual Maintenance Contract Monitoring and Evaluation, Equipment audit, Equipment utilisation	6

### Books:

1. Kunders GD. Hospitals: facilities planning and management. Tata McGraw-Hill Education; 2004.
2. Arun K. Agrawal. Standard Operating Procedures for Hospitals in India. Atlantic Publication; 2007
3. Binsend Wang .Medical Equipment Maintenance: Management and Oversight,, Morgan & Claypool Publishers; 2012

## II-124 Interior Designing & Landscaping

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1.5	23	0.5	15

### Introduction:

The course focuses on development of skills needed for planning and designing interiors, explore available options for landscaping in various healthcare set ups.

### Objectives:

- To give students an overview about planning and designing interiors of hospitals.
- To introduce students to landscaping in various healthcare set ups.

<b>Unit I</b> <b>Interior Designing</b> Principles and Elements of Design, Colour Theory, Digital Sketching, Usage of Space, Overview of Construction Materials, Functionalities of Interior Elements	4
<b>Unit II</b> Introduction to processes and tools for conversion of floor Plans to 3D plans, creating Digital Drawings, Image-Editing Techniques, 3D Modelling, Texturing, Lighting & Rendering	4
<b>Unit III</b> <b>Landscaping</b> Introduction and need, Benefits of natural environments within hospitals	4
<b>Unit IV</b> <b>Outdoor hospital spaces</b> Landscaped grounds, Landscaped setbacks, Front porches, Entry gardens, Courtyards, Plazas, Roof terraces, Roof gardens, Healing gardens, Meditation gardens, Viewing gardens, The viewing/walk-in garden, Edible gardens	4
<b>Unit V</b> <b>Outdoor design criteria for hospitals</b> Accessibility, Visibility, Feeling of Control, Feeling of security, Physiological comfort, Quiet, Familiarity, Flexibility, Sustainability	2
<b>Unit VI</b> <b>Hard landscape design</b> Gateways and entrances, Parking areas, Paths, Childrens' gardens, Dining areas	2
<b>Unit VII</b> Art, Water, Site furniture, Seating, Signage, Lighting, Receptacles, Planting design	3

### Books:

1. Setola N, Borgianni S. Designing public spaces in hospitals. Routledge; 2016 Apr 14.
2. Panero J, Zelnik M. Human dimension and interior space: a source book of design reference standards. Watson-Guptill; 2014 Jan 21.

## II-125 Wellness & Spa Centre Management

(Credits: 2, Hours: 30)

### Introduction:

This course gives an overview about the components and various aspects involved in planning, budgeting, marketing, commissioning and overall management of spas and wellness centres.

### Objectives:

- TO introduce students to composition and operations of wellness spa.
- To enable students to develop their skills in the management of wellness spa.

<b>Unit I</b> <b>Introduction to Spa and Wellness</b> Definitions of health, wellness and spas, History of wellness and spa traditions Typologies of wellness and spa facilities, Commonly availed therapies, treatments and practices, Wellness and other Branches: Hospitality, AYUSH, Tourism, Medical Tourism in Kerala, Leisure Travel and Destination Management, Regional developments in wellness and spas, Cross-cultural issues in wellness and spa services, Service Quality & Profession Etiquette, Changing trends in lifestyles and leisure	<b>12</b>
<b>Unit II</b> <b>Consumer Behaviour</b> Evidence and research base for wellness and spa treatments, Wellness and spa guests and tourists: demand, profiles, motivation	<b>6</b>
<b>Unit III</b> <b>Management</b> Managing wellness and spa facilities, Planning and developing wellness and spa facilities, Infrastructure and equipments required for Spa, Marketing wellness and spa facilities, Complementary and alternative therapies used in wellness and spas, Future trends in wellness and spas, Medical Tourism	<b>6</b>
<b>Unit IV</b> <b>Revenue Management</b> Concept, Tools of Revenue management, Essentials of Revenue Managing, Managing occupancy, Effectiveness of Revenue Managing	<b>6</b>

### Books:

1. Burkholder P. Start your own day spa and more. Entrepreneur Press; 2007 Jul 13. Health and Wellness Tourism, Melanie Smith, Laszlo Puczko, Elsevier
2. Gallup JW. Wellness centers: A guide for the design professional. John Wiley & Sons; 1999 Apr 26.

THIRD SEMESTER  
HOSPITAL MANAGEMENT COROLLARIES  
CORE COURSES

MHA -2018 program



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### III-126 Ethics & Medico Legal Systems in Hospital

(Credits: 2, Hours: 30)

#### Introduction:

With the increasing lawsuits in healthcare industry, this course provides an insight about emerging issues at the interface of medico-legal laws, ethics in medical practice.

#### Objectives:

- To give students an overview about medico-legal laws, ethics in medical practice in today's changing world.

<b>Unit I</b> <b>Medical Ethics</b> Introduction to Ethics, Indian Medical Council Act, Code of Medical Ethics, Research ethics	<b>8</b>
<b>Unit II</b> <b>Medico legal systems</b> Law of torts, Negligence, Liability	<b>8</b>
<b>Unit III</b> <b>Ethical Practices</b> Communication in healthcare (Doctor-patient, Relative-patient), Consent and Types of Consent, Privacy and Confidentiality, Incident Reports	<b>6</b>
<b>Unit IV</b> <b>Medical Malpractices</b> Cut practices, Organ Trafficking, Foetal Sex Determination, Crosspathy practice, Unethical conduct Ethical Dilemma: DNR, Euthanasia, Surrogacy, Advertisement	<b>8</b>

#### Books:

1. VP Singh, editor. Legal Issues in Medical Practice: Medicolegal Guidelines for Safe Practice, Jaypee, 2016
2. RK Sharma. Medico-Legal Aspects of Patient Care, PeePee, 2008
3. Patrick Davey, Anna Rathmell, Michael Dunn, Charles Foster, Helen Salisbury. Medical ethics, Law and Communication at a Glance. Wiley Blackwell, 2016
4. Judith Hendrick. Law and Ethics in Nursing and Healthcare. Nelson Thornes, 2000
5. SatishTiwari, Mahesh Baldwa, MukulTiwari, AlkaKuthe. Textbook on Medico Legal Issues. Jaypee, 2012
6. Swapnil S Agarwal, Lavlesh Kumar, KrishnaduttChavali. Legal Medicine Manual. Jaypee, 2008

### III-127 Biomedical Waste Management, Nosocomial Infections & Biosafety

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	1.5	23	1.5	45

#### Introduction:

The course provides an outline about healthcare waste, its collection, segregation, storage, transport, treatment, disposal and legal aspects involved. It also focuses on personnel training, nosocomial infection prevention and helps students to effectively create, develop and enhance their personal safety.

#### Objectives:


- To impart knowledge about healthcare waste management and its importance in the context of nosocomial infection prevention.

<b>Unit I</b> <b>Introduction to Health Care Waste</b> Definition and General Classification, Infectious and Non-infectious Waste, Pathological, Pharmaceutical, Chemical, Radioactive, Non hazardous general waste, Sources of Healthcare Waste, Generation of Healthcare Waste, Risks associated with healthcare waste and its impact on public health	2
<b>Unit II</b> <b>Collection, Segregation, Storage and Transport of Waste</b> Segregation Systems, Collection within HCO, Transport within HCO, Central Storage in HCO, Offsite transport	2
<b>Unit III</b> <b>Treatment and Disposal of Healthcare Waste</b> Available methods of waste treatment: Thermal, Chemical, Irradiation, Biological Mechanical, Disposal methods for all types of waste, Land disposal	2
<b>Unit IV</b> <b>Collection &amp; Disposal of Waste Water</b> Waste water from healthcare facilities- Its Effects, Pre-treatment and Discharge	2
<b>Unit V</b> <b>Recent trends</b> Waste Minimization: Reuse, Recycle, Recovery Healthcare Waste Management Economics, Cost elements, Cost estimation and Cost reduction methods Healthcare Waste Management, Need for planning, Assignment of responsibilities, Organisation structure, Assessment of waste generation, HCO's waste management plan (Development and Implementation)	2

<b>Unit VI</b> <b>Legal Aspects of Healthcare Waste</b> BMW handling rules	<b>2</b>
<b>NOSOCOMIAL INFECTIONS &amp; BIOSAFETY</b>	
<b>Unit VII</b> <b>Infection Control</b> Awareness about hospital infection, Chain of infection, Epidemiological elements, Sources of Infection, Routes of transmission	<b>1</b>
<b>Unit VIII</b> <b>Prevention of Nosocomial Infections</b> Precautions (hand Hygiene), Cleaning, Sterilisation and Disinfection, Isolation, Occupational Safety and Measures to be taken	<b>1</b>
<b>Unit IX</b> <b>Training &amp; Development of Personnel</b> Health of Healthcare Workers, Need for stakeholder awareness, Education and Training of Healthcare Personnel, Training of Healthcare Waste Handlers	<b>1</b>
<b>Unit X</b> <b>Biosafety</b> Biosafety and laboratory biosecurity in India, WHO Global Biosafety and Laboratory Biosecurity programme, Containment equipment, Risk assessment, risk management, risk communication; Disinfection, decontamination and emergency response, Shipment of Biological material, Laboratory management and legislative framework, Biosafety programme management, The new CEN Biorisk Management standard CWA15793, Laboratory construction, design and equipment, Facility operation and maintenance, BSL 3 design and construction	<b>8</b>

#### Books:

1. Anant preet Singh. Biomedical Waste Disposal. Jaypee, 2012
2. Neeta Patwardhan, Satish Patwardhan. Hospital Associated Infections: Epidemiology, Prevention and Control. Jaypee, 2017
3. Najat Rashid, Ramnik Sood. Manual of Laboratory Safety (Chemical, Radioactive and Biosafety with Biocides). Jaypee, 2013
4. Willaim C. Blackman. Jr. Basic Hazardous Waste Management. CRS Press LLC, 2001
5. Purva Mathur. Hospital Acquired Infections: Prevention and Control. Wolter Kluver/Lippincott Williams & Wilkins, 2010

  
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### III-128 Project Management in Healthcare

(Credits: 2, Hours: 30)

#### Introduction:

This course gives an overview about the components and various aspects involved in planning, budgeting, marketing, commissioning etc., of hospital and healthcare projects.

#### Objectives:

- To give students an overview about various components of project management.
- To enable students to develop their skills in handling hospital and healthcare projects.

<b>Unit I</b> <b>Overview of Project Management</b> Project Management Framework, Project Life cycle, Project Management Roles, Overview of Projects	<b>3</b>
<b>Unit II</b> <b>Project Integration Management</b> Project Plan Development, Project Manager Skills, Project Charter, Project Sponsors	<b>2</b>
<b>Unit III</b> <b>Project Scope Management</b> Work Breakdown Structure (WBS) , Project Planning and Cost Controls, Statement of Work (SOW), Customer Approvals and Reviews, Scope Change Control	<b>2</b>
<b>Unit IV</b> <b>Project Time Management</b> Activity List, Project Network Diagram Methods, Duration Estimating Methods, Critical Path, Pert, Schedule Development , Crashing, Fast Tracking, Resource Allocation, Slack/Float, Schedule Control , Dependencies	<b>2</b>
<b>Unit V</b> <b>Project Resource Management</b> Resource Requirements, Cost Estimating Methods, Cost Budgeting, Budgets, Contingency/Management, Reserve Funds, Earned Value Concepts, Earned Value Analysis, Human resource Management Processes, RAM (Responsibility Assignment Matrix), Project communication management, MS Project formats,	<b>3</b>
<b>Unit VI</b> <b>Project Quality Management</b> Project Quality Management Processes, Overview of Quality Concepts, Quality Planning /Assurance/Control, PDCA Model, Flowcharting/Control Chart, monitoring and control	<b>2</b>
<b>Unit VII</b> <b>Project Risk Management</b> Project Risk Management Processes, Risk Defined, Types of Risk, Risk Factors , Risk	<b>2</b>

Identification, Sources of Risk, Risk Quantitative Analysis, Risk Qualitative Analysis, Risk Response Strategies, Prioritizing Risk, Workarounds, Expected Value, Decision Trees	
<b>Unit VIII</b> <b>Project Procurement Management</b> Project Procurement Management Processes, Make / Buy Decisions o Elements of a Contract, Contract Types, Statement of Work / Contracts	4
<b>Unit IX</b> <b>Hospital Project :</b> Introduction to planning of various department of hospital Guiding principles in planning, Conception of idea, hospital planning team, architecture and design brief, Financial planning of hospitals, Conception to commissioning: site development, equipment planning, bed distribution, space allocation, Tender process	6
<b>Unit X</b> <b>Miscellaneous:</b> Root cause analysis, Role of hospital executive in project management and decision making, Role of stakeholders in the project management, Carbon foot print, LEEDS	4

#### Books:

1. David Shirley. Project Management for Healthcare. CRC Press, 2011
2. S Choudhury. Project Management. Tata McGraw Hill, 1988
3. Prasanna Chandra. Projects: Planning, Analysis, Selection, Financing, Implementation, and Review. Tata McGraw Hill, 2010
4. Erik Larson & Clifford Gray. Project Management: The Managerial Process. McGraw Hill, 2010
5. Harold Kerzner. Using the Project Management Maturity Model: Strategic Planning for Project Management. Wiley, 2005

### III-129 Health and Labour Laws

(Credits: 2, Hours: 30)

#### Introduction:

This course seeks to give students an understanding of the legal framework governing labour management and also provides knowledge on various laws which are specific to healthcare industry.

#### Objectives:

- To introduce students to various labour laws and laws related to healthcare industry.

<b>Unit I</b> <b>Introduction to Legal System of India</b> Overview of Judicial system in India: Supreme Court, High Court, District and Sessions Court; Criminal, Civil, Consumer, Magistrate Courts; Fundamental rights and Right to Health, Article 21, Legal terminologies	<b>2</b>
<b>Unit II</b> <b>Administrative councils of medical profession</b> Medical council of India, Dental Council of India, Pharmacy council of India, Indian Nursing Council, Central Council of Homeopathy, Central Council of Indian Medicine	<b>4</b>
<b>LAWS</b>	
<b>Unit I</b> <b>Laws concerning Healthcare</b> Consumer Protection Act, PCPNDT Act, Transplantation of human Organs Act, Medical Termination of Pregnancy Act, Drugs and Cosmetics Act, Narcotic drugs act, Drug and Magic Remedies Act, Surrogacy Act, Birth and Death Registration Act, Mental health Act	<b>8</b>
<b>Unit II</b> <b>Laws concerning business aspects of hospital</b> Trust Act, Clinical Establishments (Registration and Regulation) Act, Insurance Act, Taxation laws, Bombay Shops and Establishments Act, Indian Partnership Act, Society Registration Act, Companies Act	<b>6</b>
<b>Unit III</b> <b>Labour Laws</b> Child Labour Act, ESI Act, Minimum Wages Act, Workmens Compensation Act, Payment of Gratuity, Payment of Bonus Act, Trade Union Act, Industrial Disputes Act, Information Technology Act	<b>10</b>

#### Books:

1. D. Samuel Abraham. Laws on Hospital Administration. B.I. Publications, 2010
2. S.P Jain, Simmi Agarwal. Industrial & Labour Law. Dhanpat Rai and Sons, 2016
3. B D. Singh. Labour Law for Managers. Excel Books, 2007
4. Bare Acts

### III-130 Industrial Relations

(Credits: 2, Hours: 30)

#### Introduction:

The course helps students to understand the complexities involved in management of labour and the aspects of maintaining symbiotic relationship between top, middle, lower level employees to create an efficient organization.

#### Objectives:

- To give students an overview about management of labour and relationship between top, middle, lower level employees for creation of an efficient organization.

<b>Unit I</b> <b>Overview of Industrial Relations</b> Meaning, Definition, Scope, Importance, Factors affecting industrial relations, Role of state in IR, Trade unions, Blue collar vs white collar unions, Association of doctors, nursing staff, paramedical	<b>5</b>
<b>Unit II</b> <b>Trade Unionism in India:</b> Origin, Growth, Structure and Management of Trade Unions, Recognitions, Leadership, Trade Unionism, Employers' Organisations in India, Managerial Associations	<b>4</b>
<b>Unit III</b> <b>Industrial Dispute</b> Meaning of dispute, Causes, Consequences, Preventive and settlement machinery, Concept of Trade Union, Conflict Management, Standing orders act	<b>5</b>
<b>Unit IV</b> <b>Worker Welfare</b> Grievance Procedure, Guidelines for handling grievance, Work ethics, Work culture and quality of work life, Workers Participation in Management, Social, Insurance Scheme, Wage fixation and collective bargaining	<b>5</b>
<b>Unit V</b> <b>Collective Bargaining:</b> Theories, Prerequisites, Process, Negotiating Skills and Strategies, Agreement –content, Validity, Implementation, Productivity Bargaining, Growth of Collective Bargaining in India.	<b>6</b>
<b>Unit VI</b> <b>Workers' Participation in Management :</b> Concept, Purpose and Practices in other countries; Workers' Participation Schemes in India – Works Committee, Joint Management Council, Worker – Director, Shop Council and Joint Council, WPM, EPM; Problems and Prospects in India; Quality Circles – Concept and Practices in India.	<b>5</b>

#### Books:

1. Arun Monappa, Ranjeet Nambudiri, Patturaja Selvaraj. Industrial Relations and Labour Laws. Tata McGraw Hill, 1997
2. B. D. Singh. Industrial Relations and Labour Laws. Excel Books, 2008
3. C.B.Mamoria, Satish Mamoria. Dynamics of Industrial Relations. Himalaya Publishing House, 2015

### III-131 Operations Management & Research

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	1.5	23	1.5	45

#### Introduction:

The course helps students to understand and develop their skills in building basic concepts, techniques and issues faced during operation of a hospital and healthcare organization.

#### Objectives:

- To impart knowledge about basic concepts, techniques and issues faced during operation of a hospital and healthcare organization.
- To help students develop their skills and participate in operation of a hospital and healthcare organization.

<b>Unit I</b> <b>An Overview of Operations Management:</b> Facilities planning; Production selection; Process selection; Facilities location; Facilities layout and materials handling; Capacity planning.	<b>5</b>
<b>Unit II</b> <b>Operation Planning and Control:</b> Work design; Productivity and work style; Job design; Planning and control for mass production; Planning and control for batch production; Planning and control for shop production; Planning and control of purchase	<b>3</b>
<b>Unit III</b> <b>Maintenance management and Reliability;</b> Value Engineering; Quality assurance; Quality control; Total Quality Management and World Class Systems Management(WCSM) Continuous quality improvement, defining standards, use of advanced quality management techniques, Review and Evaluation – continuous review of system, policy, procedure, process of updating, working out indexes and indexes for evaluation of various services.Productivity study, development of productivity standards, work standards, utilization standards and indices, Latest changes and development in Health Management.Managed Care / Health Maintenance Organization (H.M.O)	<b>3</b>
<b>Unit IV</b> <b>Globalization of Services;</b> Service Strategy and Competitiveness	<b>2</b>
<b>Unit V</b> <b>Process Technology &amp; Information Technology;</b> Technology in Services; Information Systems, ERP Systems; Technology & Their Service Delivery Systems; HRM in Services	<b>3</b>
<b>Unit VI</b>	

<b>Linear Programming Techniques:</b> Graphical and Simplex solution for maximizing and minimizing problems – A case of degeneracy in Simplex method – Post optimality analysis, Sensitivity Analysis, Parametric programming – Revised Simplex problem – primal / dual relationship – Goal programming.	<b>5</b>
<b>Unit VII</b> <b>Decision Theory:</b> Decision under risk, Decision trees, Decision under uncertainty. Use of Simulation technique for decision making. Case studies for the use of Simulation techniques for decision making. Optimal Simulation run.	<b>2</b>

**Books:**

1. B Mahadevan. Operations Management: Theory And Practice, Pearson College Div, 2009
2. Russel & Taylor. Operations Management: Quality And Competitiveness In A Global Environment, Wiley, 2005
3. Taha, H.A. Operations Research - An Introduction. Prentice Hall/ Pearson Education, 2007
4. Hillier, F.S. and Lieberman, G.J. Operations Research. Tata McGraw Hill, 2000
5. Panneerselvam. Operations research. Prentice Hall, 2004
6. Anderson. Quantitative Methods for Business. South-Western College Pub, 2012
7. Prabha B. Random Processes & Queuing Theory. Scitech Publications, 2010
8. Kothari C.R. An Introduction to Operations Research. Vikas Publishing, 2002

### III-132 Quality Management & Accreditation

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
3	2	30	1	30

#### Introduction:

The course helps students gain knowledge about concept of quality and develop skills to use various tools, indicators which are essential in accreditation from various bodies at national and international level.

#### Objectives:

- To impart knowledge about components and concept of quality management in healthcare setups.
- To facilitate students to develop their skills needed to use various tools, indicators essential in accreditation process.

<b>Unit I</b> Introduction to Quality Assurance, Evolution of Quality Assurance in Healthcare, Quality Control and Quality Assurance, Dimensions of Quality Assurance	<b>6</b>
<b>Unit II</b> Understanding Systems and Processes, Standard, Protocol, Guidelines, Criteria, Performance Indicators, Setting standards and creating protocols, Quality Assurance manual and Plan.	<b>3</b>
<b>Unit III</b> Quality Assurance for Health practice: Clinical and administrative (departments) special emphasis on application of NABH standards.	<b>8</b>
<b>Unit IV</b> Cost of Quality and non conformance cost, Quality Management System, TQM. Quality Assurance at the Macro Health Scenario: District, State and National Level needs Quality Assurance and Paradigms for change in the Indian Health Care scenario, IPHS, ISO in Healthcare.	<b>3</b>
<b>Unit V</b> Healthcare Quality Organization worldwide: Quality Council of India, Institute of Medicine (with special reference to the report - Crossing the Quality Chasm), Joint Commission Resources, Health grades, International Society for Quality in healthcare, Agency for Healthcare Research and Quality (AHRQ), American Society for Quality (ASQ), Institute-of Quality Improvement (IHI), National Association for Healthcare quality (NAHQ), National Committee, for Quality Assurance (NSQA), Leap Frog Group, NICE.	<b>4</b>

<b>Unit VI</b> Training stakeholders for practicing Quality Assurance in the health care, Monitoring and Evaluation through Quality Assurance practices, Audit and Audit cycle. Accreditation and its benefits/ advantages. JCI Accreditation, Process of Accreditation.	<b>6</b>
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**Books:**

1. S K Joshi. Quality Management in Hospitals. Jaypee, 2009
2. Patrice Spath. Introduction to Healthcare Quality Management. AUPHA publication, 2009
3. Rashid Bashshue, editor. An Introduction to Quality Assurance in Healthcare. Oxford Press, 2003
4. L. Fleming Fallon, James W. Begun, William Riley. Managing Health Organizations for Quality and Performance. Jones & Barlett learning, 2013
5. Girdhar J Gyani, Alexander Thomas. Handbook of Healthcare Quality & Patient Safety. Jaypee, 2014
6. Karun Dev Sharma. Quality System Implementation in Health Care Establishments. Jaypee, 2014
7. Farooq Jan. Step by Step Quality Hospital Care. Jaypee, 2012
8. ArifRaza. Accreditation of healthcare Organizational. Jaypee, 2016



**III-133 Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce**

**(Credits: 3)**

MHA -2018 program



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## ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)

### **III-134 Customer Relationship Management (Credits: 2, Hours: 30)**

#### **Introduction:**

The course emphasizes the need for client management by synergising, modifying and maintaining internal and external processes to deliver value to the end user.

#### **Objectives:**

- To introduce students to various techniques and processes of client management.
- To facilitate students to develop their skills needed to synergise, modify and maintain internal and external processes to deliver value to the end user.

<b>Unit I</b> <b>Introduction to CRM-</b> Introduction to CRM, Consider CRM in your business strategy, Initial CRM Considerations, Preparing for Technical Implementation.	<b>6</b>
<b>Unit II</b> <b>The Customer Service/Sales Profile:</b> Why call it the customer Service /Sales Profile; three levels of Sales and Services, Importance of the Organization and Business Process of the Organization, Shape of your customer Services and Sales Profile, CRM and your profile Tool for Capturing Customer Information.	<b>8</b>
<b>Unit III</b> <b>Pre-Order Customer-Support Issues:</b> Online Visibility via Search Engines, Real time Access to Product Information, Inventory Integration, International Business, Shipping, Order Tracking.	<b>5</b>
<b>Unit IV</b> <b>Point of Order Customer- Support Issues:</b> Understanding Point of Order issues, ensuring a Smooth Ordering Process, Providing an Intuitive Site Navigation Scheme.	<b>5</b>
<b>Unit V</b> <b>Post Order Customer- Support Issue:</b> Tracking Order, Managing Relationship Through Conflict.	<b>6</b>

#### **Books:**

1. Herzlinger RE. Consumer-driven health care: implications for providers, payers, and policy-makers. John Wiley & Sons; 2004 Mar 22.
2. Baker M, Hart S. The marketing book. Routledge; 2008 Sep 10.
3. Brown SA, Coopers PW. Customer relationship management: A strategic imperative in the world of e-business. John Wiley & Sons, Inc.; 1999 Oct 1.
4. Berry M, Linoff G. Mastering data mining: The art and science of customer relationship management. John Wiley & Sons, Inc.; 1999 Dec 1.
5. Newell F. Loyalty. com: Customer relationship management in the new era of Internet marketing. McGraw-Hill, Inc.; 2001 Jan 1.
6. Linoff GS, Berry MJ. Data mining techniques: for marketing, sales, and customer relationship management. John Wiley & Sons; 2011 Mar 23.

### III-135 Medical Records & Database Management

(Credits: 2, Hours: 30)

#### Introduction:

This course helps students to develop skills and gain knowledge about collecting, storing, managing, accessing and using patient health data in electronic form. It also focuses on database management for efficient data retrieval, data analysis, security, use in decision support systems etc

#### Objectives:

- To build student awareness about collecting, storing, managing, accessing and using patient health data in traditional and electronic form.
- To enable students learn and practice database management for efficient data retrieval, data analysis, security.

<b>Medical Records Management</b>	
<b>Unit I</b> Introduction of Medical Record: Meaning, Definition Significance of medical record; Value of medical records to patient, hospital, doctors, medical education and research, Characteristics of good medical Record, Issues related to medical record	2
<b>Unit II</b> Developing recording system in the hospital: Maintaining adequate records on the patient file, Training programs for staff, Retention and storing of medical Records: Outpatient, Inpatient, Medico legal cases retention policies, process of medical record storing	5
<b>Unit III</b> Medico legal liabilities related to patient records, Medical Record committee and role of committee Hospital Utilization ; Bed turnover ratio, Average length of stay, Death rate, Bed occupancy rate	5
<b>Database Management</b>	
<b>Unit IV</b> Introduction, Database and types of database, Working of a Simple Centralized Database System, Tradition al File Systems vs. Modern Database Management Systems, Properties of Database, Types of Database Users, Advantages of using DBMS, Applications of traditional Database .	5
<b>Unit V</b> Database Core Concepts and Applications: Introduction, Data Model, Schemas and Instances, three schema architecture, Languages and Interfaces, DBMS Components, Classification of Database Management Systems.	5
<b>Unit VI</b> Record Storage and Primary File Organization: Introduction, Memory Hierarchy, Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk, Operation on Files, Files of Unordered Records (Heap Files), Files of Ordered Records, Hashing Techniques	5
<b>Unit VII</b> Computerization of medical Record; Electronic Health Record and Electronic medical record (EMR), advantages of EMR, ICD coding, HIPPA.	3

#### Books:

1. Mogli GD. Medical records: organization and management. Jaypee Bros.; 2001.
2. Kedar S. Database management system. Technical Publications; 2009.
3. Gupta GK. Database Management System. Tata McGraw-Hill Education; 2011.

### III-136 Telemedicine Management

(Credits: 2, Hours: 30)

#### Introduction:

The course provides an overview about distance communication between patient and health professionals, by use of technology in remote patient care.

#### Objectives:

- To provide an overview about components and process of distance communication between patient and health professionals using technology, in remote patient care.

<b>Unit I</b> <b>Introduction To Telemedicine:</b> Concept ,Definitions ,History, Organs and Forms, Evolution, Impact, Issues, Type of digital information of telemedicine	<b>2</b>
<b>Unit II</b> <b>Telemedicine Systems:</b> Telemedicine as a system ,Critical sub-systems of telemedicine ,Regulatory sub-systems ,Optional sub-systems of telemedicine ,Mobile applications of telemedicine	<b>5</b>
<b>Unit III</b> <b>Clinical And Technical Aspects Of Telemedicine:</b> Applications of telemedicine ,Perspectives of clinicians ,Telemedicine and diagnostic imaging ,Telemedicine and monitoring of physiological parameters ,Telemedicine and surgery	<b>5</b>
<b>Unit IV</b> <b>Data And Information Standards In Telemedicine:</b> Role of standards in Healthcare ,Health Level Seven (HL7),Digital Imaging and Communication in Medicine (DICOM),Logical Observation Identifiers Names and Codes (LOINC); Systematized Nomenclature of Medicine-Clinical Terms (SNOMED),Adoption of Information Systems Standards in Healthcare ,Ethical and legal aspects of telemedicine: confidentiality, and the law, patient rights and consent, access to medical Records, reimbursements ,Values to the Patient, Clinician, and Health Care Organization training, cost, administration, Challenges to Successful Implementation	<b>5</b>
<b>Unit V</b> <b>Telemedicine Implementation:</b> Telemedicine networks in developed countries ,Telemedicine networks in developing countries ,Mobile telemedicine (m-Health) applications ,Integration of Telemedicine with other IT applications in healthcare ,Challenges to successful implementations ,Telemedicine case study to identify the healthcare professional roles and understanding of the implications of training, cost and administration involvement.	<b>5</b>
<b>Unit VI</b> <b>Ethical And Legal Aspects Of Telemedicine:</b> Confidentiality of medical data ,Challenges being faced by telemedicine ,Roles of	<b>5</b>

clinicians and paramedical personnel ,Ethical and legal aspects of telemedicine ,Implications of trainings and cost	
<b>Unit VII</b> <b>Adoption of Telemedicine:</b> Concepts: Innovation, Adoption, Diffusion, Integration ,Factors influencing Adoption of Telemedicine ,Diffusion of IT Innovations in Healthcare ,Adoption & Diffusion of Telemedicine in resourceful and resource limited settings	<b>3</b>

**Books:**

1. Wootton R, editor. Telehealth in the developing world. IDRC; 2009 Feb 24.
2. Pisasale C, Holt A. Book review:“Telehealth in the Developing World”. Journal of Health Informatics in Developing Countries. 2009 Dec 17;3(2).
3. Khoumbati K, editor. Handbook of Research on Advances in Health Informatics and Electronic Healthcare Applications: Global Adoption and Impact of Information Communication Technologies: Global Adoption and Impact of Information Communication Technologies. IGI Global; 2009 Jul 31.
4. Shortliffe EH, Cimino JJ, editors. Biomedical informatics: computer applications in health care and biomedicine. Springer Science & Business Media; 2013 Dec 2.



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**FOURTH SEMESTER**  
**SPECIALIZATION HEALTHCARE ADMINISTRATION**  
**CORE COURSES**

## IV-137 Health Insurance Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1.5	23	0.5	15

### Introduction:

The course helps students to develop an understanding on basic principles of health insurance, IRDA, intermediaries in health insurance, TPA, insurance frauds and its managerial aspects.

### Objectives:

- To introduce students to the basic components, principles, processes and operations of health insurance management.

<b>Unit I</b> Basic principles of general insurance: History and development of health insurance, Current scenario- International, Indian.	4
<b>Unit II</b> Insurance Act, 1939, Insurance Regulatory and Development Authority (IRDA), Consumer Protection Act, 1986	6
<b>Unit III</b> Insurance Ombudsman, Intermediaries in health insurance, Evolution of TPA industry in India, Working and role of TPA, Managed health care, Regulations relating to the intermediaries, Other intermediaries	4
<b>Unit IV</b> <b>Health insurance frauds:</b> Introduction, Measures to control insurance fraud and abuse, Case studies, IT and control of health insurance frauds and abuse	3
<b>Unit V</b> <b>Health insurance products:</b> International, Indian health insurance products, Interpretation of terms and conditions, Specific ailment based products- HIV and Diabetes, Community based health insurance, Social Health Insurance-ESIS and CGHS	4
<b>Unit VI</b> <b>Operational aspects:</b> Claims and utilisation management, International Classification of Diseases (ICD), Provider management, Medical underwriting, HIPAA	2

### Books:

1. Meyer WF. Life & Health Insurance Law. Lawyers Co-operative Publishing Company; 1971.
2. Jütting J. Health insurance for the poor in developing countries. Gower Publishing, Ltd.; 2005..
3. Palande PS, Shah RS, Lunawat ML. Insurance in India: Changing policies and Emerging opportunities. SAGE Publications India; 2003 Sep 11.

## IV-138 Clinical Research Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1.5	23	0.5	15

### Introduction:

The course helps students to gain an overview of activities in a clinical research study and develop skills for its operations management.

### Objectives:

- To introduce students to the basic components, principles, processes and operations of clinical research management.

<b>Unit I</b> <b>Overview of Medicinal Product Research and Development</b> Drug Discovery and Pre-Clinical Research; The Clinical Research and New Drug Application Approval Process; The Biologics Research, Development, and Licensing Process; Medical Device Research, Development, and Marketing.	<b>4</b>
<b>Unit II</b> <b>Good Clinical Practice (GCP)</b> Investigational New Drug Application 21 CFR 312: Sponsor's Obligations; Investigational New Drug Application 21 CFR 312: Investigator's Obligations; Institutional Review Boards 21 CFR 56; Protection of Human Subjects 21 CFR 50; Financial Disclosure 21 CFR 54.	<b>4</b>
<b>Unit III</b> <b>International Conference of Harmonization</b> The History of the International Conference of Harmonization; The ICH Good Clinical Practice Consolidated Guideline (E6); The ICH Clinical Safety Data Guideline (E2).	<b>4</b>
<b>Unit IV</b> <b>Clinical Trial Development</b> Protocol Design and Development; Case Report Form Design and Development; Principals of Data Management and the Query Resolution Process; The Study Types Providing Expanded Access to Investigational Products.	<b>4</b>
<b>Unit V</b> <b>Investigator Site Perspective: Coordinating a Clinical Trial at the Site</b> Essentials of Source Documentation; Maintaining and Managing Essential Documents; Recording and Reporting Non-Serious and Serious Adverse Events.	<b>2</b>
<b>Unit VI</b> <b>Sponsor's Perspective: Managing a Clinical Trial</b> Selecting Investigators and Monitors; Maintaining and Managing Essential Documents (e.g. FDA Form 1572); Case Report Form Data Transmission and Generation of the Clinical Study Report; Reviewing and Reporting of Serious Unexpected Adverse Drug Experiences; Implementing Monitoring Plan and Performing Quality Control.	<b>2</b>
<b>Unit VII</b>	



### Monitoring Obligations and Methods

3

Monitoring Role and Responsibilities According to the FDA Guideline; Monitoring Role and Responsibilities According to ICH Good Clinical Practice Consolidated Guideline (E6); Monitoring Responsibilities: Type of Monitoring Visits, Monitoring Activities Pre-Visit, On-Site, and Post Visit; Monitoring Method: Implementing a Systematic Monitoring Approach to Effectively Monitor a Multi-Center Trial; Problem Solving and Trouble Shooting GCP / ICH Issues; Writing Strategic Monitoring Reports and Follow-Up Visit Letters.

#### Books:

1. Nesbitt LA. Clinical Research: What it is and how it works. Jones & Bartlett Learning; 2004..
2. Portney LG, Watkins MP. Foundations of clinical research: application to practice. Stamford, USA: Appleton & Lange. 1993..
3. Gad SC, editor. Clinical trials handbook. John Wiley & Sons; 2009 Jun 17.,
4. Stone J. Conducting clinical research: A practical guide for physicians, nurses, study coordinators, and investigators.
5. Hulley SB, Cummings SR, Browner WS, Grady DG, Newman TB. Designing clinical research. Lippincott Williams & Wilkins; 2013 May 8.
6. Glick HA, Doshi JA, Sonnad SS, Polsky D. Economic evaluation in clinical trials. OUP Oxford; 2014 Oct 2.
7. McFadden E. Management of data in clinical trials. John Wiley & Sons; 2007 Dec 14.

### Introduction:

The course focuses to develop an understanding about medical tourism industry- understand its scope, trends, strategies, challenges and its managerial aspects.

### Objectives:

- To impart knowledge about components, concepts and procedures of medical tourism management to cater to international patients.

<b>Unit I</b> Introduction: Introduction to Medical Tourism, Need of Medical Tourism, History of Medical Tourism, Medical Tourism Concepts & Strategy.	6
<b>Unit II</b> Compare Medical Tourism in various countries, Tourism Destinations and focus on India & Maharashtra, Kerala	8
<b>Unit III</b> Medical Tourism, Travel Retailing and Logistics, Managing the Hospitality of the clients, Overseas sourcing of Patients – agents etc., Visa Formalities, Security and other restrictions by Ministry of External Affairs , Police reporting and verifications procedures & compliances, Hospital Liabilities Vis-à-vis patients, Foreign Currency handling and remittance, Travel and tourism aspects – Hotels, ticketing and transportation,	10
<b>Unit IV</b> Legal Aspects, Ethical, Legal and Social Concerns; Organ donation and /or transplants for foreign nationals; Blood bank – blood requirement for surgical procedures, SOPs for case of death of a foreign national.	6

### Books:

1. Berkowitz E. Essentials of health care marketing. Jones & Bartlett Learning; 2010 Oct 22.
2. Onkvisit S, Shaw JJ. International marketing: Analysis and strategy. Psychology Press; 2004.
3. Connell J. From medical tourism to transnational health care? An epilogue for the future. Social science & medicine (1982). 2015 Jan;124:398.
4. Hall CM, editor. Medical tourism: The ethics, regulation, and marketing of health mobility. Routledge; 2013.
5. Botterill D, Pennings G, Mainil T, editors. Medical tourism and transnational health care. Springer; 2013 May 18.
6. Watson S, Stolley K. Medical Tourism: A Reference Handbook: A Reference Handbook. ABC-CLIO; 2012 Apr 23.
7. Todd MK. Handbook of medical tourism program development: developing globally integrated health systems. CRC Press; 2011 Dec 8.

## IV-140 Healthcare NGO Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1.5	23	0.5	15

**Introduction:**

The course helps students in developing skills required for managing healthcare NGOs by providing an orientation towards NGOs and their functioning.

**Objectives:**

- To introduce students to the basic components, principles, processes and operations of non-governmental organizations working in healthcare sector.

<b>Unit I</b> NGO Environment, Stake holders involved in NGO, NGO formation , Work process of NGO	<b>6</b>
<b>Unit II</b> Issues in NGO management, Problem identification	<b>4</b>
<b>Unit III</b> Social Marketing, IEC activities : Information, Education and Communication, Monitoring & Evaluation	<b>6</b>
<b>Unit IV</b> Proposal Development, Fund Raising	<b>4</b>
<b>Unit V</b> Health Situational Analysis, Networking and Advocacy, Community Mobilization , Public Private Partnership in Health Sector	<b>3</b>

**Books:**

1. Abraham A. Formation and management of NGOs: Non-governmental organisations. Universal Law Publishing; 2011.
2. Rockefeller D. Global health leadership and management. John Wiley & Sons; 2005 May 6.
3. Bebbington J, Unerman J, O'Dwyer B, editors. Sustainability accounting and accountability. Routledge; 2014 Jun 5.
4. Osborne S. Public-private partnerships: Theory and practice in international perspective. Routledge; 2002 Sep 6.

**IV-141 Medical Writing**

**(Credits: 2, Hours: 30)**

**Introduction:**

The course provides students a platform to understand and practice about scientific writing, regulatory and academic medical writing, writing for patient information leaflets, manuals, reports, website etc along with an idea on documentation, proofreading, ethical and legal issues.

**Objectives:**


- To introduce students to the components of scientific, regulatory and academic medical writing.
- To enable students to participate and practice tools of medical writing.

<b>Unit I</b> Introduction to Medical Writing (Types and Requirements) Writer's Role -Need or Basis of Medical Writing	<b>5</b>
<b>Unit II</b> Tools Used for Medical Writing- Reference, Writing Style and Resources Medical Writing for Clinical Research Industry (Designing and Preparation of Protocols, ICDs, CRFs etc); Writing for Regulatory submissions and Drug Promotion Activities (IND, NDA, BLA, SNDA, ANDA)	<b>6</b>
<b>Unit III</b> Dossier preparation in CTD Format, eCTD Submissions, Scientific Writing (Manuscript, Abstract writing, review articles), Documents in Medico Marketing	<b>8</b>
<b>Unit IV</b> Achieving Flow and Cohesiveness, Managing the Review Process (Quality Control Check/Proof Reading Concept)	<b>4</b>
<b>Unit V</b> Judicial/ Copyright Issues in Medical Writing & Unethical Practice	<b>4</b>
<b>Unit VI</b> Industry Based Case Studies	<b>3</b>

**Books:**

1. Taylor RB. Medical writing: a guide for clinicians, educators, and researchers. Springer Science & Business Media; 2011 Aug 17.
2. Stuart MC, editor. The complete guide to medical writing. Pharmaceutical Press; 2007.

**IV-142 Corporate Social Responsibility (CSR)**

  
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(Deemed to be University)  
Centre For Health Management  
Studies and Research  
Pune-Satara Road, Pune-43.

(Credits: 2, Hours: 30)

**Introduction:**

The course helps students to understand the concept of CSR in today's healthcare industry and the need for incorporating it as part of various organizational practices.

**Objectives:**

- To introduce students to the basic components, principles, processes and operations of CSR activities in health sector.

<b>Unit I</b> Why CSR? Legal and voluntary frameworks for CSR in the Indian context, Non-market environment and its influence on business performance, CSR as a source of competitive advantage	<b>3</b>
<b>Unit II</b> Operationalizing CSR, Basic Principles of Working with Communities	<b>3</b>
<b>Unit III</b> Stakeholder analysis and issues management	<b>4</b>
<b>Unit IV</b> Legal Framework of CSR in India: Integrating CSR initiatives across the supply chain, Integrating CSR metrics into organizational performance management systems, Embedding the CSR culture within the organization, Aligning organizational strategy with the CSR strategy and priorities, Aligning CSR and HR strategies, Aligning CSR and business strategies, Managing Risk and decision making, Best practices in CSR reporting, Industry Best practices	<b>8</b>
<b>Unit V</b> Evolving Models of CSR	<b>3</b>
<b>Unit VI</b> Assessment of NGO Partners & CSR Project Proposals	<b>3</b>
<b>Unit VII</b> Measuring Impact of CSR Compliance	<b>3</b>
<b>Unit VIII</b> Next Generation CSR Strategies: Emerging challenges in CSR and ethical dilemmas, New approaches to business and CSR (BOP, inclusive Business models etc.)	<b>3</b>

**Books:**

1. Pedersen ER, editor. Corporate social responsibility. Sage; 2015 Jan 22.
2. Crowther D. Corporate social responsibility. Bookboon; 2008.
3. Baxi CV, Prasad A, editors. Corporate social responsibility: concepts and cases: the indian experience. Excel Books India; 2005.
4. Drake MJ. HealthCare's Corporate Social Responsibility Program. Pearson Education; 2014 Jan 16.


**IV-143 Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce (Credits:3)**

IV-144 Project II Viva-Voce

(Credits: 3)

MHA -2018 program


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**ELECTIVE COURSES (ANY TWO TO CHOOSE FROM)**

MHA -2018 program

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Studies and Research  
Pune-Satara Road, Pune-43.

## IV-145 Health Event Management

Total Credits	Theory	Teaching Hours	Practical	Posting Hours
2	1	15	1	30

### Introduction:

Conduction of a national conference/ training session/ public meeting/ fundraising meeting etc needs proper training as events are public face of the organisation. This course trains students to conduct and manage such events.

### Objectives:

- To provide students an overview about the components and procedures of health event management.

<b>Unit I</b> Event Planning, Event Marketing & Branding, Event Team Management & Coordination <b>Secretariat services:</b> Computerised database creation and management, Event related communications & PR both offline and online, Correspondence between clients and internal functional departments, Preparing operational protocols and follow-up relating to the adherence of such protocols, Banking Operations, Accounting, Budget Control, Legal and Compliance related operations, Compiling of event handover documents for independent, post-event audits	<b>4</b>
<b>Unit II</b> <b>Content:</b> Developing Need Statements and Learning Outcome Statements, Scientific Agenda Creation, Abstract/ Paper/ Poster/ Video Submission coordination and confirmation, Faculty/ Speaker Management and coordination (Domestic and International), Slide Deck Creation/ Review, Scanning for Plagiarism/ Updating content with appropriate referencing guidelines, Preparing statutory documents for accreditation, Preparing post-event evaluation methods	<b>4</b>
<b>Unit III</b> <b>Venue:</b> Venue selection and considerations, Hall selections and working drawings, Seating arrangements, Inauguration/Banquet venues, Trade and Industry venues, Rooming and residential blocks, Meals and Banqueting, Venue Licenses	<b>4</b>
<b>Unit IV</b> <b>Technology:</b> Custom responsive website (Desktop and Mobile Friendly), Custom CMS and admin dashboard, Online registration with payment gateway (Credit Card, Debit Card, IMPS, Netbanking), Online abstract submission and management, Online speaker management, Online Trip planning in collaboration with leading portal Tripadvisor, Online housing booking in collaboration with leading portal Booking.com, Custom mobile application with a variety of	<b>4</b>



<p>third party integrations, Third party integrations for mailing, SMS and notifications, On-site registration management and spot registration management, Data and Event Intelligence, Offline registration and group registration management, Sponsor management and industry relations, Accounting management and online book-keeping, e-receipt, e-certification and online feedback</p> <p><b>Design &amp; Media:</b> Adobe Creative Suite, Corel Creative Suite, Sketch-up, 3Ds Max, V-Ray, Reason</p>	
<p><b>Unit V</b></p> <p><b>A-Visual:</b> Sound, Lighting, Visuals with LED/Projector and Washout, Stage and Fabrication, Trussing, Venue Construction and Superstructure, Octanorm/Shell Scheme, Photography, Videography, Artist Management, Talent Management, Power and Communication, Licenses</p>	<b>2</b>
<p><b>Unit VI</b></p> <p><b>Guest Services:</b> Registration Desk, Hospitality Desk, Logistics Desk, Tour Extensions and Daily Extensions, Accompanying Delegate Programs, Preview Rooms, General Assistance, First Aid, Valet, Security, Fire Marshals, Event Ushers, Housekeeping, Hostess , F&amp;B Executives</p>	<b>2</b>
<p><b>Unit VII</b></p> <p><b>Logistics:</b> Air Travel, Rail Bookings, Car Bookings, Bus Bookings, Hotel Bookings, Local Taxi Bookings, Local Excursions, Tour Extensions, Accompanying Delegates Program, Special Events (MICE &amp; Corporate events)</p>	<b>3</b>

**Books:**

1. Robinson P, Wale D, Dickson G, editors. Events management. CABI; 2010.
2. Bowdin G, O'Toole W, Allen J, Harris R, McDonnell I. Events management. Routledge; 2006 Mar 15.
3. Raj R, Musgrave J, editors. Event management and sustainability. CABI; 2009.
4. Conway DG. The Event Manager's Bible 3rd Edition: The Complete Guide to Planning and Organising a Voluntary or Public Event. Hachette UK; 2014 Feb 21

## IV-146 ICD – 10 Coding System

(Credits: 2, Hours: 30)

### Introduction:

The course helps students to gain knowledge about effectively identifying, understanding and utilizing ICD – 10 medical codes and practice its application.

### Objectives:

- To build student awareness about collecting, storing, managing, accessing, using and importance of patient health data in the ICD – 10 code format.

<b>Unit I</b> <b>ICD-10-PCS History and Organization</b> History and Design, ICD-10-PCS Versus ICD-9-CM, Use and Organization of ICD-10-PCS	<b>6</b>
<b>Unit II</b> <b>ICD-10-PCS Code Structure and Definitions</b> Body Systems, Root Operations, Body Parts, Approaches, Other Considerations	<b>6</b>
<b>Unit III</b> <b>ICD-10-PCS Coding Guidelines</b> The Basics, Body System Guidelines, Root Operation Guidelines, Body Part Guidelines, Other Considerations	<b>6</b>
<b>Unit IV</b> <b>Other Medical and Surgical-Related Procedures</b> Obstetrics, Placement, Administration, Measurement and Monitoring, Extracorporeal Assistance and Performance, Extracorporeal Therapies, Osteopathic Procedures, Other Procedures, Chiropractic Procedures	<b>6</b>
<b>Unit V</b> <b>Ancillary Procedures</b> Imaging, Nuclear Medicine, Radiation Oncology, Physical Rehabilitation and Diagnostic Audiology, Mental Health, Substance Abuse Treatment	<b>6</b>

### Books:

1. World Health Organization. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. World Health Organization; 1992.
2. Buck CJ. 2012 ICD-10-CM Draft Standard Edition--E-Book. Elsevier Health Sciences; 2016 Jun 16.
3. Lovaasen KR. ICD-10-CM/PCs Coding: Theory and Practice, 2018 Edition E-Book. Elsevier Health Sciences; 2017 Jul 12.

## IV-147 Health Informatics Management

(Credits: 2, Hours: 30)

**Introduction:** The course helps students to get an overview about concepts of health informatics and use of technology in healthcare delivery.

### Objectives:

- To give students an overview about concepts of health informatics and use of technology in healthcare delivery.

<b>Unit I</b> Introduction and overview, Net searching tips, Standards for health informatics	<b>6</b>
<b>Unit II</b> Databases and Knowledge management	<b>6</b>
<b>Unit III</b> Electronic Health Records, HL7 and XML	<b>8</b>
<b>Unit IV</b> Integrated HIS including Clinical Decision Support Systems, Imaging, including PACS and DICOM	<b>6</b>
<b>Unit V</b> Requirements management, Artificial intelligence	<b>4</b>

### Books:

1. Khumbati K, editor. Handbook of Research on Advances in Health Informatics and Electronic Healthcare Applications: Global Adoption and Impact of Information Communication Technologies: Global Adoption and Impact of Information Communication Technologies. IGI Global; 2009 Jul 31.
2. Shortliffe EH, Cimino JJ, editors. Biomedical informatics: computer applications in health care and biomedicine. Springer Science & Business Media; 2013 Dec 2
3. Hasman A, editor. Education and Training in Health Informatics in Europe: State of the Art, Guidelines, Applications. IOS press; 1995.

## IV-148 Entrepreneurship in Healthcare

(Credits: 2, Hours: 30)

### Introduction:

The course focuses to help students to think about innovations possible in health care sector along with development of skills to nurture entrepreneurship and fulfil their dreams.

### Objectives:

- To introduce students to the components of process of innovation and successful entrepreneurship.
- To enable students to participate and practice tools to be a successful entrepreneur.

<b>Unit I</b> Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur - Characteristics of an Entrepreneur -Distinction between an Entrepreneur and a Manager - Functions of an Entrepreneur - Types of Entrepreneur - Intrapreneur Role of Entrepreneurship in Economic Development , Recent Trends of Women Entrepreneurship, Rural Entrepreneurship – Need, Problems and Development of Rural Entrepreneurship.	6
<b>Unit II</b> Factors Affecting Entrepreneurial Growth: Economic and Non-Economic Factors - Government Actions; Entrepreneurial motivation, Opportunities for an Entrepreneurial career	6
<b>Unit III</b> Small Enterprises: Definition - Characteristics - Relationship with large units - Rationale - Objectives - Scope of Small Enterprises ,Role of Small Enterprises in Economic Development - Their problems - Project Identification and Selection - Project Formulation - Project Appraisal - Financing - ownership Structures.	6
<b>Unit IV</b> Institutional Finance to Entrepreneurs: Commercial Banks - Other Financial Institutions(NBFCs), Need for Institutional support to Entrepreneurs, Angel Investors	6
<b>Unit V</b> Venture Capital: Venture Capital Financing Concept and features, Need, relevance and development of venture capital funds. Structure and regulatory framework of venture capital financing in India. Investment process and evaluation - Conventional valuation method, the first Chicago method, Revenue multiplier method. Structuring venture capital financing. Investments nurturing methodologies - valuation of venture capital portfolio. Performance of TDICI and other Venture Capital Firms in India. Exit Strategies of venture capital financing. Policy imperatives of VCF development in India.	6

### Books:

1. Khanka SS. Entrepreneurial development. S. Chand Publishing; 2006.
2. Desai V. Dynamics of Entrepreneurial Development and Management: Entrepreneurship, Project Management, Finances, Programmes, and Problems. Himalaya Publishing House; 2001..
3. Sahay A, Nirjar A. Entrepreneurship: Education, Research and Practice. Excel Books; 2006..
4. Nicholls A, editor. Social entrepreneurship: New models of sustainable social change. OUP Oxford; 2008 Apr 3.
5. Charantimath PM. Entrepreneurship development and small business enterprise. Pearson Education India; 2005.
6. Antonakis J, Day DV, editors. The nature of leadership. Sage publications; 2017 Sep 26.
7. Frederick HH, Kuratko DF, Hodgetts RM. Entrepreneurship: Theory, process, practice. Victoria: Cengage Learning; 2006.

## IV-149 Pharmaceutical Management

(Credits: 2, Hours: 30)

### Introduction:

The course provides students an overview about challenges in management of pharmaceutical industry from regulatory clearances up to marketing of new product.

### Objectives:

- To introduce students to the basic components, principles, processes and operations of pharmaceutical management.

<b>Unit I</b> <b>Overview of Pharmacology</b>	<b>6</b>
<b>Unit II</b> <b>Pharma Sales &amp; Marketing Management</b> Pharma Sales and Distribution Management, Pharmaceutical Marketing Management, Advertisement & Promotions in Pharmaceutical Industry	<b>6</b>
<b>Unit III</b> <b>Pharma Product Management</b> Brand Management, Rural Marketing, OTC Marketing	<b>6</b>
<b>Unit IV</b> <b>Drug Regulatory Affairs</b>	<b>6</b>
<b>Unit V</b> <b>The Ayurvedic and Herbal Market:</b> Overview of global Ayurvedic and Herbal industry, Ayurvedic and Herbal industry in India, Prescription vs. OTC market, Major stakeholders in domestic and global market, Major Ayurvedic Brands, Regulatory environment in Ayurvedic industry.	<b>6</b>

### Books:

1. Itkar MS. Pharmaceutical management. Nirali Prakashan; 2008 Jan 7.
2. G.S.banker, R.K.Chalmers "Pharmaceutics and Pharmacy Practice "J.B.Lippincott Company, Philadelphia, PA, 1982.
3. Mickey Smith; Pharmaceutical Marketing in the 21 th Century, Viva Books Pvt. Ltd., New Delhi, 2001.
4. G. Vidyasagar; Pharmaceutical Industrial Management, Pharma book Syndicate, Hyderabad, 2005

## Annexure 1


### PROCEDURE FOR SELECTION OF CANDIDATES INTO MHA:

1. Candidate can get the application form and other details regarding the programme from our website [www.chmsr.net](http://www.chmsr.net) / or other revised web address.
2. Interested candidate can download the application form and **post** the duly filled application form along with the processing fee and photocopies of required documents to below mentioned address.

**Center for Health Management Studies and Research,  
Bharati Vidyapeeth( Deemed to be University),  
2<sup>nd</sup> floor of College of Physical Education,  
Dhankawadi, Katraj, Pune 411043**

**Admission fees of Rs. 1500 has to be sent with application form in form of Demand Draft to "Director, Centre for Health Management Studies and Research"**

3. Selection process comprises of personal interview. The applications received will be scrutinized further and all the eligible candidates will be notified regarding the interview.
4. Personal interview will be held on 2<sup>nd</sup> or 4<sup>th</sup> Saturday in the month of March/ April/ May/ June or as needed.
5. Students will be selected based on their previous qualification, experience and performance in personal interview.
6. The selected candidates will be notified through email/ telephone.
7. The selected candidates are required to pay **full** fees within 15days of their selection.

  
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(Deemed to be University)  
Centre For Health Management  
Studies and Research  
Pune-Satara Road, Pune-43.

## Annexure 2

### LIST OF DOCUMENTS TO BE SENT ALONG WITH APPLICATION FORM

Attested photocopies of following documents need to be attached with application form:

1. Aadhar Card
2. Caste Certificate (if applicable)
3. 10<sup>th</sup> and 12<sup>th</sup> passing certificate
4. Graduation certificate along with mark list
5. Transfer certificate
6. Bonafide certificate
7. Migration certificate
8. Gap certificate (if applicable)
9. Experience certificate (if applicable)
10. Medical Fitness Certificate

Original documents of the above mentioned list should be submitted during 1<sup>st</sup> week of college re-opening.

## Annexure 3

### LIST OF THE JOURNALS AND MAGAZINES NEWS PAPERS

#### JOURNALS

Sr. no	
1.	Health Policy and Planning
2.	Journal of Health Care Management
3.	Bulletin of WHO
4.	International Journal of Healthcare Technology & Management (IJHTM)
5.	Health Facilities Management
6.	Health Leaders.
7.	Hospital and Health Network / H&HN
8.	Journal of Public Health Management and Practice
9.	Indian Journal of Marketing
10.	Consumer Behaviour
11.	Service Marketing
12.	Indian Journal of Human Development
13.	Training and Development Journal
14.	Journal of Soft Skills
15.	British Medical Journal
16.	Lancet
17.	Indian Journal of Community Medicine

#### MAGAZINES

18.	Time
19.	The Economists
20.	E- Health
21.	Economic and Political Weekly
22.	Express Healthcare
23.	Yojana
24.	Seminars
25.	Marketing Mastermind
26.	4Ps

#### NEWS PAPERS

27.	Economics Times
28.	Hindu
29.	Times of India
30.	Business Standards
31.	Indian Express



## Annexure 4

### ACADEMIC CALENDAR SUMMARY

In each term, apart from the regular classes following activities are included in the academic calendar:

- Field Visits
- Guest Lectures
- Regular Field Postings
- Conferences
- Extracurricular events

<b>Tentative Academic Calendar as Applicable to the Program</b>	
<b>For Every Admission Cycle</b>	
<b>First Year</b>	
<b>1<sup>st</sup> Semester</b>	July – October
Semester end Examinations	November
Diwali Holidays	As announced by Bharati Vidyapeeth (Deemed to be University)
Semester break	After semester examinations (2 weeks).
<b>2<sup>nd</sup> Semester</b>	
	December – March
Semester end Examinations	April
Summer Vacation	After semester examinations (4 weeks).
<b>Second Year</b>	
<b>3<sup>rd</sup> Semester</b>	
	July – October
Semester end Examinations	November
Diwali Hoildays	As announced by Bharati Vidyapeeth( Deemed to be University)
Semester break	After semester examinations (2 weeks).
<b>4<sup>th</sup> Semester</b>	
	December – March
Semester end Examinations	April

## Annexure 5

### LIST OF TYPES OF ORGANIZATIONS FOR INDUSTRIAL VISITS, GUEST LECTURES AND FIELD ASSIGNMENTS, PROJECTS AND POSTINGS

Project, Field visits, postings and Guest Lecture for MHA students will be organized in/from the following areas:

- Hospitals
  - Teaching
  - Private
  - Corporate
  - Government
  - Charitable etc
- Pharmaceutical Industries
- NGOs
- Public Health Department
- Emergency preparedness and disaster management agencies
- Biomedical waste disposal units
- Health Insurance companies and TPAs
- Hospital administration & Healthcare consultancies
- Health informatics and Telemedicine and relevant related fields
- Hospital architecture consultancies
- Event management organizations
- Law firms
- Maintenance agencies
- Focused logistics agencies
- Disaster mitigation agencies

For these activities liaisons and formal contacts with various organizations would be initiated

Students would be granted leave to attend conferences/ workshops related to the programme.

## Annexure 6

### GUIDELINES FOR CONCURRENT ROTATORY PRACTICAL POSTINGS (CRPP), PROJECT POSTINGS

Various training programmes are designed to help students to simplify the formal and informal steps involved in successful administration and operation. In this training the focus will be on description of role, the necessary documents needed to formalize monitor and complete the training process and some pearls of wisdom from other preceptors.

**Objective 1: To gain practical experience in health services administration or planning.**

**Objective 2: To apply knowledge learned in the classroom/ field and to analyze organizational activities.**

**Objective 3: To learn the key aspects of a health services delivery system, including allocation of resources.**

**Objective 4: To develop a professional identity, including communication and time management skills.**

#### **Details of Concurrent Rotatory Practical Postings (CRPP),**

Hospital and Healthcare organizations would be chosen as per the following criteria:

- Any hospital should be minimum of 30 bed capacity.
- The hospital should be a multispecialty hospital or a single specialty hospital with atleast 50 beds.
- The healthcare organizations should be of repute and with substantial experience and work in the domain.
- Student will have to submit project reports in the areas of Hospital/ Healthcare Administration in problem areas identified by the respective departments/companies during their training period.
- Projects will be carried out concurrently with academic sessions.

**\*Student will have to submit project reports in the areas of Healthcare Administration in problem areas identified by the respective departments/companies during their training period. Projects will be carried out concurrently with academic sessions daily 3 hours (2.00 pm-5.00pm).**

Students are supposed to study the following areas as relevant to the course, of the organization as a part of training and are required to maintain the Journal specifying the detailed procedures of below mentioned areas:

#### **I Hospital Administration:**

##### **1 OPD Services**

Involvement in:-

- 1) Layout of Reception Desk in OPD
- 1) Registration and department wise OPD Card segregation
- 2) Location of the concerned Department

- 3) Reception of patients
- 4) Physical facilities in OPDs
- 5) Close supervision of Doctor's Chamber for the followings:-  
Availability of
  - a) Prescription Pad,
  - b) Stethoscope
  - c) View Box,
  - d) Bed Trolley
  - e) Weigh Machine
  - f) Torch Light
  - g) Gloves
  - h) Liquid soap and towel
- 5) Records maintenance of OPD
- 6) Supervision of patient waiting area and its seating arrangement
- 7) Adequate communication with other departments / units / wards etc.
- 8) Public Addressing System
- 9) Deployment of Staff like Jr. Doctor, Para Medical Staff, Receptionist, Assistant etc.

## 2 Reception

Participation in the process of:-

- 1) Receiving patients and providing information
- 2) Providing information of availability of doctors
- 3) Fixing appointment with doctors
- 4) Arrangement of direct admission for urgent cases
- 5) Public Address System
- 6) Supervising internal transportation system
- 7) No. of Receptionist required to handle the Desk

## 3 Registration

Participation in the process of:-

- 1) Infrastructure – Lay out, Physical facilities,
- 2) Patient registration
- 3) Assisting in collection of hospital charges
- 4) Transmitting information to respective doctor
- 5) Assisting in sending patient to the respective departments
- 6) Computer based functional activity by Receptionist

## 4 Admission Desk

Involvement in the process of:-

- 1) Documentation of registration for Admission of patients
- 2) Preparation of files with relevant papers
- 3) Observing the process of receiving advance payment during admission either by cash or credit card
- 4) Formalities of procedures for ensuring availability of payee's fund
- 5) Distribution of visiting card, literatures, brochure etc. to the client
- 6) Transfer of Patient to ward
- 7) Ambulance management and billing
- 8) Deployment of no. of Receptionist-cum-Office Assistant
- 9) Foreign Exchange facilities

## 5 Billing & Discharge

Involvement in the process of:-

- 1) Assimilation of information through LAN from the different departments
- 2) Checking of data in the computer
- 3) Observation of different billing system like;
  - a) Cash Billing – As per hospital's prevailing rate schedule
  - b) TPA Billing – As per hospital's prevailing rate schedule
  - c) Copt. Billing – Tailor-made billing as per agreement
- 4) Handing over the bill to the patient party
- 5) Providing Birth Certificate, Amputated Certificate, Death Certificate, Referral Letter, as and when required
- 6) Providing discharge certificate in original along with all relevant documents for cash payee patient and photo copy of discharge certificate to the corporate and TPA patients
- 7) Deployment of no. of Receptionist-cum-Office Assistant
- 8) Facilities – Computer, Swapping Machine, Note Counting Machine, Communication facility

## 6 Pharmacy Services

Involvement in:-

- 1) Space requirement as per act
- 2) Lay out
- 3) Storage facility – different set up for different type of drugs
- 4) Equipments
- 5) Organizational structure (role and function)
- 6) Purchase of drugs – disposables, consumables etc.
- 7) Purchase of food items
- 8) Quality control
- 9) Proper storage of drugs
- 10) Sales policy
- 11) Record maintenance
- 12) Preparation of Accounts
- 13) Pharmacy Audit

## 7 Laboratory Services

Observation of:-

- 1) Location
- 2) Structural facility
- 3) Administrative Area
- 4) Laboratory equipment
- 5) Lighting in laboratory
- 6) Laboratory furniture
- 7) Special mechanical and electrical equipments
- 8) Various functional units
  - a) Clinical pathology
  - b) Hematology
  - c) Bio Chemistry
  - d) Histology
  - e) Bacteriology and Serology
- 9) Auxiliary service area
- 10) Collection of samples and delivery of reports
- 11) Requirements for various quality accreditation systems
- 12) Organization



## 8 Imaging Services

Observation of:-

- 1) Layout of X-ray rooms
- 2) Various types of imaging machines and its usages
- 3) Maintenance of imaging machines
- 4) Protective gears
- 5) Precaution taken for Hazardous radio activity
- 6) Licenses required
- 7) General and special investigations
- 8) Layout of Reception area
- 9) Dress changing area of patient
- 9) Film processing room
- 10) Analysis of developed film and preparation of report
- 10) Storing of developed film
- 11) Delivery of film to patient / ward
- 12) Roll of Radiologist, Technicians, and Office Assistant of Radiology Dept.

## Emergency

Observation of:-

- 1) Location of Emergency in hospital
- 2) Basic layout of Emergency
  - (a) Receiving patients
  - (b) Patient examination zone
  - (c) Patient investigation zone
  - (d) Procedure room
  - (d) Cardio Pulmonary Resuscitation Unit
  - (e) Dead patient barrier
  - (f) EMO's Office
  - (g) Nursing Station
- 3) Infrastructural facilities
  - a) Office of EMO
  - b) Nursing Office
- 4) Equipments
- 5) Legal procedure system
- 6) Emergency Operation Theatre
  - (a) Arrangement of instruments and oxygen for minor Operation
  - (b) Sterilization and fumigation of O.T. Room
- 7) Admission procedure
- 8) Billing for day care procedure in Emergency Dept.
- 8) Staffing
  - i) Medical
  - ii) Para Medical
- 9) Security

## 10 Critical Care Unit

Observation / involvement in:-

Physical structure and facilities

- 1) Organizational structure
- 2) Bed orientation pattern

- 3) Lighting system
- 4) Monitoring system including connection to centralized monitoring system

(a) Invasive

- (i) Central Venous Pressure (CVP)
- (ii) Arterial Blood Pressure monitoring
- (iii) Cardiac output monitoring
- (iv) Pulmonary Arterial monitoring

(b) Non-invasive

- (i) Heart beat rate
- (ii) Blood Pressure
- (iii) Respiratory rate
- (iv) Intake & output monitoring

Maintenance of sterility and general cleanliness

- 1) Maintenance of sterility of the ward
- 2) Maintenance of sterility of clothing used in CCU
- 3) General sterilizing procedures before examination of the patient

Administration of CCU

- 1) Qualified doctor having experience in CCU (as per WHO ratio)
- 2) Qualified nurse having experience in CCU (as per WHO ratio)
- 3) Deployment of qualified paramedical staff (as per WHO ratio)

Workflow

- 1) In flow of patient
- 2) Type of patients commonly admitted in CCU
- 3) Pattern of treatment patient receive in CCU
- 4) Type of patient actually needs life saving support
- 5) Out flow of patient
- 6) Counselling with outside visitors / patient party

Equipment maintained in CCU

- 1) Monitor
- 2) Ventilator
- 3) Defibrillator
- 4) ECG and other equipments used in CCU

Equipment maintained in specialized CCU

- 1) Intra Aortic Balloon Pump
- 2) Photo Therapy Machine

Maintenance of uninterrupted gas and power supply system and their utilization

- 1) Continuous wall flow oxygen
- 2) Compressed air
- 3) Suction Apparatus (Vacuum Pump)
- 4) Uninterrupted Power Supply (UPS) line

## 11 Operation Theatre

Observation / involvement in:-

- 1) Location
- 2) Zoning of Operation Theatre
- 3) Infrastructural facilities
- 4) Centralized and decentralized Operation Theatres
- 5) Equipment requirement
- 6) Procurement and maintenance including annual maintenance contract
- 7) Functions and policies of Operation Theatres

- 8) Manpower requirement
  - a) Medical Superintendent
  - b) In-charge
  - c) Anaesthetist
  - c) Nursing personnel
  - d) Technician
  - e) Ward Boy
- 9) Duties and responsibilities including standard operation procedures
- 10) Safety procedures
- 11) Methods of checking operating rooms for readiness to receive patient
- 12) Periodical sterilization / fumigation
- 13) Sterile supply
- 14) Equipments procurement and maintenance

## 12 Wards

Observation of:-

- 1) Ward Composition - Beds Patient Ratio
- 1) Lay out
  - Types of ward
  - 4) Physical facilities
    - a) Nursing Station
    - b) Doctor's room
    - c) Dirty utility room
    - d) Dress Changing room
    - e) Sanitary facilities
    - f) Dressing room for minor treatment
    - g) Isolation room
    - h) Ward Pantry
    - i) Day room
    - j) Barrier Nursing
    - k) Other facilities
    - i) Ward side Laboratory
    - ii) Linen Store
    - iii) Drug Store etc.
  - 5) Other Equipment facilities
    - Electronic Monitoring Devices
    - Ventilation Devices – Natural & Mechanical
    - c) Ward Lighting
    - d) Calling Bell
    - e) Fire Alarm System
  - 6) Organization
  - 7) Communication facilities
  - 8) Methods of patients' record keeping in wards / technical / medical details
  - 9) Admission and Discharge procedures
  - 10) Billing system / generation of bills based on bed head ticket entry
  - 11) Cleanliness
  - 12) Duty arrangement of various medical and para medical staff

## 13 Burn Unit

Observation / involvement in:-



1. Location
2. Infrastructural facility
3. Special equipment requirement for Burn Unit
4. Attached Laboratory facility
5. Communication facility
6. Maintenance of Asepsis
7. Manpower
8. Mechanism for specialized training need assessment

#### **14 Blood Bank**

Observation / involvement in:-

- 1) Location
- 2) Reception
- 3) Special arrangements for voluntary donors
- 4) Administrative Office
- 5) Record Keeping
- 6) Servicing rooms
- 7) Bleeding Room
- 8) Storage Room
- 9) Storage equipment
- 10) Regulatory requirement
- 11) Blood safety procedures
- 12) Receive and delivery of blood
- 13) Triple screening and check method
- 14) Record keeping
- 15) Medico-legal aspects
- 16) Physical facilities
- 17) Waiting facilities
- 18) Laboratory facilities
- 19) Other facilities
- 20) Issuance of Blood Donor Card
- 21) Safety devices
- 22) Liquid waste management
- 23) Procedure for discarding
- 24) Staffing

#### **15 Central Sterile Supply Department (CSSD)**

Observation of

- 1) Location
- 2) Name and function of equipments
- 3) Items processed by Central Sterile Supply Department
- 4) Sterilization technique
  - a) Heat
  - b) Gas
  - c) Liquid
  - d) Ionizing radiation
  - e) Others
- 5) Work flow
- 6) Clean zone, dirty zone
- 7) Pooling of materials, equipments

- 8) Function of different equipments used for sterilization
- 9) Process of receiving and distribution of materials
- 10) Technique of Gauge folding
- 11) Cleaning, drying and packing of sterilized materials
- 12) Segregation of Dirty zone and clean zone
- 13) Process of receiving and distribution of materials
- 14) Quality control checking of sterilization in collaboration with Micro-biology Lab.
- 15) Organization
- 16) CSSD Committee

### 16 Medical Records Department

Observation / involvement in

All elements of physical records maintenance plus

- 1) Alphanumerical data
- 2) Machine generated data
- 3) Image data
- 4) Interpretation of data
- 5) Derived data
- 6) Storage process of electronic data
- 7) Data classification
- 8) ICD – 10 System and its use in electronic records maintenance system.

### 17 Maintenance Department

Observation of

- a) Location of different maintenance department
- b) Lay out
- c) Power Generation and supply
- d) Water Treatment Plant and distribution system
- e) Demineralization Plant with R.O. facility for Dialysis unit
- f) Oxygen Plant
- g) Effluent Treatment Plant
- h) Air Condition Plant and distribution system
- i) Maintenance of the medical equipments, calibration
- j) Maintenance of total hospital building – civil, electrical and mechanical
- k) Organization
- l) Bio Medical equipment and their function
- m) Observation of Bio-Medical Equipments
- n) Knowing the name of the Bio-Medical Equipments
- o) Importance and fundamental functions of Bio-Medical Equipments
- p) Maintenance procedures of Bio-Medical Equipments
- q) Need assessment and procurement procedure
- r) Periodical audit of Bio Medical Equipment
- s) AMC of Bio Medical Equipments

### 18 Personnel / H. R. Department

Observation and Involvement under supervision for:

**A. Present employee status:** Organization structure, Job description and specification, Clarity of roles ; Preparation of Cadre wise Daily Duty roster / rotation, Job Rotation/ Deputation; Record keeping and verification of employee leaves according to its types and organizational policy; Record keeping and verification of employee overtime.

**B. Selection and recruitment procedure:** Manpower planning; Job analysis; Identification of sources of recruitment; preparation of advertisement; Scrutiny of job applications; Scheduling and coordination of interviews; Process of shortlisting and communication to the selected candidates; process of Pre-employment health check-up; joining formalities etc.

**C. Employee training and development system-** Preparation of Cadre wise induction and training module; Training need analysis according to performance; job profile and recent trends/advances in the employee domain.

**D. Employee appraisal system:** Periodicity, criteria and methodology of appraisal, Performance based incentives/disincentives, Promotion criteria and process

**5. Employee welfare activities:** Group Insurance, PPF, Dependant Benefits, Employee Medical benefits, Activities for celebrating organizational achievements, etc.

**6. Retirement and retirement benefit system:** Review of policy, Process, coordination with relevant departments, documentation etc.

**7. H. R. Audit:** Employee awareness regarding their rights and responsibilities, Employee Turnover rate/ Attrition rate, verification of all processes of H.R. department etc.

**8. Wage Administration:** Calculation of Payroll preparation, preparation of Pay Slip, calculation and policy of wage and salary deductions; etc.

**9. Disciplinary Action:** Criteria for identification of in-disciplinary actions or behaviour; process and documentation for disciplinary action.

**10. Grievance Redress:** Policy, process, documentation; handling of grievances in the court of law

## 19 Marketing

Observation / involvement in:-

- 1) Office Lay out
- 2) Different types of advertisement for projection
- 3) Fixture required for marketing
  - (a) Banner
  - (b) Leaflet
  - (c) Hoarding
  - (d) CD / VCD / DVD
- 4) Media Management (Print, Electronic)
- 5) Event Management (Camp, Seminar, CME)
- 6) Institutional / Corporate marketing
- 7) Direct marketing
- 8) Channel / Franchise marketing
- 9) Data analysis
- 10) Patient feed back
- 11) Organization

## 20 Laundry & Linen Services

Observation of

- 1) Location
- 2) Work flow
- 3) Physical facilities of Laundry
  - a) Receiving, Storing, Sorting, washing area
  - b) Central Disinfection Area
  - c) Cleaned Linen processing room
  - d) Laundry Manager's Office
  - e) Staff Room
  - f) Sewing and inspection area
  - g) Supply storage room

- h) Solution Preparation area
- i) Cleaned Linen issue area
- j) Natural ventilation and light
- k) Free Linen movement area
- 4) Other facilities
  - a) Adequate Water supply
  - b) Drainage system
  - c) Adjacent power supply
  - d) Steam
  - e) Compressed air
- 5) Arrangement of equipments
- 6) Soiled linen receiving from ward, OT, other areas
- 7) Process of sorting and cleaning, washing, drying, ironing
- 8) Collection and storing process of cleaned linen
- 9) Sorting of discarded linen and sending them to the Store
- 10) Process of linen distribution
- 11) Maintenance of hygiene
- 12) Infection control process
- 13) Process of staff training
- 14) Process of co-ordination among the related departments
- 15) Manpower

#### **21 Kitchen & Dietary Services**

- 1) Overview of kitchen lay out and its adjacent areas
- 2) Physical facilities
  - a) Receiving area
  - b) Washing area
  - c) Preparation area
  - d) Cooking area
  - e) Storing area
  - f) Food Distribution area
  - g) Garbage disposal area
  - h) Office of Kitchen Manager
  - i) Office Kitchen Staff
- 3) Work Flow

4) Patient visit and observation of the diet chart preparation

5) Observation and process of:-

- i) Coordination with Dietitian before preparing process of food for patient
- ii) Receiving and storage of perishable and non-perishable food
- iii) Process of calculation the quantity of perishable & non-perishable items to be cooked
- iv) Washing, cutting, preparation and cooking process
- v) Storage of cooked food and precaution to be taken
- vi) Delivery process of hot food (Hot Trolley) to patient according to diet chart
- vii) Process of distribution of food in the cafeteria and dining hall
- viii) Maintenance of hygiene by kitchen staff
- ix) Safety measure
- x) Receiving of soiled utensils and left over food
- xi) Collection of utensils and washing process
- xii) Garbage disposal system
- xiii) Maintenance of Accounts

- xiv) Pest control system
  - xv) Process of supervision and leadership style
  - xvi) Educational programme, research, dietary counseling etc.
  - xvii) Periodical audit
6. Organization

## 22 Security Services

Observation of:-

- 1) Security room and posts
- 2) Security services in the hospital
- 3) Role of Security during patient visiting hours
- 4) Traffic control inside the hospital
- 5) Maintenance of fire precautions
- 6) Process of medico legal activities

## 23 Transportation Services

Observation of:

- a) Different internal and external transport
- b) Different ambulances
- c) Ambulances enmarked for communicable disease
- d) Facilities given in the emergency ambulance
- e) Maintenance of ambulance
- f) Maintenance of internal transportation

## 24 Mortuary

Observation / involvement in:-

- 1) Location
- 2) Physical facilities
- 3) Body refrigerator
- 4) Walk in refrigerator
- 5) Capacity decision of Mortuary
- 6) Autopsy facility
- 7) Requirement for autopsy room
- 8) Preservation / identification/leveling of viscera / body fluids and other materials for medicolegal purposes
- 9) Embalming procedures
- 10) Methods of long distance transport of dead bodies
- 11) Arrangements for religious rides
- 12) Mortuary traffic control
  - a) Internal
  - b) External
- 13) Identification of bodies using triple check system
- 14) Maintenance of records
- 15) Various legal requirements
- 16) Disposal of unclaimed bodies
- 17) Various religious rites

## 25 Library in Hospital

Observation the functioning of:-

- 1) Library work flow
- 2) Physical facilities

- 3) Procurement of books and journals as per Good Office Committee (GOC) norms
- 6) Receiving the purchased books / periodicals, audio visual journals etc.
- 7) Preservation of books in the Shelves
- 8) Catalogue preparation
- 9) Process of issue and collection of books
- 10) Updating of catalogue annually
- 11) Library rules and regulations
- 12) Preparation of Membership Card
- 13) Repair of damaged books
- 14) Ascertaining of lost books and journals
- 15) Arrangement of educational programme through Video Satellite system
- 16) Stock verification of Library items periodically

## **II Telemedicine**

1. Infrastructure – both end – (1) Hospital end (2) Nodal Centre
2. Requirement
  - a) Computer Monitors
  - b) Cameras
  - c) Internet connection
3. Observation of telemedicine techniques and taking part in the process
4. Manpower

## **III Health Informatics**

1. Infrastructure Requirement
  - a) Computer Monitors
  - b) Cameras
  - c) Internet connection
2. Observation of informatics techniques and taking part in the process
3. Manpower requirement
4. Transmission modes

## **IV Medical Transcription**

1. Observation of techniques and taking part in the process
2. Infrastructural requirement
3. Trained manpower
4. Transmission modes

## **Health Insurance company**

## **VI Biomedical Waste Disposal Units**

## **VII Clinical Research Organization**

## **VIII Pharmaceutical Industry**

## **IX Non-Governmental Organization**

## **X Public Health Department**

## **XI Emergency Preparedness & Disaster Management Agency**

## **XII Healthcare Consultancies**

## **XIII Event management organizations**

## **XIV Law firms**

## **XV Maintenance agencies**

## **XVI Focused logistics agencies**

## **XVII Other Scope Areas of Healthcare Administration**

## Annexure 7

### EXAMINATION PATTERN

Attendance of 75% is mandatory to appear for examinations. Students will be evaluated throughout the two years programme as under:

- Ongoing internal assessments (which include students' attendance and participation in classroom &/ or experiential learning activities, interactive activities and assignments, field visit, tests in form etc.)
- Semester end University Examinations.
- Journal submissions.
- Project Reports and Viva-Voce.

The performance of student is evaluated on Cumulative Grade Point Average (CGPA) system.

Theory, Practical, University and Internal examinations should be passed separately.

#### Internal & University Examination Details

For each paper of 100 marks (3 credit courses), there will be an Internal Assessment (IA) for 40 marks and the University Examination (UE) for 60 marks. The UE will be of three hours duration.

For each paper of 60 marks (2 credit courses), there will be an Internal Assessment (IA) for 20 marks and the University Examination (UE) for 40 marks. The UE will be of two hours duration.

Marks Allocated for Internal and University Exams			
Course Credits	Internal Assessment	University Exam	Total
3	40	60	100
2	20	40	60

Marks Allocation in Internal Assessment			
Credits	Assignments	Class Tests( Written and /or Oral)	Participation*
3	10 marks	20 marks (1 per every course)	10 marks
2	5 marks	10 marks (1 per every course)	5 marks

\*Students participation in classroom &/ or experiential learning, discipline, group discussions, assignments, tests, field activities, performance reports, pro-activeness, field work and classroom &/ or experiential learning attendance etc.

For passing in the subject, student has to score minimum **40% marks separately in UE's & IA's**. Student should clear all the subjects of **I Semester** and would also be allowed to carry forward **maximum 3 subjects from II Semester to get admission into second year**. In this scenario, the student will be allowed **admission only in winter session (July - October) of the subsequent academic year/s only after** clearing all (I & II Semester) backlog subjects.

**Framework of University Examination**

Course Credits	Questions	Marks	University Total
3	<b>Section -I</b> Out of 3 long answers (each carrying 10 marks), 2 should be answered.	10 x 2 = 20	60 marks
	Out of 3 short notes (each carrying 5 marks), 2 should be answered.	5 x 2 = 10	
	<b>Section -II</b> Out of 3 long answers (each carrying 10 marks), 2 should be answered.	10 x 2 = 20	
	Out of 3 short notes (each carrying 5 marks), 2 should be answered.	5 x 2 = 10	
2	Two long answers (each carrying 10 marks) should be answered. There is no choice.	10 x 2 = 20	40 marks
	Out of 5 short notes (each carrying 5 marks), 4 should be answered.	5 x 4 = 20	

**Journal**

Handwritten journal should be submitted in uniform format, as instructed by CHMSR faculty in I (administrative departments) and III (clinical/ specialization departments) semesters.

Journal Format	
S.No	Content
1	Certificate signed by Director, CHMSR
2	Certificate of Attendance signed by hospital/ healthcare organization authority
3	Organization Profile
4	Introduction to Department
5	Layout
6	Organization Structure
7	Department Work Details
8	Enlisting of Processes with Flowcharts of each process in the Department
9	Equipment List



**Guidelines:**

1. Title page & certificate should be colour printed.
2. The Journal should be hand written with hand drawn diagrams, however students can paste relevant photographs wherever needed by them.
3. The Journal should be spiral bound.
4. Certificate should signed by HOD of the department/institute where the student is posted.
5. Journal marks would be included in internal assessment under participation in each course of the semester.

**Concurrent Rotatory Practical Postings (CRPP) with Comprehensive Viva-Voce**

**Marks Distribution :**

Sr.No	Seat No	Internal Assessment (40 Marks) <ul style="list-style-type: none"><li>• Organizational feedback about student<ul style="list-style-type: none"><li>○ General Behaviour-10</li><li>○ Punctuality-10</li><li>○ Efficiency -10</li></ul></li><li>• Posting Completion Certificate-10</li></ul>	Project Report and Viva-Voce (out of 60)
1			
2			
3			
4			
Seal			
Signature of Co-ordinator			

## Project Marks Distribution

Sr.No	Seat No	Internal Assessment (40 Marks) <ul style="list-style-type: none"><li>• Proactiveness - 10</li><li>• Proposal – 10</li><li>• Progress Report – 10</li><li>• 2<sup>nd</sup> Progress Report – 10</li></ul>	Project Report and Viva-Voce (out of 60)
1			
2			
3			
4			
Seal			
Signature of Co-ordinator			

## Guidelines for Project Report

Students will start working on their project I simultaneously along with their academic sessions from the commencement of first semester.

Students will start working on project II simultaneously from the commencement of third semester.

For all the projects they would be posted in relevant organization daily for five hours (as needed) throughout the semester.

Students are supposed to submit the project report in the below mentioned format.

The evaluation of this will be at the end, the break up of which is mentioned above in tables.

### Format of Project Report

S.No	Content	Project
i	Title Page	1 Page
ii	Acknowledgements	1 Page
iii	Certificate from CHMSR	
iv	Certificate from Organisation	
v	Executive Summary (Abstract)	2 Pages
vi	Contents	1 Page
vii	List of Tables	
viii	List of Graphs	
ix	List of Figures	
x	Abbreviations	1 Page
1	Introduction 1.1. Organization Profile(where project is done) 1.2. Definition and Purpose of the Project 1.3. Aim and Objectives of the Project 1.4. Value Addition to Existing System/ Set up	Max. 7 Pages
2	Review of Literature	Max. 15 Pages
3	Research Methodology 1.1 Method of Research 1.2 Type of Research 1.3 Objectives (with Justification) 1.4 Data Type – Primary & Secondary 1.5 Data collection 1.6 Sampling 1.7 Processing and Analysis of Data	Max. 5 Pages
4	Data Analysis and Interpretation	Min. 20 Pages
5	Conclusion	1-2 Pages
6	Limitations	1-2 Pages
7	Recommendations	
xi	Annexure	
xii	Bibliography	

#### Standard of Passing:

In order to pass in a course, the student must obtain a minimum GP of 4.5 at UE and also a minimum Grade Point of 4.5 IA separately. Otherwise, he/she will have to reappear for the subject till he/she passes.



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MHA -2018 program

DIRECTOR  
 Bharati Vidyapeeth  
 (Deemed to be University)  
 Centre for Health Management  
 Studies and Research  
 Pune-Satara Road, Pune-43.

The Grade Point Index (GPI) for a course will be calculated by using the formula  $0.6 * GP (UE) + 0.4 * GP (IA)$ . At the end of each semester, a Cumulative Grade Point Average (CGPA) and also Semester Grade Point Average (SGPA) will be calculated as a weighted average of the GPI of all courses in which the student has passed till that semester.

A student shall be permitted to proceed from first semester to second semester irrespective of his/her back-log in any number of subjects.

Permission to third semester will be given on clearance of all first semester and atleast five courses of second semester.

A student shall be permitted to final semester irrespective of his/ her back-log in any number of subjects, once the student is permitted to third semester.

A student who passes in all the courses will be declared to have passed Masters in Hospital Administration (MHA) with the following honors:

CGPI in [4.00, 4.99]	Pass Class
CGPI in [5.00, 5.49]	Second Class
CGPI in [5.50, 5.99]	Higher Second Class
CGPI in [6.00, 7.99]	First Class
CGPI in [8.00, 10.00]	First Class with Distinction

### Grace marks & Mercy Marks

As per Bharati Vidyapeeth (Deemed to be University) guidelines.

### 10 Grade Point Scheme:-

The 10 point scale would be used to convert marks out of 100 to grades and grade points according the following table:-

Range in % of marks	Range of CGPA	Letter grade
[75.0 - 100]	[9.00 - 10.00]	O
[70.0 - 74.9]	[8.00 - 8.99]	A+
[65.0 - 69.9]	[7.00 - 7.99]	A
[60.0 - 64.9]	[6.00 - 6.99]	B+
[55.0 - 59.9]	[5.50 - 5.99]	B
[50.0 - 54.9]	[5.00 - 5.49]	C+
[45.0 - 49.9]	[4.50 - 4.99]	C
40.0 - 44.9]	[4.00 - 4.49]	D
[00.0 - 39.9]	[0.00 - 3.99]	F

### Structure of the Transcript:

At the end of each semester, student will be given a transcript showing the performance and result in each course. The transcript shows, for each course the title of the course, credit values, grade in University examination, grade in internal assessment, Grade point index, result as pass or fail. Also, the semester grade point average and cumulative grade point average will be shown. Further, the equivalent percentage of marks corresponding to SGPA and CGPA will be shown. The formula to convert SGPA or CGPA to equivalent percentage is given by:

$$10 \times \text{CGPA if CGPI/SGPI is in [4.00, 6.00]}$$

$$\text{Equivalent percentage marks} = 05 \times \text{CGPA} + 30 \text{ if CGPI/SGPI is in [6.00, 9.00]}$$

$$25 \times \text{CGPA} - 150 \text{ if CGPI/SGPI is in [9.00, 10.00]}$$

The percentage of marks can be obtained by using the following table:

CGPA	% of marks	CGPA	% of marks	CGPA	% of marks	CGPA	% of marks
4.0	40.0	5.5	55.0	7.0	65.0	8.5	72.5
4.1	41.0	5.6	56.0	7.1	65.5	8.6	73.0
4.2	42.0	5.7	57.0	7.2	66.0	8.7	73.5
4.3	43.0	5.8	58.0	7.3	66.5	8.8	74.0
4.4	44.0	5.9	59.0	7.4	67.0	8.9	74.5
4.5	45.0	6.0	60.0	7.5	67.5	9.0	75.0
4.6	46.0	6.1	60.5	7.6	68.0	9.1	77.5
4.7	47.0	6.2	61.0	7.7	68.5	9.2	80.0
4.8	48.0	6.3	61.5	7.8	69.0	9.3	82.5
4.9	49.0	6.4	62.0	7.9	69.5	9.4	85.0
5.0	50.0	6.5	62.5	8.0	70.0	9.5	87.5
5.1	51.0	6.6	63.0	8.1	70.5	9.6	90.0
5.2	52.0	6.7	63.5	8.2	71.0	9.7	92.5
5.3	53.0	6.8	64.0	8.3	71.5	9.8	95.0
5.4	54.0	6.9	64.5	8.4	72.0	9.9	97.5
						10.0	100



# Bharati Vidyapeeth (Deemed to be University) Pune, India.

1112-2  
1121  
1122  
Celebrating  
and Beyond  
BHARATI VIDYAPEETH  
Founder Hon'ble Dr. Patangrao Kadam

Hon'ble Dr. Patangrao Kadam  
M.A., LL.B., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
Vice Chancellor

Accredited with 'A+' Grade (2017) by NAAC  
'A' Grade University Status by MHRD, Govt. of India  
Accredited (2004) & Reaccredited (2011) with 'A' Grade by NAAC



Bharati Vidyapeeth Bhavan,  
Lal Bahadur Shastri Marg,  
Pune - 411 030 (INDIA)

Tel. : +91-20-24407100, 24325701  
Fax : +91-20-24339121, 24321910  
E-mail : bvuniversity@yahoo.co.in  
Web : www.bvuniversity.edu.in

## NOTIFICATION NO. 917

It is hereby notified for the information of all concerned that the Academic Council, at its 55<sup>th</sup> meeting held on 26-3-2018, has resolved to start following Two PG Diploma courses and Four Certificate courses under the Faculty of Interdisciplinary Studies offered at BVDU Centre for Health Management Studies and Research, Pune from the academic year 2018-19.

Sr. No.	Name of the Course	Duration
1	Post Graduate Diploma in Hospital Planning & Design (PGDHPD)	1 year
2	Post Graduate Diploma in Health Event Management (PGDHEM)	1 year
3	Certificate Course in Hospital Material and Pharmacy Management (CCHMPM)	1 year
4	Certificate Course in Hospital Support Services Management (CCHSSM)	1 year
5	Certificate Course in Hospital Maintenance Management (CCHMM)	1 year
6	Certificate Course in Outpatient Service Management (CCOSM)	1 year

All the concerned may please note.

Ref. No. BVDU/2017-18/5382

Date: April 11, 2018

To

1. The Dean, Faculty of Interdisciplinary Studies, BVDU, College of Engineering, Pune 43
2. The Director, Centre for Health Management Studies & Research, Pune 43
3. The CET Cell, BVDU.
4. The Eligibility Section, BVDU
5. The Accounts & Finance Officer, BVDU
6. The Controller of Examinations, BVDU.
7. The IT Cell for uploading in the Website.

G. Rajakumar  
Registrar

DIRECTOR  
Bharati Vidyapeeth  
(Deemed to be University)  
Centre For Health Management  
Studies and Research  
Pune-Satara Road, Pune-43.

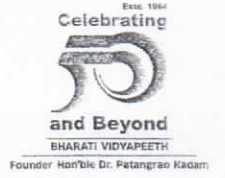
Notification/AC26-3-2018/55-5.1)

Inward No. 287  
Date 28/5/2018  
BVDUCHMSR

28/05/18



# Bharati Vidyapeeth (Deemed to be University) Pune, India.



Hon'ble Dr. Patangrao Kadam  
M.A., LL.B., Ph.D.  
Chancellor

Prof. Dr. Shivajirao Kadam  
M.Sc., Ph.D.  
Pro Chancellor

Prof. M. M. Salunkhe  
M.Sc., Ph.D., F.R.S.C.  
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Accredited with 'A+' Grade (2017) by NAAC  
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Tel. : +91-20-24407100, 24325701  
Fax : +91-20-24339121, 24321910  
E-mail : bvuniversity@yahoo.co.in  
Web : www.bvuniversity.edu.in

## NOTIFICATION NO. 893

It is hereby notified for the information of all concerned that the Academic Council, at its 55<sup>th</sup> meeting held on 26-3-2018, has resolved to approve the revised syllabi for :

- (1) Master of Hospital Administration
- (2) PG Diploma in Hospital Management and
- (3) PG Diploma in Disaster Management

offered in the University at Centre for Health Management Studies & Research to be implemented from the academic year 2018-19.

Copies of revised syllabi for the above mentioned courses are enclosed.

All the concerned may please note.

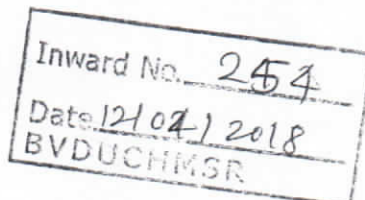
Ref. No. BVDU/2017-18/ 5332

Date: April 10, 2018

*G. Rajkumar*  
Registrar

- 12/04/18*  
*m. monasvi*
1. The Dean, Faculty of Interdisciplinary Studies, BVDU, College of Engineering, Pune 43
  2. The Director, Centre for Health Management Studies & Research, Pune 43
  3. The Controller of Examinations, BVDU.
  4. The IT Cell for uploading in the Website.

Notification/AC26-3-2018(55-5.6)



*[Signature]*  
DIRECTOR  
Bharati Vidyapeeth  
(Deemed to be University)  
Centre For Health Management  
Studies and Research  
Pune-Satara Road, Pune-43.



Prof. Dr. Shivajirao Kadam  
Chancellor M.Sc., Ph.D.

Prof. Dr. M. M. Salunkhe  
Vice Chancellor M.Sc., Ph.D., F.R.S.C.

**Bharati Vidyapeeth**  
(Deemed to be University)  
Pune, India.

Founder Chancellor : Dr. Patangrao Kadam

- ★ Accredited with 'A+' Grade (2017) by NAAC ★
- ★ Category-I University Status by UGC ★
- ★ NIRF Ranking - 66 ★



Dr. Vishwajeet Kadam  
B.Tech., M.B.A., Ph.D.  
Pro Vice Chancellor

G. Jayakumar  
M.Com., Dip.Pub.Admin.  
Registrar

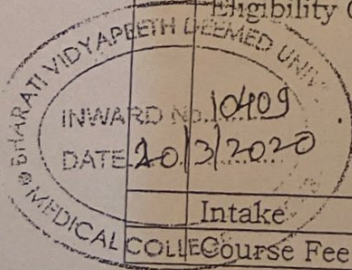
"Social Transformation Through Dynamic Education"

**NOTIFICATION NO. 1034**

It is hereby notified for the information of all concerned that the Academic Council, at its 60<sup>th</sup> meeting held on 20-1-2020 resolved to start the following B.Sc. / PG Diploma / Certificate courses at Medical College, Pune from the academic year 2020-21.

It was further resolved to authorize the Hon'ble Vice Chancellor to approve the course structure, syllabus and the rules of the examinations for all the proposed Degree, Diploma and certificate programmes,

1)	Name of the Course	:	B.Sc. (Cardiovascular Technology)
	Duration	:	3 yrs. + 1 yr. internship
	Eligibility Criteria	:	1)Age- Completed 17 yrs at the time of admission. 2)Candidates who has successfully passed the Higher Secondary Examinations (10+2 Sci.) Course with Physics, Chemistry, Biology and English with minimum 50% marks from recognized Board.
	Intake	:	10
	Course Fee	:	Rs. 1,00,000/- per year
2)	Name of the Course	:	B.Sc. (Neuro Electrophysiology Technology)
	Duration	:	3 yrs. + 1 yr. internship
	Eligibility Criteria	:	1)Age- Completed 17 yrs at the time of admission. 2)Candidates who has successfully passed the Higher Secondary Examinations (10+2 Sci.) Course with Physics, Chemistry, Biology and English with minimum 50% marks from recognized Board.
	Intake	:	10
	Course Fee	:	Rs. 1,00,000/- per year
3)	Name of the Course	:	B.Sc. (Anaesthesia and OT Technology)
	Duration	:	3 yrs. + 1 yr. internship
	Eligibility Criteria	:	1)Age- Completed 17 yrs at the time of admission. 2)Candidates who has successfully passed the Higher Secondary Examinations (10+2 Sci.) Course with Physics, Chemistry, Biology and English with minimum 50% marks from recognized Board.
	Intake	:	10
	Course Fee	:	Rs. 1,00,000/- per year



G. Jayakumar





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4)	Name of the Course	:	PG Diploma in Clinical Nutrition
	Duration	:	1 yr.
	Eligibility Criteria	:	B.Sc. with Physics, Chemistry, Biology, Nursing and English with minimum 50% marks from recognized Board.
	Intake	:	20
	Course Fee	:	Rs. 40,000/-
5)	Name of the Course	:	PG Diploma in Psychological Counselling
	Duration	:	1 yr.
	Eligibility Criteria	:	Bachelor's degree in Psychology. B.Sc.(Nursing), P.B. B.Sc. (Nursing).
	Intake	:	10
	Course Fee	:	Rs. 40,000/-
6)	Name of the Course	:	PG Diploma in Neonatal Nursing
	Duration	:	1 yr.
	Eligibility Criteria	:	B.Sc.(Nursing), P.B. B.Sc. (Nursing).
	Intake	:	10
	Course Fee	:	Rs. 40,000/- per year
7)	Name of the Course	:	Certificate Course in Endoscopy Technician
	Duration	:	1 yr.
	Eligibility Criteria	:	1) Completed 17 yrs at the time of admission. 2) ANM/ GNM / B.Sc. (Nursing)
	Intake	:	10
	Course Fee	:	Rs. 40,000/-

This is for the information of all concerned.

Ref. No. BVDU/2019-20/ 5336

Date: March 17, 2020

To,

1. The Dean, Faculty of Medicine, Medical College, Pune
2. The Principal, Medical College, Pune
3. The Controller of Examinations, BVDU, Pune
4. The IT Cell for uploading in the Website.

AC20-1-2020 (60-5.4)

*G. Rajkumar*  
Registrar

Pharmacy Council of India  
New Delhi

Rules & Syllabus for the Bachelor  
of Pharmacy (B. Pharm) Course

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[Framed under Regulation 6, 7 & 8 of the Bachelor of  
Pharmacy (B. Pharm) course regulations 2014]

## **CHAPTER- I: REGULATIONS**

### **1. Short Title and Commencement**

These regulations shall be called as “The Revised Regulations for the B. Pharm. Degree Program (CBCS)of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

### **2. Minimum qualification for admission**

#### **2.1 First year B. Pharm:**

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

#### **2.2. B. Pharm lateral entry (to third semester):**

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

### **3. Duration of the program**

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### **4. Medium of instruction and examinations**

Medium of instruction and examination shall be in English.

### **5. Working days in each semester**

Each semestershall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

### **6. Attendance and progress**

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

## **7. Program/Course credit structure**

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

### **7.1. Credit assignment**

#### **7.1.1. Theory and Laboratory courses**

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

### **7.2. Minimum credit requirements**

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Project over the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

## **8. Academic work**

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

### 9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

**Table-I: Course of study for semester I**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
<b>Total</b>		<b>32/34<sup>§</sup>/36<sup>#</sup></b>	<b>4</b>	<b>27/29<sup>§</sup>/30<sup>#</sup></b>

<sup>#</sup>Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>§</sup>Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)

**Table-II: Course of study for semester II**

<b>Course Code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
<b>Total</b>		<b>32</b>	<b>4</b>	<b>29</b>

\*Non University Examination (NUE)

**Table-III: Course of study for semester III**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
<b>Total</b>		<b>28</b>	<b>4</b>	<b>24</b>

**Table-IV: Course of study for semester IV**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
<b>Total</b>		<b>31</b>	<b>5</b>	<b>28</b>

**Table-V: Course of study for semester V**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
<b>Total</b>		<b>27</b>	<b>5</b>	<b>26</b>

**Table-VI: Course of study for semester VI**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
<b>Total</b>		<b>30</b>	<b>6</b>	<b>30</b>

**Table-VII: Course of study for semester VII**

<b>Course code</b>	<b>Name of the course</b>	<b>No. of hours</b>	<b>Tutorial</b>	<b>Credit points</b>
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
<b>Total</b>		<b>28</b>	<b>5</b>	<b>24</b>

\* Non University Examination (NUE)



**Table-VIII: Course of study for semester VIII**

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
<b>Total</b>		<b>24</b>	<b>4</b>	<b>22</b>

**Table-IX: Semester wise credits distribution**

Semester	Credit Points
I	27/29 <sup>§</sup> /30 <sup>#</sup>
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
<b>Total credit points for the program</b>	<b>209/211<sup>§</sup>/212<sup>#</sup></b>

\* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

<sup>§</sup>Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

<sup>#</sup>Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

## **10. Program Committee**

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

- i. Periodically reviewing the progress of the classes.
- ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
- iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

## **11. Examinations/Assessments**

The scheme for internal assessment and end semester examinations is given in Table – X.

### **11.1. End semester examinations**

The End Semester Examinations for each theory and practical coursethrough semesters I to VIII shall be conducted by the university except for the subjects with asterix symbol (\*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

**Tables-X: Schemes for internal assessments and end semester examinations semester wise**

**Semester I**

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Marks	Duration	
			Marks	Duration			
BP101T	Human Anatomy and Physiology I – Theory	10	15	1 Hr	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	15	2 Hrs	25
	<b>Total</b>	<b>70/75<sup>§</sup>/80<sup>#</sup></b>	<b>115/125<sup>§</sup>/130<sup>#</sup></b>	<b>23/24<sup>§</sup>/26<sup>#</sup> Hrs</b>	<b>490/525<sup>§</sup>/ 540<sup>#</sup></b>	<b>31.5/33<sup>§</sup>/ 35<sup>#</sup> Hrs</b>	<b>675/725<sup>§</sup>/ 750<sup>#</sup></b>

<sup>#</sup> Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

<sup>§</sup> Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

\* Non University Examination (NUE)

## Semester II

Course code	Name of the course	Internal Assessment			End Semester Exams			Total Marks
		Continuous Mode	Sessional Exams		Marks	Duration	Total	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	75	3 Hrs	25	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	75	3 Hrs	25	100
BP203T	Biochemistry – Theory	10	15	1 Hr	75	3 Hrs	25	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	75	3 Hrs	25	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	50	2 Hrs	25	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	50	2 Hrs	25	75
BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hrs	35	4 Hrs	15	50
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	35	4 Hrs	15	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	35	4 Hrs	15	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	15	2 Hrs	10	25
<b>Total</b>		<b>80</b>	<b>125</b>	<b>20 Hrs</b>	<b>520</b>	<b>30 Hrs</b>	<b>205</b>	<b>725</b>

\* The subject experts at college level shall conduct examinations

### Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceutics I –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
<b>Total</b>		<b>60</b>	<b>100</b>	<b>20</b>	<b>160</b>	<b>440</b>	<b>28Hrs</b>	<b>600</b>

**Semester IV**

Course code	Name of the course	Internal Assessment			End Semester Exams			Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
<b>Total</b>		<b>70</b>	<b>115</b>	<b>21 Hrs</b>	<b>185</b>	<b>515</b>	<b>31 Hrs</b>	<b>700</b>

**Semester V**

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Marks	Duration	
			Marks	Duration			
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	35	4 Hrs	50
	<b>Total</b>	<b>65</b>	<b>105</b>	<b>17 Hr</b>	<b>480</b>	<b>27 Hrs</b>	<b>650</b>

**Semester VI**

Course code	Name of the course	Internal Assessment			End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams Marks	Duration	Marks	Duration	
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	35	4 Hrs	50
	<b>Total</b>	<b>75</b>	<b>120</b>	<b>18 Hrs</b>	<b>555</b>	<b>30 Hrs</b>	<b>750</b>



**Semester VII**

Course code	Name of the course	Internal Assessment				End Semester Exams			Total Marks
		Continuous Mode	Sessional Marks	Sessional Exams Duration	Total	Marks	Duration		
								Marks	
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100	
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100	
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100	
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100	
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50	
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150	
	<b>Total</b>	<b>70</b>	<b>70</b>	<b>8Hrs</b>	<b>140</b>	<b>460</b>	<b>21 Hrs</b>	<b>600</b>	

\* The subject experts at college level shall conduct examinations

**Semester VIII**

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Marks	Sessional Exams Duration	Total	Marks	Duration	
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory							
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150
<b>Total</b>		<b>40</b>	<b>60</b>	<b>4 Hrs</b>	<b>100</b>	<b>450</b>	<b>16 Hrs</b>	<b>550</b>



### 11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

**Table-XI: Scheme for awarding internal assessment: Continuous mode**

<b>Theory</b>		
<b>Criteria</b>	<b>Maximum Marks</b>	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
<b>Total</b>	<b>10</b>	<b>5</b>
<b>Practical</b>		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
<b>Total</b>	<b>5</b>	

**Table- XII: Guidelines for the allotment of marks for attendance**

<b>Percentage of Attendance</b>	<b>Theory</b>	<b>Practical</b>
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

#### 11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

#### Question paper pattern for theory Sessional examinations

##### For subjects having University examination

I. Multiple Choice Questions (MCQs)	=	10 x 1 = 10
OR		OR
Objective Type Questions (5 x 2) (Answer all the questions)	=	05 x 2 = 10
I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 2 out of 3)	=	2 x 5 = 10
		-----
Total	=	30 marks

**For subjects having Non University Examination**

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20
		-----
Total	=	30 marks
		-----

**Question paper pattern for practical sessional examinations**

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05
		-----
Total	=	40 marks
		-----

**12. Promotion and award of grades**

A student shall be declared PASS and eligible for getting grade in a course of B.Pharm. program if he/she secures at least 50% marks in that particular course including internal assessment. For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

**13. Carry forward of marks**

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessments shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

**14. Improvement of internal assessment**

A student shall have the opportunity to improve his/her performance only once in the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

**15. Re-examination of end semester examinations**

Reexamination of end semester examinations shall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

**Table-XIII: Tentative schedule of end semester examinations**

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

**Question paper pattern for end semester theory examinations**

**For 75 marks paper**

I. Multiple Choice Questions(MCQs)	=	20 x 1	=	20
OR				OR
Objective Type Questions (10 x 2)	=	10 x 2	=	20
(Answer all the questions)				
II. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
III. Short Answers (Answer 7 out of 9)	=	7 x 5	=	35

Total = 75 marks

**For 50 marks paper**

I. Long Answers (Answer 2 out of 3)	=	2 x 10	=	20
II. Short Answers (Answer 6 out of 8)	=	6 x 5	=	30

Total = 50 marks

**For 35 marks paper**

I. Long Answers (Answer 1 out of 2)	=	1 x 10	=	10
II. Short Answers (Answer 5 out of 7)	=	5 x 5	=	25

Total = 35 marks

**Question paper pattern for end semester practical examinations**

I. Synopsis	=	5
II. Experiments	=	25
III. Viva voce	=	5

Total = 35 marks

**16. Academic Progression:**

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who has given more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade AB should be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

## 17. Grading of performances

### 17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – XII.

**Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances**

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

## 18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called ‘Semester Grade Point Average’ (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, C<sub>4</sub> and C<sub>5</sub> and the student’s grade points in these courses are G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub>, G<sub>4</sub> and G<sub>5</sub>, respectively, and then students’ SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, the SGPA shall then be computed as:



$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * \text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

**19. Cumulative Grade Point Average (CGPA)**

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>,... is the total number of credits for semester I,II,III,... and S<sub>1</sub>,S<sub>2</sub>, S<sub>3</sub>,... is the SGPA of semester I,II,III,....

**20. Declaration of class**

The class shall be awarded on the basis of CGPA as follows:

- First Class with Distinction = CGPA of 7.50 and above
- First Class = CGPA of 6.00 to 7.49
- Second Class = CGPA of 5.00 to 5.99

**21. Project work**

All the students shall undertake a project under the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

***Evaluation of Dissertation Book:***

Objective(s) of the work done	15 Marks
Methodology adopted	20 Marks
Results and Discussions	20 Marks
Conclusions and Outcomes	20 Marks

**Total** 75 Marks

***Evaluation of Presentation:***

Presentation of work	25 Marks
Communication skills	20 Marks
Question and answer skills	30 Marks

**Total** 75 Marks

*Explanation:* The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

**22. Industrial training (Desirable)**

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

**23. Practice School**

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college level and grade point shall be awarded.

**24. Award of Ranks**

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

**25. Award of degree**

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

**26. Duration for completion of the program of study**

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

**27. Re-admission after break of study**

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

# 2016

## THE MASTER OF PHARMACY (M. PHARM.) COURSE REGULATION 2014

(BASED ON NOTIFICATION IN THE GAZETTE OF INDIA No. 362, DATED DECEMBER 11, 2014)

## SCHEME AND SYLLABUS



**PHARMACY COUNCIL OF INDIA**  
Combined Council's Building, Kotla Road,  
Aiwan-E-Ghalib Marg, New Delhi-110 002.  
Website : [www.pci.nic](http://www.pci.nic).

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# भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग III—खण्ड 4

PART III—Section 4

प्रधिकार से प्रकाशित

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## PHARMACY COUNCIL OF INDIA NOTIFICATION

New Delhi, the 10th December, 2014

**The Master of Pharmacy (M.Pharm) Course Regulations, 2014**

No. 14-136/2014-PCI.—In exercise of the powers conferred by Sections 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government hereby makes the following regulations: namely—

## CHAPTER –I:REGULATIONS

### 1. Short Title and Commencement

These regulations shall be called as “The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi”. They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

### 2. Minimum qualification for admission

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

### 3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### 4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

### 5. Working days in each semester

Each semester shall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

## 6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

## 7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

### 7.1. Credit assignment

#### 7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

### 7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments, Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits



are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

#### 8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

#### 9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: List of M.Pharm. Specializations and their Code

S. No.	Specialization	Code
1.	Pharmaceutics	MPH
2.	Industrial Pharmacy	MIP
3.	Pharmaceutical Chemistry	MPC
4.	Pharmaceutical Analysis	MPA
5.	Pharmaceutical Quality Assurance	MQA
6.	Pharmaceutical Regulatory Affairs	MRA
7.	Pharmaceutical Biotechnology	MPB
8.	Pharmacy Practice	MPP
9.	Pharmacology	MPL
10.	Pharmacognosy	MPG

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table - 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 3: Course of study for M. Pharm. (Industrial Pharmacy)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
<b>Semester I</b>					
MIP101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MIP102T	Pharmaceutical Formulation Development	4	4	4	100
MIP103T	Novel drug delivery systems	4	4	4	100
MIP104T	Intellectual Property Rights	4	4	4	100
MIP105P	Industrial Pharmacy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
<b>Semester II</b>					
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	4	4	4	100
MIP202T	Scale up and Technology Transfer	4	4	4	100
MIP203T	Pharmaceutical Production Technology	4	4	4	100
MIP204T	Entrepreneurship Management	4	4	4	100
MIP205P	Industrial Pharmacy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table - 4: Course of study for M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry -I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 5: Course of study for M. Pharm. (Pharmaceutical Analysis)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPA102T	Advanced Pharmaceutical Analysis	4	4	4	100
MPA103T	Pharmaceutical Validation	4	4	4	100
MPA104T	Food Analysis	4	4	4	100
MPA105P	Pharmaceutical Analysis Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPA201T	Advanced Instrumental Analysis	4	4	4	100
MPA202T	Modern Bio-Analytical Techniques	4	4	4	100
MPA203T	Quality Control and Quality Assurance	4	4	4	100
MPA204T	Herbal and Cosmetic Analysis	4	4	4	100
MPA205P	Pharmaceutical Analysis Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 6: Course of study for M. Pharm. (Pharmaceutical Quality Assurance)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MQA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MQA102T	Quality Management System	4	4	4	100
MQA103T	Quality Control and Quality Assurance	4	4	4	100
MQA104T	Product Development and Technology Transfer	4	4	4	100
MQA105P	Pharmaceutical Quality Assurance Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MQA201T	Hazards and Safety Management	4	4	4	100
MQA202T	Pharmaceutical Validation	4	4	4	100
MQA203T	Audits and Regulatory Compliance	4	4	4	100
MQA204T	Pharmaceutical Manufacturing Technology	4	4	4	100
MQA205P	Pharmaceutical Quality Assurance Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 7: Course of study for M. Pharm. (Regulatory Affairs)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MRA 101T	Good Regulatory Practices	4	4	4	100
MRA 102T	Documentation and Regulatory Writing	4	4	4	100
MRA 103T	Clinical Research Regulations	4	4	4	100
MRA 104T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	4	4	4	100
MRA 105P	Regulatory Affairs Practical I	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
Semester II					
MRA 201T	Regulatory Aspects of Drugs & Cosmetics	4	4	4	100
MRA 202T	Regulatory Aspects of Herbal & Biologicals	4	4	4	100
MRA 203T	Regulatory Aspects of Medical Devices	4	4	4	100
MRA 204T	Regulatory Aspects of Food & Nutraceuticals	4	4	4	100
MRA 205P	Regulatory Affairs Practical II	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 8: Course of study for M. Pharm. (Pharmaceutical Biotechnology)

Course Code	Course	Credit Hours	Credit Points	Hrs./week	Marks
Semester I					
MPB 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPB 102T	Microbial And Cellular Biology	4	4	4	100
MPB 103T	Bioprocess Engineering and Technology	4	4	4	100
MPB 104T	Advanced Pharmaceutical Biotechnology	4	4	4	100
MPB 105P	Pharmaceutical Biotechnology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPB 201T	Proteins and protein Formulation	4	4	4	100
MPB 202T	Immunotechnology	4	4	4	100
MPB 203T	Bioinformatics and Computer Technology	4	4	4	100
MPB 204T	Biological Evaluation of Drug Therapy	4	4	4	100
MPB 205P	Pharmaceutical Biotechnology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650



Table – 9: Course of study for M. Pharm. (Pharmacy Practice)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPP 101T	Clinical Pharmacy Practice	4	4	4	100
MPP 102T	Pharmacotherapeutics-I	4	4	4	100
MPP 103T	Hospital & Community Pharmacy	4	4	4	100
MPP 104T	Clinical Research	4	4	4	100
MPP 105P	Pharmacy Practice Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPP 201T	Principles of Quality Use of Medicines	4	4	4	100
MPP 102T	Pharmacotherapeutics II	4	4	4	100
MPP 203T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	4	4	4	100
MPP 204T	Pharmacoepidemiology & Pharmacoconomics	4	4	4	100
MPP 205P	Pharmacy Practice Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 10: Course of study for (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPL 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL 102T	Advanced Pharmacology-I	4	4	4	100
MPL 103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL 104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL 105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPL 201T	Advanced Pharmacology II	4	4	4	100
MPL 202T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL 203T	Principles of Drug Discovery	4	4	4	100
MPL 204T	Experimental Pharmacology practical- II	4	4	4	100
MPL 205P	Pharmacology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 11: Course of study for M. Pharm. (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPG101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPG102T	Advanced Pharmacognosy-I	4	4	4	100
MPG103T	Phytochemistry	4	4	4	100
MPG104T	Industrial Pharmacognostical Technology	4	4	4	100
MPG105P	Pharmacognosy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPG201T	Medicinal Plant biotechnology	4	4	4	100
MPG102T	Advanced Pharmacognosy-II	4	4	4	100
MPG203T	Indian system of medicine	4	4	4	100
MPG204T	Herbal cosmetics	4	4	4	100
MPG205P	Pharmacognosy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650

Table – 12: Course of study for M. Pharm. III Semester  
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
Total		35	21

\* Non University Exam

Table – 13: Course of study for M. Pharm. IV Semester  
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
Total		35	20

Table – 14: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

\*Credit Points for Co-curricular Activities

Table – 15: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

\*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

#### 10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.
2. The composition of the Programme Committee shall be as follows:  
A teacher at the cadre of Professor shall be the Chairperson; One Teacher from each M.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.
3. Duties of the Programme Committee:
  - i. Periodically reviewing the progress of the classes.
  - ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
  - iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

- iv. Communicating its recommendation to the Head of the institution on academic matters.
- v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessionalexam and before the end semester exam.

## 11. Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table – 16.

### 11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to IVshall beconducted by the respective university except for the subject with asterix symbol (\*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables – 1616 : Schemes for internal assessments and end semester  
(Pharmaceutics- MPH)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPH 101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPH 201T	Molecular Pharmaceutics(Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

204T	and Cosmeceutic als							
MPH 205P	Pharmaceuti cs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650



Tables – 1717 : Schemes for internal assessments and end semester  
(Industrial Pharmacy- MIP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuou s Mode	Sessional Exams		Tot al	Mar ks	Dura tion	
			Mar ks	Durati on				
SEMESTER I								
MIP101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MIP102T	Pharmaceutical Formulation Development	10	15	1 Hr	25	75	3 Hrs	100
MIP103T	Novel drug delivery systems	10	15	1 Hr	25	75	3 Hrs	100
MIP104T	Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MIP105P	Industrial Pharmacy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MIP202T	Scale up and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MIP203T	Pharmaceutical Production Technology	10	15	1 Hr	25	75	3 Hrs	100
MIP204T	Entrepreneurship Management	10	15	1 Hr	25	75	3 Hrs	100

MIP205P	Industrial Pharmacy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

## (Pharmaceutical Chemistry-MPC)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuos Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPC102T	Advanced Organic Chemistry -I	10	15	1 Hr	25	75	3 Hrs	100
MPC103T	Advanced Medicinal chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC104T	Chemistry of Natural Products	10	15	1 Hr	25	75	3 Hrs	100
MPC105P	Pharmaceutical Chemistry Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPC202T	Advanced Organic Chemistry -II	10	15	1 Hr	25	75	3 Hrs	100
MPC203T	Computer Aided Drug Design	10	15	1 Hr	25	75	3 Hrs	100
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC205P	Pharmaceutic	20	30	6 Hrs	50	100	6	150

	al Chemistry Practical II						Hrs	
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 19: Schemes for internal assessments and end semester examinations  
(Pharmaceutical Analysis-MPA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continu- ous Mode	Sessional Exams		Tot al	Mark s	Dura tion	
			Mark s	Durati on				
SEMESTER I								
MPA101T	Modern Pharmaceuti cal Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA102T	Advanced Pharmaceuti cal Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA103T	Pharmaceuti cal Validation	10	15	1 Hr	25	75	3 Hrs	100
MPA104T	Food Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA105P	Pharmaceuti cal Analysis-I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPA201T	Advanced Instrumental Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA202T	Modern Bio- Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPA203T	Quality Control and Quality	10	15	1 Hr	25	75	3 Hrs	100

	Assurance							
MPA204T	Herbal and Cosmetic analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA205P	Pharmaceuti cal Analysis- II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 20: Schemes for internal assessments and end semester examinations  
(Pharmaceutical Quality Assurance-MQA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MQA101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MQA102T	Quality Management System	10	15	1 Hr	25	75	3 Hrs	100
MQA103T	Quality Control and Quality Assurance	10	15	1 Hr	25	75	3 Hrs	100
MQA104T	Product Development and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MQA105P	Pharmaceutical Quality Assurance Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
<b>Total</b>								650
<b>SEMESTER II</b>								
MQA201T	Hazards and Safety Management	10	15	1 Hr	25	75	3 Hrs	100
MQA202T	Pharmaceutical Validation	10	15	1 Hr	25	75	3 Hrs	100
MQA203T	Audits and Regulatory Compliance	10	15	1 Hr	25	75	3 Hrs	100
MQA204T	Pharmaceutical Manufacturing Technology	10	15	1 Hr	25	75	3 Hrs	100
MQA205P	Pharmaceutical Quality Assurance Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
<b>Total</b>								650

Tables – 21: Schemes for internal assessments and end semester examinations  
(Pharmaceutical Regulatory Affairs-MRA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continu- ous Mod- e	Sessional Exams		Tot- al	Mar- ks	Dura- tion	
			Mar- ks	Durati- on				
SEMESTER I								
MRA10 1T	Good Pharmaceutical Practices	10	15	1 Hr	25	75	3 Hrs	100
MRA10 2T	Documentation and Regulatory Writing	10	15	1 Hr	25	75	3 Hrs	100
MRA10 3T	Clinical Research Regulations	10	15	1 Hr	25	75	3 Hrs	100
MRA10 4T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MRA10 5T	Pharmaceutical Regulatory Affairs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MRA20 1T	Regulatory Aspects of Drugs & Cosmetics	10	15	1 Hr	25	75	3 Hrs	100

MRA20 2T	Regulatory Aspects of Herbal & Biologicals	10	15	1 Hr	25	75	3 Hrs	100
MRA20 3T	Regulatory Aspects of Medical Devices	10	15	1 Hr	25	75	3 Hrs	100
MRA20 4T	Regulatory Aspects of Food & Nutraceuticals	10	15	1 Hr	25	75	3 Hrs	100
MRA20 5P	Pharmaceutical Regulatory Affairs Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650



Tables – 22: Schemes for internal assessments and end semester examinations  
(Pharmaceutical Biotechnology-MPB)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPB10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPB10 2T	Microbial And Cellular Biology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 3T	Bioprocess Engineering and Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 4T	Advanced Pharmaceutical Biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB10 5P	Pharmaceutical Biotechnology Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPB20 1T	Proteins and protein Formulation	10	15	1 Hr	25	75	3 Hrs	100
MPB20 2T	Immunotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB20 3T	Bioinformatics and Computer Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB20 4T	Biological Evaluation of Drug Therapy	10	15	1 Hr	25	75	3 Hrs	100
MPB20 5P	Pharmaceutical Biotechnology Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 23: Schemes for internal assessments and end semester examinations  
(Pharmacy Practice-MPP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPP10 1T	Clinical Pharmacy Practice	10	15	1 Hr	25	75	3 Hrs	100
MPP10 2T	Pharmacotherapeutics-I	10	15	1 Hr	25	75	3 Hrs	100
MPP10 3T	Hospital & Community Pharmacy	10	15	1 Hr	25	75	3 Hrs	100
MPP10 4T	Clinical Research	10	15	1 Hr	25	75	3 Hrs	100
MPP10 5P	Pharmacy Practice Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPP20 1T	Principles of Quality Use of Medicines	10	15	1 Hr	25	75	3 Hrs	100
MPP10 2T	Pharmacotherapeutics II	10	15	1 Hr	25	75	3 Hrs	100
MPP20 3T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	10	15	1 Hr	25	75	3 Hrs	100
MPP20 4T	Pharmacoepidemiology & Pharmacoeconomics	10	15	1 Hr	25	75	3 Hrs	100
MPP20 5P	Pharmacy Practice Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 24: Schemes for internal assessments and end semester examinations  
(Pharmacology-MPL)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPL10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 3T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL10 4T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL10 5P	Experimental Pharmacology - I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPL20 1T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL10 2T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL20 3T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL20 4T	Clinical research and pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL20 5P	Experimental Pharmacology - II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 25: Schemes for internal assessments and end semester examinations  
(Pharmacognosy-MPG)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
<b>SEMESTER I</b>								
MPG10 1T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPG10 2T	Advanced Pharmacognosy-I	10	15	1 Hr	25	75	3 Hrs	100
MPG10 3T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100
MPG10 4T	Industrial Pharmacognostical Technology	10	15	1 Hr	25	75	3 Hrs	100
MPG10 5P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
<b>SEMESTER II</b>								
MPG20 1T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPG10 2T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100
MPG20 3T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100
MPG20 4T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100
MPG20 5P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 26: Schemes for internal assessments and end semester examinations  
(Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuou s Mode	Sessional Exams		Total	Marks	Durati on	
			Marks	Durati on				
SEMESTER III								
MRM301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work*	-	-	-	-	350	1 Hr	350
Total								525
SEMESTER IV								
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
Total								500

\*Non University Examination

## 11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 27: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance (Refer Table – 28)	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance (Refer Table – 28)	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

Table – 28: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

### 11.2.1. Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

## 12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm.programme if he/she secures at least 50% marks in that particular course including internal assessment.

## 13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

#### 14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

#### 15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 29. The exact dates of examinations shall be notified from time to time.

Table – 29: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

#### 16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and II semesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

#### 17. Grading of performances

##### 17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course. The letter grades and their corresponding grade points are given in Table – 30.