



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE**

**Faculty of Engineering & Technology
B. Tech. (Computer Science and Engineering)
New Syllabus**



**BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY) Pune.**

**Faculty of Engineering & Technology
Programme : B. Tech. (Computer Science and
Engineering) (2021 Course)
Course Structure & Syllabus
(Choice based credit systems-2021)
B.Tech (Computer Science and
Engineering)Semester I to VIII**



Manual1.

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Executive summary

Students pursuing engineering studies need to be well equipped and state of art with the latest technological trends and industrial requirements. To produce the students with high caliber and technically sound, enrichment in the curriculum content and various quality initiatives are needed. This is possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.


Curriculum Development History

- In ambits of Deemed University- 2000
- Curriculum of SPPU Accepted
- First Revision in 2004
- Second Revision in 2007
- Third Revision in 2011
- Fourth Revision in 2014
- Fifth Revision in 2018 was expected

The proposed curriculum is developed to inculcate the advanced engineering skills to cope up with upcoming industrial and societal needs. Students will be imparted with advanced contents from respective field and innovative delivery methods.

To inculcate the advanced engineering skills and knowledge, branch specific courses have been introduced from the Sem – I itself. There are total 38 theory courses, 4 vocational courses, 3 MOOCs, 2 projects, technical research paper writing, no. of application software courses, no. of practical based courses, 6 Industry taught courses along with 60 days exclusive internship have been incorporated in the curriculum with 230 credits and 6500 Marks.

There will be collaboration with the prominent industries to execute the vocational courses. These industries will deliver the content and execute the hands-on session to inculcate the required engineering skills of particular course. Also, one course per semester will be entirely delivered by the expert/s from the industry of respective field for which blended teaching learning will be adopted.



Students will apply the knowledge of respective courses and develop the prototype/ model as a part of project based learning.

To give the experience of technical writing and research article, students have to develop the two projects in pre final and final year respectively and shall submit the research article to reputed journal for publication. This will inculcate research aptitude among students and will enhance the research profile of institute also. Incorporation of various practical based courses in respective discipline, will give hands on experience to students to understand the engineering concept in better way. Nowadays all practices and process in the field are being computerized and automated. Hence, it was pertinent to increase software content in the curriculum. It was demand from the industry that every engineer should be conversant with Software/Programming/Data analysis and automation process. Hence, courses to such as C, C++, Python, Machine Learning, Artificial Intelligence are added in curriculum of all discipline. Students who wish to develop their career in the IT field, significant courses related to computational engineering and application software have been incorporated in the curriculum of each discipline.

National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology. To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students to provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.




2. Curriculum Content

- Curriculum derived from Latin word 'Currere', which means a race course or runway on which one runs to reach a goal.
- Curriculum is the instructional and educative programme by following which students achieve their goals, ideals and aspirational life.
- Curriculum is a standards based sequence of planned experiences, which students practice and achieve proficiency in content and applied learning skills
- Its confidence building process
- Its total learning experience of the individuals
- Its interactive system of instructions and learning with specific goals, contents, strategies, measurements and resources.
- The desired outcome of curriculum is successful transfer / development of knowledge, skills, and attitude.
- Curriculum should lead to transformation of student to contributory member of the society

We tried to develop curriculum, which will meet these concepts.

Curriculum is the outline of concepts to be taught to students to help them meet the content standards. **Curriculum** is what is taught in a given course or subject. It refers to an interactive system of instruction and learning with specific goals, contents, strategies, measurement, and resources. It is a course of study that will enable the learner to acquire specific knowledge and skills. A **curriculum** consists of the "roadmap" or "guideline" of any given discipline. Both the philosophy of teaching of the instructors as well as of the educational institution serve as two of the principles upon which a curriculum is based.

In Engineering, a **curriculum** is the combination of instructional practices, learning experiences, and students' performance assessment that are designed to bring out and evaluate the target learning outcomes of a particular course. It is the goals, assessments, methods, and materials used to teach a particular skill or subject and includes thinking under "skill.". The curriculum needs to be planned




and designed in such a way so as to sequentially improve students' knowledge and skills.

Placement is an important parameter and outcome of a good curriculum, which satisfy the need of good placement. The written curriculum is a plan of what is to be taught so that the student gets good placement. For this , a variety of technical and non-technical courses that are required to complete a specific degree so as to help the student for placement are included in the curriculum. In addition to technical knowledge , it should also include social behaviors as well as content and thinking skills.

Overall, the curriculum should be such that it should develop a student in a good job seeker, good entrepreneur and also a good human being.

All the above aspects are taken care in the curriculum of **B. Tech-2021** course. This will develop different abilities in a student.



3. Curriculum Preamble

The curriculum 2021 is formed such that it will develop different abilities in a student. It a combination of blended teaching learning process in which both online and offline teaching is a part of the curriculum. In order to develop affection towards the discipline a student has selected, core discipline courses are included right from first year. This will also help to give the overall idea about the branch / discipline to the student.

Interaction with the industry is increased in this curriculum by introducing two new concepts –

1. **Vocational Course** and 2. Industry Taught Course.

Vocational Course (VC), a student will able to develop a specific skill set from the relevant people/ agency from the industry. This will add in gaining new skill sets required by the industry. Such Vocational Courses are included from Semester III to Semester VI of the curriculum. Department also design vocational course relevant for the discipline, which add practical knowledge to students. The vocational courses should be discipline specific. 4 vocational courses and 8 credits are integrated with curriculum.

Industry Taught Courses (ITC) are the courses which will be taught by the people from industry who are experts in the relevant field, either partially or fully. This will provide a scope to students to gain the latest knowledge as used in industry and also to have direct one on one interaction with the industry. This will develop a confidence among the students. Such teaching by industry experts will be as per their availability, if required online and other than official college hours also. Thus, there is a blend of online and offline teaching, knowledge from academicians as well as from industry. Total six Industry Taught Courses are included in the curriculum.

Industry Internship of 60 days at the end of Semester VI integrated with curriculum, will also add to the interaction with the industry. A student will avail his training in industry or on site or in any design office or research organization as allotted to him/by the institute. A separate logbook will be maintained by the student during this period duly signed daily by the competent authority.

Project Based Learning is a part of almost each course of the curriculum. Small projects on relevant topics will be allotted to the students as a part of term-work

of that course. This will inculcate the habit of applying the knowledge learnt to solve practical problems.

Two Projects are included in two stages, one in third year (Sem V and Sem VI) and the second in final year (Sem VII and Sem VIII). Improvement in Research, thinking ability and application of theoretical knowledge to develop practical ideas is the main purpose of these projects.

Publication of a research paper is the outcome expected from the Project work and as a motivation, separate credits are allotted for this. Students are expected to write research article based on Project-I in standard journals in final year. Guide for Project -I will help in writing the research article.

To develop the self studying, self-learning skills, each student has to join the **MOOC/NPTEL** courses and will get the certification of the respective course. This will also give him/her a chance to get the knowledge from teachers from well known institutes of national repute. Three such MOOC/NPTEL courses are included each in Semester III, Semester V and Semester VII and separate credits are allotted to it.

Various new courses are introduced in the curriculum thereby introducing the current and latest technology to students. Basic Science and Engineering Science course contents are designed to match the requirement of the specific disciplines.

Number of software related to that branch/ discipline are included as part of the curriculum. This will help the students to get good placement.

Few soft courses are introduced to non-circuit branches. This will give a soft feel to such branches and also to inculcate confidence among the students.

In addition to technical abilities, a student needs to be developed as a good human being. For this, he will complete social activities in Semester IV and Sem VIII.

Thus Curriculum-2021 satisfies the requirements of National Education Policy-2021.

“Knowledge, Skill, Behavior” are the three attributes that are inculcated in a student when he completes his B.Tech. course under Curriculum-2021.

Recommendations considered

- UGC- Quality mandate
- National Education Policy (NEP)

- AICTE model curriculum
- Curriculum of International Universities
- Curriculum of Indian Universities
- Feedback from HR of industries called for placements
- Market perception

Methodologies Adopted In Designing Curriculum (2021-22)

- 19 Basic Points for design of Curriculum
- Listing of common points (credits, marks, No. of courses, common courses, industry taught courses, vocational Programmes etc.)
- Conducted series of meetings
- Conducted in depth one on one discussions with HoDs
- Planned three workshops,
- Eminent experts from Industry, IITs, IISER, NIT, SPPU, Central Universities were invited for workshops
- First workshop - Course structure, Titles of courses, Industry taught courses, Vocational Courses.
- Second workshop - Content of first and second year courses
- Third workshop - Content of third and fourth year courses- (Planned)

4. Salient features

- Total 250 contact hours teaching are incorporated.
- Credit based 38 theory courses being offered to achieve global standards of quality.
- Curriculum offers practicals to more than 80 % (~ 30 theory courses) theory courses.
- Total 230 credits (6500 marks) are offered for the entire B. Tech. programme.
- Theory courses contains 60% of courses and 20% to practical courses.
- Tutorials (6 Credits), online courses (6 Credits), vocational courses (6 Credits), projects (18 Credits), internship (3 Credits), Research Publication (2 Credits) and social activities assigned (4 Credits) contains remaining 20% of credits
- Blended education policy is adopted considering its importance. 20% courses are taught in online mode.
- Incorporation of 6 industry taught courses is one of the important and strategic step.
- Adopting 4 vocational Programmes in cooperation with industries, renowned agencies, universities will improve skillsets of our students.
- 60 days industrial internship to meet the requirements of industry.
- Including of 2 projects to enhance technical skills & self learning.
- Research paper based on Project-I will inculcate research aptitude among students.
- Project based learning practically for all courses will enhance the ability of application of knowledge and problem solving aptitude.
- NPTEL/ MOOC courses in online mode are introduced as integrated part of the course structure.
- To understand social responsibility and social activities of weightage of 4 credits are integrated part of the course structure.
- Quantitative Techniques and communication courses are introduced to enhance the analytical ability of students and address employability.
- Wide range of elective courses have been offered to provide the choice, to explore the knowledge in their domain of interest.

Salient Features

Sr. No.	UGC (Quality mandate)/ NEP2020-Recommendations	Curriculum (2021-22)
1	Learning Outcome-based Curriculum Framework (LOCF)	a) Programme outcomes and course outcomes are being made ready
2	Imparting Life Skills to Students.	a) Quantitative techniques b) Communication skills c) Bridging gap with Industry by vocational courses d) Self learning by NPTEL/PBL/Two projects
3	Social and Industry Connect	a) 6 Industry taught courses b) 4 Vocational courses c) 60 days internship d) Time and credits for social activities
4	Promotion of Research and the Creation of New Knowledge.	a) Research publications based on projects b) Project based learning
5	Blended Education	a) 15% courses in online mode b) NPTEL/MOOC courses in online mode
6	Technology Enabled Learning/Self Learning	a) NPTEL/MOOCs
7	Software Applications	a) Programme specific softwares and Software application Courses

5. Curriculum Details

5.1. Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement

Courses-Theory/Practical's/Tutorials/Units/Co-mapping and Engagement, University exam and internal assessment

The B.Tech. 2021 offers Credit and Outcome based curriculum with total 230 credits, required for graduation with a Bachelors' degree (B.Tech). The Under-Graduate Programme (B.Tech) is of four years duration i.e of eight semesters (two semesters/year).

Engagement of Courses:

The courses in revised curriculum structure of B.Tech. program are categorized under Core courses, Elective courses, Engineering Science courses and Basic Science courses. These courses are taught to students by engaging them through lectures, practical or tutorials by respective course coordinators. From semester I to VI, there are five (lecture engaged and assessed) courses and in semester VII and VIII there are four (lecture engaged and assessed) courses which are mandatory. All the courses have varying hours of engagement and credits. Theory lecture engagement varies between 3 hours to 4 hours/week, practical engagement varies between 2 hours to 4 hours/week for the respective courses. The contents of every course is divided into six units. Each unit can be covered in 6 hours or 8 hours depending on the total allotted hours/week of lecture engagement for the respective course. Some courses are solely practical oriented. These courses will be only engaged through laboratory sessions.

Outcome Based Curriculum:

Planning and realization of teaching and learning related to outcome-based curricular model requires that initial element shall be an outcome. It serves as a basis for defining modes of evaluation and validation of outcomes. The curriculum defines the Course Outcomes (COs) and course objectives for every course. The outcomes are assessed through various activities and evaluation of learner's performance in various examination schemes i.e Theory/Practical/Oral/Term work.

Credit Calculation:

The course credits are computed based on the teaching hours per week for that course using the formula as mentioned below.

Credits earned by the Student = Credits earned in Theory (Th) + Credits earned in Practical (P) / Oral (O) + Credits earned in Tutorial (T)

Here, as mentioned above, the credit assignment for Th/P/O/T of any course is based on number of teaching hours of that course. It is as mentioned here:

Number of Credits for Theory (Th) courses = Number of classroom teaching hours per week for that course (1:1 correspondence)

Number of Credits for Practical (P) / Oral (O) courses = Number of laboratory hours per week for that course / 2 (0.5:1 correspondence)

Number of Credits for Tutorial (T) courses = Number of tutorial hours for that course (1:1 correspondence)

Example: If a course has 4 hours of classroom teaching, 2 hours of laboratory session and 1 hour of tutorial, then the credits assigned for that course will be 4(Th), 1(P/O) and 1(T) respectively.


Examination Pattern:

A) University Examination (UE)

The pattern for theory examination is of 60:40, where the learner can earn 60 Marks (maximum) through University Examination (UE) and 40 marks (maximum) are assigned for Internal Assessment (IA). For the UE of Practical/Oral assessment, the total marks allotted are 50. The laboratory assessment is divided into three assessment heads viz. Term work (TW), Practical (P) and Oral (O). The students will be assessed through TW or P or O or combination of any of these for the courses that have practical assessment. 25 Marks are assigned to TW/P/O each, so when a learner is assessed for practical through TW and P heads, he/she will be assessed for 50 marks.

B) Internal Assessment (IA)

The Internal Assessment (IA) for the respective courses will be performed through Unit Tests (UT) and Assignments. Total two UTs of 20 marks each will be



conducted and the average marks of these two UTs will be considered. Similarly, course coordinators will design the class assignments in terms of exercises, case studies, real world problems or mini projects, which the learners have to submit from time-to-time, as mentioned by the deadline of each assignment. While designing the assignment, the course coordinators will provide the assessment criteria to the learners and maximum score (marks) for the assignment as well. If there are multiple assignments, then the average of score (from score attained in all assignments) will be calculated and considered as IA marks. This way, the learner will be assessed for 20 marks (maximum) for assignments.

Hence, total marks for UT and assignments are 20 each and so, IA will be of 40 marks. The score for IA is calculated as:

IA Score attained by learner (Max 40) = Average Score attained in UTs (Max 20) + Score attained in Assignments (Max 20)

5.2. Credit Concept: Equivalence

In CBCS 2021 Course structure, the allotment of credits are as follows:

Theory class of 1 hour: 1 Credit

Practical class of 2 hours: 1 Credit

Tutorial class of 1 hour: 1 Credit

Project, Research Paper & Social Activity: 1 Credit

5.3. Vocational course

Vocational learning opportunities play a important role in skill development and employability of student. Vocational courses are ways of implementation of theoretical knowledge in the practice. The importance of vocational development can largely be summed up as the difference between theoretical knowledge vs. practical skills. The vocational courses are based on the teaching of practical skills. These courses are designed to introduce the manual skills in the professional education in addition to the theory. These courses will serve as bridge courses for professional growth and career improvement.

Aims & objectives of vocational courses:

- To provide students with technical knowledge and skills necessary for progressive education in engineering profession.
- To give a better understanding of the emerging of technology.
- To train the student with necessary skills leading to skilled personnel who will be enterprising and self-reliant.
- To enhance the skill of students for becoming self-sustained engineer.
- To reduce the mismatch between the demand and supply of skill man-power.

In this curriculum at B.Tech Programme, there are four vocational courses introduced i.e. in Semester III, IV, V and VI. The courses offered at these semesters are as per the requirement of the programme.

Methodology:

The vocational courses shall be conducted in association with the companies through MoUs. The candidate shall be provided training in the industries in respective area. The training can also be given by the company experts in the college with appropriate infrastructure. Departments can design vocational programme/course as per employability skills for an engineer of respective discipline required. The student shall have to attend the training sessions for at least 4 hours per week. The training sessions shall be organized on weekends or on the extended hours of the college timing.

A faculty-in-charge will be appointed to monitor the functioning of the vocational

course as well as monitor the performance of the student for the said course.

The student has to maintain proper record of the training attended throughout the semester and submit the report on the work carried out. The record has to be checked and signed by the faculty –in-charge.

Assessment:

The assessment of the performance of the candidate for the vocational courses shall be in the form of term work and oral. The term work and oral carry 50 marks. The candidate performance shall be evaluated based on the training undertaken by the candidate throughout the semester. Student shall give presentation of skills he learned through vocational courses followed by viva. External examiner for the same shall necessarily from relevant industry.

A total of 2 credits shall be allotted per vocational course per semester.

Certificate:

Every candidate shall be awarded a certificate after successful completion of the vocational course as per the rules & regulations.

The certificate shall be jointly signed by concerned authorities of college and the company.

5.4. Industry Taught Courses

PREAMBLE:

The concept of Industry Offered Courses enables bridging of technological gaps between students and state-of-the-art technologies used current in the industry.

OBJECTIVES: To

- i. Impart the state-of-art technology course existing in the industry.
- ii. Expose students to application of technologies adopted by industry.
- iii. Train students for solving real-world projects in respective industries by applying technical knowledge gleaned from an industry expert
- iv. Make students draw benefit from the experience of veterans from industry. Knowledge sharing by industry experts.
- v. Align student's mind-set towards industrial environment through the instructor from industry. Provide industry instructor lead courses.

CREDIT/HRS.:

Percentage of Industry Taught Courses in the programme = %

METHODOLOGY:

- A) A faculty shall be appointed as course co-ordinator. Roles and responsibilities of Course coordinator are as follows:
- (i) Act as a liaison between identified Industry expert and department.
 - (ii) Arrange schedule of lectures in consultation with identified Industry expert.
 - (iii) Keep record of students' attendance.
 - (iv) Collect feedback from students and suggest changes and modifications in lecture delivery method by industry subject expert.
 - (v) Keep record of Unit Test Performance and Practicals along with experts.
 - (vi) Organise visit to the industry relevant to the course.


B) Execution:

(i) The Identified industry expert can conduct theory classes on weekends or as per convenience of Industry experts either through offline or online mode. The courses which are to be taught by expert from industry are already identified and confirmed in workshop-I

(ii) Practical sessions will be conducted by course coordinator. Panel of experts from Industry shall be identified to teach the course before the commencement of the respective semester and submitted for the approval of the Head of the Institution with financial layout.

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COLLEGE OF ENGINEERING, PUNE – 411043.

Approval format for Expenditure for Industry Taught Course

Date:

Name of the Department: _____

- Budgetary allocation for industry expert (As per Budget 2021-22) Please mention total amount (in Rupees) and other bifurcations, if made-----
---- (to be filled at college level)
- No. of Lectures (Industry offered Course wise / Subject wise) required with specific subjects:

Sr.No.	Title of the course	Name of Department	Semester	Work Load per week	Details of Industry Expert(s)				Total Remuneration
					Name & Designation of Expert	Name of the company	Contact Details	Honorarium per lecture	
1									
2									
3									

Recommendation for Course Coordinator

Recommendation for HoD

Recommendation for Principal

- Total financial Outlay for honorarium of Faculty: (Industry taught courses-Subject wise): with number of lectures (in Hours) in UG sections

Sr. No.	Name of industry Expert	Honorarium	Financial Outlay (in rupees)
1			
Total			

Signature of HoD

Signature of Principal

Request format-To Industry Expert

To

.....

Subject: Industry Taught Course (ITC) for B.Tech (.....) , Sem-____

Dear Sir,

Greetings from Dept. of _____, Bharati Vidyapeeth (Deemed to be University)
College of Engineering, Pune

Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, BV(DU)COEP an AICTE approved institution, was established in the year 1983 and is a constituent unit of Bharati Vidyapeeth (Deemed to be University), accredited (3rd Cycle) with 'A+' grade by NAAC and NBA.

In the national arena, BV(DU)COE Pune has been among top 100 Engineering Colleges of India, consecutively for five years (99th ranking in 2020) by MHRD in June 2020. It has also been ranked 20th at national level by AICTE Internshala for internships. Our reputation as India's premier engineering institution is further enhanced by being honored with the Platinum category by AICTE-CII survey. College is proud to be ranked 11th across India by the prestigious magazine India Today. DATAQUEST a leading journal, ranked BV(DU)COEP in 3rd position amongst the Top 50 Private T - Institutes of India. The college ranked 17th position in the survey conducted by Times of India in 2019.

----Brief about dept-----

The course curriculum has a multi-dimensional approach, it not only implements a dynamic, qualitative, and evolved structure and syllabus, but also incorporates a good and healthy mix of theoretical and practical exposure. In this regards the institute promotes and encourages courses in line with industry expectations and forthcoming challenges which should ease the students for undergoing industry offered courses for practical exposure of applications of Education system. This is much required to bridge the gap between Industry and Academia and by promoting industry orientation for creating a complete industry ready professional.

To fulfil these objectives, curriculum design, which will be implemented from the academic year 2021-22, B.Tech. program includes 6 courses taught by industry experts. With reference to the subject mentioned above, we request you to teach... .. Total..... number of lectures (60 min each) are required to be delivered. A blended learning, to be offered for the students through combining online or offline teaching wherever and whichever is best possible. Therefore, I request you to send acceptance letter, mode of teaching, convenient day and time slot to teach the said course. Enclosed please find herewith standard format for reply.

With Thanks and Regards,

Sign and stamp of Head, Dept of _____

Enclose:- Course content

Reply

To
The Principal
BV(DU)
COE,
Pune.

Subject: - Acceptance for delivering/ conducting lecture of the course-----of
B.Tech(-----), Sem(----).

Ref.: - Your letter----- dated-

Dear Sir,

This has a reference of your letter mentioned above. It gives me immense pleasure to accept your invitation to deliver lectures in the said course. Following will be the time-table for the lecture.

Sr. No.	Title of Course	Time	Days						
			Mon	Tue	Wed	Thu	Fri	Sat	Sun

Sincerely

<Signature >

< Name of Expert>

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COLLEGE OF ENGINEERING, PUNE – 411043.**

Date:

AGREEMENT TIME-TABLE

Name of department:

Name of industry taught course:

Sr. No.	Day	Date	Time Slot

(Name & sign. of HOD with date & stamp)

(Name & Sign. of Concerned Person)

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COLLEGE OF ENGINEERING, PUNE – 411043.**

Industry Taught Courses (Assessment- Theory/ Practical)

- One course coordinator should be appointed for the course. All documents related to assessment of the course will be maintained by the course coordinator.
- Total assessment of Industry Taught Course -Theory is of 100 Marks.
- Assessment of this course consists of Internal Assessment and End Semester Exam which carry 40 Marks and 60 Marks, respectively.
- Internal Assessment consists of assignments and mini projects.
- One real world project (mini project) is considered as part of Internal Assessment.
- Students should give presentation on given topic.
- Industry expert should set question papers.
- In case of practical exam, industry expert can take oral exam (may be online) and students will perform the experiments in the presence of course coordinator in the department.

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B.Tech (Branch Name) Sem __

Title of ITC: - _____

Record of Lecture Taken

Sr. No.	Lecture No.	Unit no.	Date of Conduction	Topic Covered	No. of Students Attended	Sign

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COLLEGE OF ENGINEERING, PUNE – 411043.

Bill format for remuneration for Industry Taught Courses

(The bill should be submitted directly to the concerned department on or before 5th of every month)

1. Name of industry expert: _____

Company/Industry name: _____

2. Name of the Department: _____

3. Remuneration for the Month: _____

4.

Name of the Bank	Branch	A/C No.	IFSC

5. Contact Details: -

Email	Cell Phone No.

6. Details of lectures delivered:

Sr. No.	Title of the Course	Class	Date	No. of lectures	Total Remuneration (Rs./lecture)
Total					

Date: _____

Signature of the Industry expert

Certified that _____ has been appointed by the ----- dept as an industry expert for the course vide order No. _____ dated. _____ has delivered ___ lectures/taken classes during the month/ Sem _____ and is entitled to honorarium of Rs. _____ (@Rs.----- /- per lecture/per day)

Course Coordinator: _____

Signature of the Head of the Department with Seal

Date:

Receipt: -

Received with thanks ₹----- from BVDUCOE, Pune towards conduct of ----- lectures of the course ----- of B.Tech(-----), Sem--- --.

Signature of Industry Expert

**BHARATI VIDYAPEETH
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COLLEGE OF ENGINEERING, PUNE – 411043.**

**Payment Record
(Copy to be maintained in the Department)**

Sr. No	Name of Department	Name of course	Name of Industry Expert	Name of company	Email	Mo. No	Address	Amount	Remark/ check number transaction id

Encl:

- 1) College voucher copy**
- 2) NEFT/RTGS copy**

5.5 MOOCs Implementation

To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Courses to all the students. It will provide an affordable and flexible way to learn new skills, advance the career and deliver quality educational experiences at scale.

Also, National Education Policy is insisting the Online and Digital Education and Ensuring Equitable Use of Technology.

A massive open online course (MOOC) is an online course aimed at large-scale interactive participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for the students, professors, and teaching assistants (TAs).

BV(DU)COE Pune is having active NPTEL local chapter-partnership. Proposed curriculum has introduced three MOOCs at B.Tech Sem – III, Sem V and Sem VII with following objectives.

1. To provide e-learning through online web and video courses in Engineering by experts in the country in that subject.
2. To develop self-learning attitude in students.
3. To provide platform for knowledge enhancement of student's as per their area of interest.
4. To update students with advanced technologies.
5. To make the students more employable.
6. To prepare the students for competitive exams like GATE and also for higher studies.

Methodology of Assessment:

- Department shall publish list of NPTEL courses in every semester. Student can refer selected one of them in respective semester.
- Considering pre-requisite, proposed curriculum has provided with the various subject baskets as per the courses available.
- Students need to enroll for the course in each academic year as mentioned in the structure.

- Students need to attend all online lectures and complete all assignments as per schedule for registered course.
- Student will register and appear for exam conducted by NPTEL and shall submit the copy of course completion certificate received after passing the exam for registered course.
- Accordingly, the credits will be allotted to the student for respective MOOCs.
- Students have the flexibility to attempt the said course during the entire B.Tech Programme to earn the credits of respective MOOCs.
- NPTEL courses relevant to respective branch are only expected to select by students. Credits will not be awarded if general/ non engineering courses opted.

5.6 Project I and II

Project Stage I Objectives:

Provide help to the students

- In generating a new idea or modify existing system for solving societal, industrial and/or institutional problem.
- In review of literature that aligns with new idea and/or existing systems and clearly defining the problem
- In developing a workflow process/methodology for the desired system.
- In designing various components of the system assembly
- In developing a CAD model of the desired system.
- In writing the technical report based on the work completed

Project Stage II Objectives:

Provide help to the students

- In fabrication of the experimental setup/new system and/or purchase of standard components
- In pilot run and/or validation of new system for its performance
- In modifying the system if required to improve its performance.
- In detailed parametric studies of the modified system and analyzing the results
- In writing the technical report, research article and/or filing a patent.

Particular	Hours per week	Credits allotted
Project I stage I	2	4
Project I stage II	2	4
Project II stage I	4	4
Project II stage II	4	6

Assessment & Evaluation:

For Project-I Stage I & II		
Assessment Tools	Assessed through	Marks
	Presentation 1	10
	Presentation 2	10
	Presentation 3	10
	Continuous Assessment by guide	10
	Final Project demonstration, presentation & viva voce (University Examination)	60
Total Marks		100

For Project-II Stage I & II		
Assessment Tools	Assessed through	Marks
	Presentation 1	20
	Presentation 2	20
	Presentation 3	20
	Continuous Assessment by guide	20
	Final Project demonstration, presentation & viva voce (University Examination)	120
Total marks		200

Minimum number of in-sem. project presentations: 03

Parameters for evaluation of project in University examination

1. Idea of Project/Topic
2. Technical content
3. Innovation
4. Experimentation/Model development/Software development/Simulation development etc.
5. Participation as an Individual
6. Research Potential
7. Project Hardware/Software
8. Fabrication/Model/Equipment development
9. Data Analysis
10. Attendance
11. Timely completion
12. Report writing
13. Presentation

Prepare a format for report card of indicating progress, assessment and progressive evaluation of the project. This progressive evaluation record (PER) is prerequisite for university examination.

Progressive Evaluation Record (PER) shall be submitted in the department at the end of the semester and made available at time of university examination.

5.7 Social Activities for the Learners

A) Introduction

The prime objective of Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune is holistic development of students. The learner achieves the status as “whole” when he/she has not only achieved success in academics but also has succeeded in bringing the nation up by connecting with socially left-out elements and bringing ray of hopes into their lives. In this respect, the new curriculum encourages the learner on the social activities. In this case, student’s social activities are provided by the colleges, but not limited to them. Total of four credits assigned for these activities.

B) Objectives

- a) To make people create balances, so they do not only focus on academic aspects, but there can also be other aspects to have in life.
- b) To build better relationship with others.
- c) To create great balance with the academic aspects.
- d) To learn and understand society.
- e) To develop the nature of help and enhance the ethical norms for behaviors.
- f) Teamwork

C) Outcome of Social Activities:

The social activities make a good impact on learners. The learner:

- a) Will be able to understand the needs of society.
It enables a learner to consider the perspective of other people and understand their needs by interacting with people from diverse backgrounds.
- b) Will be able to understand different perspectives and engage other cultures.
Social events develop social skills and empathy—the outward-oriented dimensions of emotional intelligence (EQ). The interactions or conversations elicited by events helps students build relationships, understand different perspectives and engage other cultures. Social events provide an opportunity to expand one’s social circle.

c) Will be able to maintain positive outlook towards life.

With high adaptability to diverse situations and a good level of understanding of other's opinions, socially aware learners are less likely to indulge in negative behavior. They are also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behavior. These students also have a more positive outlook on life.

d) Will be able to maintain good emotional health.

Social activities keep the learners sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer. Connecting with others helps keep you in a positive mood, which in turn wards off depression by improving physical health and maintaining good emotional health as well.

D) Sample list of Social Activities (not limited to them)

a) Organizing Educational Camps

Educational camps may be organized for the socially and economically weak elements, especially in rural areas or even in the slum areas of the city, by making them aware of the importance of education and their own human rights.

b) Tree Plantation Drive

There are so many health benefits to having plants around – like fresher air, improved emotional state, and reduction of illness in and around the society. Tree plantation in this respect plays a crucial role. Just planting the tree is not enough but it should be made to grow to its extent.

c) Offer Helping Hand for Martyrs Family by Fundraisers

Soldiers fight for our country, securing our borders. They don't think of their family and sacrifice their lives for us, and what we do for them? Packages are announced every time after the death of our worriers but rarely reaches them. Families keep waiting for years. In this regard, few of these forgotten families can be visited and a small helping hand can be lend to them, to make them lead their further life peacefully. Fundraising in this respect, is a great student society social idea. It is incredible to see how people can bring positive change if they work together. The youth can make a team with an

external organization to take part in a purposeful community event as mentioned above.

d) National Service Scheme

It will help in the overall personality development of a learner by participating in projects that benefit the community. This extra-curricular activity is sponsored by the Ministry of Youth Affairs and Sports.

e) Felicitations of People who have contributed to the society but now forgotten by the society

There are so many intellectuals in our society who have achieved great heights in their field, who are stalwarts in different field but never came into limelight, their contribution is not recognized. Few of these can be invited publicly or visited at individual level by making a team and felicitate to appreciate their contribution towards the society or nation. Some of these stalwarts may be like Anand Kumar who teaches underprivileged students for IIT-JEE without a penny, Shekhar Naik who is the Captain of Indian Blind Cricket Team, Ranjeet Singh Desale who even being a rural teacher, is awarded by UNESCO with Global Teacher Prize, Ritu Biyani who fought cancer, traveled across the country to spread awareness.

f) Street Play on Social Awareness

This is also typically known as “Nukkad Natak”. This form has been used to propagate social and political messages and to create awareness amongst the people regarding social issues. What is important is that the plays make the people think. The play is seen by many people of different age groups who then question and discuss the contents of the play. There have been several plays exposing the mechanism of black marketing and hoarding. Some talk of the use of political power for pressurizing people. Others highlight caste conflicts or ideas about hygiene and health. Street plays are also used to encourage literacy amongst villagers. Street plays on some of the topics like degradation of Indian media, hypocrisy, responsibility towards environmental concerns, brain drain, dilapidated educational structure, safety issues and rights for women. child labor, organ/human trafficking etc., can be thought of. The learners can participate in street play festivals like Manthan Mahotsav, the largest street play festival in India.

g) Poster Exhibition on Contributions of Heroes of India

The learners can organize an exhibition to not only display but explain the contribution of Indian Heroes who have been forgotten and remained in the book of history. Some of these inspiring heroes may be Mihir Sen, Khashaba Dadasaheb Jadhav, Anandibai Joshi – First woman doctor from India, Bhikaji Cama, Khudiram Bose, Baba and Prakash Amte etc. Such exhibitions make inspired, the youth of today's generation.

h) Waste Clean Drive

i) Educating literacy-poor societies about disposal of nature-harming objects

j) Distributing needful items for living in economically backward societies

k) Organizing early completion on national issues.

l) Cleaning of Public Places/ Traffic Management/ Police Mitra.

m) Organizing activities under engagement of people with Science and Technology.

Report of social activities conducted each student shall be prepared in standard format. Appropriate documentary evidences shall be part of report of students correspondence with respective authorities for social activities, permissions, certificates from Institutes/Organization/Local Government are essential documents for award of credits under this head.

E) Summary

Thus the interactions or conversations elicited by such social events help students to build relationships, understand different perspectives and engage other cultures and these events not only will uplift the moral of the society but also ignite minds of generations ahead to provide their support and enthusiastically participate in such activities. Such interactions will certainly provide an opportunity to expand their own social circle.

5.8 Internship

Internship of 60 days is incorporated as an integrated part of curriculum structure-2021. The primary objective of internship is to make students familiar with industry environment and to take up on- site assignment as trainees or interns in order to bridge the gap between theory and industrial practices. It is mandatory for students to undergo in-plant training after completion of semester VI in reputed industrial organization. The student shall submit the “Intern Certificate” issued by the industry organization as well as a technical report not exceeding 30 pages within the stipulated time to be eligible for making a presentation before the committee constituted by the department. On the basis of daily work carried out in the industry, student shall prepare a record book. This record book shall be checked and signed by his/her supervisor from the industry where he/she is doing internship on daily basis.

University examination carries 50 marks and after successful completion, student may be awarded 3 credits for the internship work. Standard format for record book shall be as below. Marks will be awarded out of maximum 50 and three credits will be given upon completion of internship towards the degree requirements, as per the regulations. Internship will ultimately assist students to apply theory learned in classroom to industrial practices so as to understand engineering/technical solutions in a global, economic, environmental and societal context.

5.9 Research paper publication

Research paper publication is one of the innovative features of programme curriculum- 2021.

1. It has been & introduced in 7th semester. Two credits are awarded for the same subject to publish of research paper. Student shall publish a research paper in peer reviewed/ Standard journal(not in paid journals) based on research work carried out for Project-I. Guide for Project-I shall be responsible for Writing manuscript, Selection of journal for publication, Submission of manuscript to the journal. Progress report of publication of research paper shall be prepared in standard format and submitted for the award of credits. Students shall be first author of research papers. No name either of faculty members except guide or other students shall be added without any contribution in research/project work. Format for progress report of research paper published (To be maintained by Guide). A departmental committee comprising of head of department, project guide, and one senior professor will review the progress of this activity periodically (not exceeding three months). The suggestions/comments offered by committee will be incorporated in due course of time to accomplish the task within a predetermined period.

2. Research paper publication as a integrated part of the course structure, will inculcate research aptitude among students. This will help there in seeking admissions in reputed International Universities for higher studies. Further, this research aptitude developed may enhance his employability also.

3. This activity is expected to generate 15 to 20 publication per year, which will enhance research profile of department and institute too.

4. Hence, there should be team of maximum 3 to 4 students per project except very exceptional projects. Prior permission to increase team size is essential.

Weekly progress report of the research paper publication.

Title of the project -

Name of the Guide -

Weekly schedule of meeting- Day----- Time-----

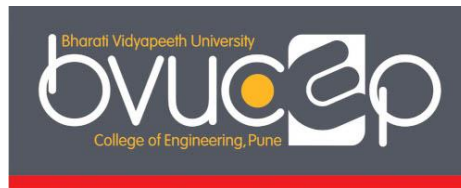
Student Details - Name----- PRN----- Roll No.---

Sr. No.	Week No.	Date	Work completed/done by students per week



Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



B.Tech. (Computer Science and Engineering)
Program Curriculum
(2021 Course)

VISION OF UNIVERSITY:

Social Transformation through Dynamic Education

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambience created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal and other deprived sections of the population.

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- 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, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be focused on innovative and quality education in computer science and engineering that prepares professionals for development of society.

MISSION OF THE DEPARTMENT

- To provide academic environment for the development of skilled professionals
- To cultivate research culture that contributes to the sustainable development of the society.
- To enhance academic and industry collaborations for global exposure.

PROGRAM EDUCATIONAL OBJECTIVES

The students of B.TECH. (Computer Science and Engineering), after graduating will able to,

1. Demonstrate technical and professional competencies by applying Engineering Fundamentals, knowledge of computing and technologies.
2. Exhibit effective personality, good communication and team building skills
3. Adopt to the latest trends in the field of computer science and engineering.

PROGRAM SPECIFIC OUTCOMES

1. To design, develop and implement computer programs on hardware towards solving problems.
2. To employ expertise and ethical practice through continuing intellectual growth and adapting to the working environment.

PROGRAM OUTCOMES

- a. Apply the knowledge of mathematics, science, engineering, and computing to provide a solution of complex engineering problems.
- b. Identify, analyse complex engineering problems to derive conclusions using computer science and engineering knowledge.
- c. Outline resolutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration, societal, and environmental considerations.
- d. Use existing research knowledge and research techniques including design of experiments, data analysis, and synthesis to provide valid inferences.
- e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
- f. Apply inferences obtained by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the subsequent responsibilities relevant to the professional engineering practice.
- g. Recognize the impact of the professional engineering solutions in societal and environmental contexts to demonstrate the knowledge for sustainable development.
- h. Apply ethical principles and execute professional ethics and responsibilities and norms of the engineering practice.
- i. Work effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary surroundings.
- j. Talk effectively on complex engineering activities with the engineering community such as being able to comprehend and write effective reports and design documentation, make effective presentations.
- k. Prove knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team.
- l. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in context of technological change.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	<input type="checkbox"/>											
Problem Analysis		<input type="checkbox"/>										
Design/Development of solutions			<input type="checkbox"/>									
Conduct Investigations of Complex Problems				<input type="checkbox"/>								
Modern Tool Usage					<input type="checkbox"/>							
The Engineer and Society						<input type="checkbox"/>						
Environment and Sustainability							<input type="checkbox"/>					
Ethics								<input type="checkbox"/>				
Individual and teamwork									<input type="checkbox"/>			
Communication										<input type="checkbox"/>		
Project management and finance											<input type="checkbox"/>	
Life-long learning												<input type="checkbox"/>

DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
2 Hour Practical (P) per week	1 credit
4 Hours Practical (P) per week	2 credit

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	22
2	Engineering Science Course (ESC)	15
3	Core Course (CC)	140
4	Elective Course (EC)	08
5	Project (PROJ)	08
6	Internship (INT)	03
7	Vocational Course (VC)	04
8	MOOCs (MOOC)	04 (Add-on course)
9	Research Paper Publication (Research)	02 (Add-on course)
10	Social Activity (SA)	04 (Add-on course)
11	Mandatory Course (MC)	Non-Credit
12	Internal Assessment (IA)	-
13	End Semester Examination (ESE)	-
TOTAL		200

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1.	Basic Science Course	5
2.	Engineering Science Course	4
3.	Core Courses	34
4.	Elective Course	2
5.	Project	2
6.	Internship	1
7.	Vocational Course	4
8.	MOOCs	3
9.	Research Paper Publication	1
10.	Mandatory Course	1
11.	Social Activities	2
TOTAL		59

Program: **B.TECH. (Computer Science and Engineering)**

Semester – I

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Internet Programming	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Organic and Electrochemistry	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Digital Electronics	4	2	-	60	40	50	-	-	150	4	1	-	5
5		Programming and Problem Solving	4	2	-	60	40	50	-	50	200	4	1	-	5
6		Computer Aided Drafting	-	2	-	-	-	25	-	-	25	-	1	-	1
		Total	19	10	1	300	200	175	25	50	750	19	5	1	25

Program: B.TECH. (Computer Science and Engineering)

Semester – II

CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ES E	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Probability and Statistics	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Physics for Computing Systems	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Linear Data Structures	4	4	-	60	40	50	-	50	200	4	2	-	6
6		Computer Systems Workshop Technology	-	2	-	-	-	25	-	25	50	-	1	-	1
		Total	18	12	1	300	200	150	-	100	750	18	6	1	25

Program: B.TECH. (Computer Science and Engineering) Semester – III CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Non-Linear Data Structures	3	2	1	60	40	25	-	25	150	3	1	1	5
2		Discrete Mathematical Structures	3	2	-	60	40	25	25	-	150	3	1	-	4
3		Machine Organization and Microprocessor	4	-	1	60	40	-	-	-	100	4	-	1	5
4		Software Engineering	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Object Oriented Methodology*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		Vocational Course-I	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	18	10	2	300	200	125	50	75	750	18	5	2	25
		Social Activity – I	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course – I**

List of Vocational Courses will be published by the department before the commencement of respective semester.

Program: **B.TECH. (Computer Science and Engineering)** Semester – IV **CBCS 2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Theory of Computation	3	-	1	60	40	-	-	-	100	3	-	1	4
2		System Programming and Operating System	4	2	-	60	40	25	25		150	4	1	-	5
3		Computer Graphics and Multimedia	3	-	-	60	40	-	-		100	3	-	-	3
4		Design of Algorithms	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Database Systems*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		CSE Skill Lab-I	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-II	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	18	12	1	300	200	125	50	75	750	18	6	1	25
		MOOC - I [#]	-	-	-	-	-	-	-	-	-	-	-	-	2

* Industry Taught Course – II

Add-on Course - List of MOOC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: **B.TECH. (Computer Science and Engineering)** Semester – V **CBCS 2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Software Testing and Quality Assurance	3	2	-	60	40	25	25	-	150	3	1	-	4
2		Big Data Analytics	4	-	-	60	40	-	-	-	100	4	-	-	4
3		Human Machine Interaction	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Computer Networks	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Artificial Intelligence*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		CSE Skill Lab –II	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-III	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	19	12	-	300	200	125	50	75	750	19	6	-	25
		Social Activity-II	-	-	-	-	-	-	-	-	-	-	-	-	2
		Environmental Studies**	2	-	-	50	-	-	-	-	-	-	-	-	-

* Industry Taught Course – III

** Mandatory Audit Course - 50 Marks Theory Examination

List of Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – VI CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Business Intelligence System*	3	2	-	60	40	25	-	25	150	3	1	-	4
2		Cryptography and Network Security	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Natural Language Processing	4	2	-	60	40	25	25	-	150	4	1	-	5
4		Quantitative Techniques, Communication and Values	4		-	60	40	-	-	-	100	4	-	-	4
5		Design Thinking	4	-		60	40	-	-	-	100	4		-	4
6		CSE Skill Lab –III	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-IV	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	19	12	-	300	200	125	50	75	750	19	06	-	25
		MOOC - II #	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course- IV**

Add-on Course - List of MOOC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – VII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Machine Learning	3	2	-	60	40	25	-	25	150	3	1	-	4
2		Internet of Things *	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Optimization Techniques	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Elective I	3	2	-	60	40	25	25	-	150	3	1	-	4
5		CSE Skill Lab-IV	-	4	-	-	-	25	-	25	50	-	2	-	2
6		Project Stage-I	-	2	-	-	-	50	50	-	100	-	2	-	3
7		Internship	-	-	-	-	-	25	25	-	50	-	3	-	3
		Total	14	12	-	240	160	175	125	50	750	14	10	-	25

***Industry Taught Course- V**

Elective I	Deep learning	Game Theory	Semantic Web	Text Mining
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Program: B.TECH. (Computer Science and Engineering) Semester – VIII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Data Visualization & Reporting	3	-	1	60	40	25	-	-	125	3	-	1	4
2		Augmented and Virtual Reality	4	2	-	60	40	-	25	-	125	4	1	-	5
3		Block Chain and Digital Currency*	3	2	-	60	40	-	-	25	125	3	1	-	4
4		Elective –II	3	2	-	60	40	-	25	-	125	3	1	-	4
5		CSE Skill Lab–V	-	4	-	-	-	25	-	25	50	-	2	-	2
6		Project Stage-II	-	4	-	-	-	100	100	-	200	-	6	-	6
		Total	13	14	1	240	160	150	150	50	750	13	11	1	25
		Research Paper Publication [#]	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course- VI**

Add-on Course

Elective -II	Pattern Recognition	Industrial IOT	Knowledge Management System	Information Retrieval
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B.TECH (Computer Science and Engineering)

SEMESTER – I

COURSE SYLLABUS

Mathematics for Computing-I

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week				Credits	
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective:

- Linear equations and its basis and dimension.
- Linear mapping and its matrix representation.
- Orthogonalization and diagonalisation of matrices

Prerequisite:

The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I

06 Hours

System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II

06Hours

Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III

06 Hours

Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping.

Unit IV

06 Hours

Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices.

Unit V

06 Hours

Inner Product space and orthogonalization: Inner product space, Cauchy-schwarz equality, orthogonality, orthogonal sets and bases, projections, Gramschidorthogonalization, orthogonal and positive definite matrices, matrix representation of inner product.

Unit VI

06Hours

Diagonalisation: Eigen values and eigenvectors: Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigenvectors, properties.

Textbooks

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune VidyarthiGrihaPrakashan, Pune, 2013
2. .B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

4. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

Reference Books

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
2. Michael Greenberg, Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

Students are expected to prepare a report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram Schmidt Orthogonalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Internet Programming

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objectives:

To introduce students about all web programming languages with detailed study about HTML, CSS, DHTML, XML and DNS.

Prerequisite:

Basic knowledge about computers, web applications and internet.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the fundamentals of programming languages.
2. Implement the Hyper Text Markup Language.
3. Use of Cascading Style Sheets in web page development.
4. Elucidate with implementation of Dynamic Hyper Text Markup Language.
5. Apply the knowledge to implement the Extensible Markup Language.
6. Implement the Hyper Text Transfer Protocol and DNS.

Unit I

08 Hours

Introduction to internet programming: Computer Network, working of internet, Web applications, Introduction to web programming languages: HTML, DHTML, JSP, PHP, Role of the Server on the internet, Introduction to JSP, Introduction about Node JS and angular JS

Unit II

08 Hours

Hyper Text Markup Language: Introduction to HTML, Tags, Div Span, Lists, Images, Hyperlink, Table, Iframe, Form, Headers, all content with HTML5

Unit III

08 Hours

Cascading Style Sheets: Introduction to CSS, Syntax, Selectors, background, Text Fonts, Lists Tables, Box Models, Display Positioning, Floats.

Unit IV

08 Hours

Dynamic Hyper Text Markup Language: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models

Unit V

08 Hours

Extensible Markup Language: Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes, XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting, XML with Style Sheet Technologies- Concept of XSL, XML Schema, Importance of XML schema, Creating Element in XML Schema, XML Schema Types.

Unit VI

08 Hours

Hyper Text Transfer Protocol and DNS: DNS, WWW, HTTP, HTTPs, XML HTTP Request- Introduction, XMLHttpRequest, The XMLHttpRequest Object, Events for the XMLHttpRequest Object, Request Object for XMLHttpRequest, Response Object for XMLHttpRequest, Complete working of web browser

Textbooks/ Reference Books:

1. HTML & CSS: The Complete Reference, Fifth Edition Paperback by Thomas Powell, McGraw

Hill Education.

2.HTML & XHTML: The Complete Reference, by Thomas Powell, McGraw Hill Education, McGraw-Hill Education.

3.XML: The Complete Reference, by Heather Williamson, McGraw Hill Education.

4.HTTP Pocket Reference (Pocket Reference (O'Reilly)), Clinton Wong, O'Reilly Publication.

5.HTML & XHTML: The Definitive Guide, 5th Edition, by Bill Kennedy and Chuck Musciano, O'Reilly Publications.

List of Assignments:

(Course coordinator can design his/her own theory assignment. Following are samples of theory assignments.)

1. Explain the role of web programming languages in internet.
2. Explain any five HTML tags with example.
3. Consider any web-based example to explain the role of CSS in web programming.
4. Explain the role of DHTML in web programming and web applications.

List of Laboratory Exercises:

1. Introduction to web format files and file extensions.
2. Implementation of simple HTML page.
3. Implementation of Images and Tables.
4. Implementation of frames.
5. Implementation of form.
6. Implementation of CSS.
7. Implementation of DHTML.
8. Implementation of XML.
9. Develop the web page with any scenario where HTML, CSS, XML will be used.
10. Develop any web project for any website or any portal.
11. Case Study on web programming languages.
12. Case Study on any web project

Project Based Learning

1. Website Development Hotel management
2. Website Development Personal Website
3. Website Development Organization website
4. Website Development Dummy Ecommerce website
5. Website Development Login page with user credentials
6. Development of aEmployee Interests Survey form / Student survey form
7. Technical documentation page
8. Create image slider
9. Railway concession form
10. Website development for personal portfolio

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Organic and Electrochemistry

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objectives:

The student should acquire the knowledge of

- To develop the interest among the students regarding chemistry and their applications in engineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite:

Basic Chemistry

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants

Unit I

06 Hours

Chemical Bonding in Molecules: MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra, and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit II

06 Hours

Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye- Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO₂), and products from natural materials.

Unit III

06 Hours

Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV

06 Hours

Polymers for The Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenylene), Polyheterocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V

06 Hours

Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process

Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI

06 Hours

Fuels & Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid, and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

Textbooks:

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGraw Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, DhanpatRai & Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, DhanpatRai Publishing Company, 2013.

Reference Books:

1. Inorganic Chemistry (4th edition), D. F. Shriver and P. W. Atkins, Oxford University, Oxford, 2006.
2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.
3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample
9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method

11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin
13. To study set up of Daniel cell.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Digital Electronics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To understand the various semiconductor memories and related technology

Prerequisite:

Mathematics and Elementary Physics

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyse and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I

08 Hours

Digital systems: Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.

Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.

Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.

Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II

08 Hours

Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III

08 Hours

Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker(IC 74180), ALU

Unit IV

08 Hours

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.

Registers: Buffer register, Shift register.

Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V

08 Hours

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI

08 Hours

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, Designing combinational circuits using PLDs.

Textbooks:

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F. Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2

Reference Books:

1. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
2. Digital Integrated Electronics- H. Taub&D.Shilling, McGraw Hill.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070, 4071, 4010
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA. (Function and Equation will be given by Subject Teacher)

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/ subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation)
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.

9. Design (State diagram, state table & K map) and implement 3 bit Up and Down Asynchronous and Synchronous Counter using JK flip-flop
10. Design and implement modulo 'n' counter with IC 7490.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

Programming and Problem Solving

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	50 Marks	Practical	01
		Practical	50 Marks		
		Total	200 Marks	Total	05

Course Objective:

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Prerequisite:

Basic knowledge of mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Describe the steps in problem-solving and write a pseudocode for a given problem.
2. Identify the suitable control structure and write a C code for the same.
3. Write the C code for a given algorithm.
4. Illustrate use of pointers and functions
5. Write programs that perform operations using derived data types.
6. Validate the logic building and code formulation by designing code capable of passing various test cases

Unit I

08 Hours

Introduction to Computer Problem Solving: The problem solving Aspect, Top Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms, Fundamental Algorithms:

General problem solving strategies: Introduction to program Planning tools- algorithm, flowcharts, and pseudo codes. Introduction to Programming Logic.

Unit II

08 Hours

Control structures: Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operators assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions if-else, nested if-else, ladder if-else and switch statement. C Conditional control structures: for, while do-while Unconditional control structures: break, continue, goto statement.

Unit III

08 Hours

Arrays and strings: Declaration initialization of one dimensional Array, two dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.

Unit IV

08 Hours

Functions and structures: 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 ,Overview of Structures , Defining and Using a Structure , Structures within a Structure.

Unit V

08 Hours

Pointers: Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.

Unit VI

08 Hours

Files : FILE , Opening and Closing of Files , Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments

Textbooks:

1. Let Us C by Yashavant Kanetkar, 13e, BPB Publication.
2. BrainW. Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI.
3. E. Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill.
4. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.

Reference Books:

1. C: The Complete Reference by Herbert Schildt.

List of Assignments:

1. Write a pseudocode and draw a flowchart for a given problem.
2. Justify the selection of appropriate control structure
3. Write a function to check whether the string is palindrome.
4. List and explain the working of standard string I/O functions.
5. Define a dynamic array to store the student record.
6. List and explain the different modes of opening file.

Project Based Learning

1. Calendar using C
2. Snake Game
3. Cricket score display
4. Quiz game
5. Phone-book application
6. Election System
7. Simple Result system
8. Typing Tutor
9. Bill Calculator
10. Grade Calculator
11. CGPA Calculator
12. Digital Clock
13. Contact Management System
14. IP finder
15. Bank Management System.
16. Departmental Store Management.
17. Hangman Game Project.
18. Librar Management System

List of Laboratory Exercises:

1. Describe the problem-solving steps.
2. Write a pseudocode and draw a flowchart.
3. Use mathematical operators and basic data types.
4. Demonstrate use of control structures.
5. Demonstrate use of logical operators.
6. Solve the real time problem using single and two dimensional array.
7. Perform the operations on string.
8. Solve the problems using recursive and non-recursive functions.
9. Solve the problems using dynamic memory allocations.
10. Perform the operations on files.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Computer Aided Drafting

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	02 Hours/Week	Term Work	25 Marks	Practical	01
		Total	25 Marks	Total	01

Course Objectives:

To provide knowledge about

- Fundamentals of engineering drawing and curves
- Isometric views and projection
- Projections of points, lines, planes & solids
- Use of CAD tools.

Prerequisite:

Basics of Mathematics at Secondary School Level

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand dimensioning methods and drawing of engineering curves.
2. Draw orthographic projections using 1st angle method of projection.
3. Draw Isometric views from given orthographic projections.
4. Draw projection of Lines, its traces and projections of planes.
5. Draw projection of different solids.
6. Draw development of lateral surfaces of solids.

Unit I

04 Hours

Lines and Dimensioning in Engineering Drawing and Engineering Curves: 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 Arcs of Circles method, Concentric circles method. Involute of a circle, Cycloid.

Introduction to Auto CAD commands.

Unit II

04 Hours

Orthographic Projections: 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. (Using AutoCAD commands)

Unit III

04 Hours

Isometric Projections: 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. (Using AutoCAD commands)

Unit IV

04 Hours

Projections of Points & Lines: Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only). (Using AutoCAD commands).

Unit V**04 Hours**

Projections of Planes: Projections of Planes, Inclination of the plane with HP, VP.
(Using AutoCAD commands)

Unit VI**04 Hours**

Projections of Solids: Projection of prism, pyramid, cone and cylinder by rotation method. (Using AutoCAD commands)

Textbooks:

1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India,
2. "AutoCAD 2020 Beginning and Intermediate", MunirHamad, Mercury Learning & Information Publication, 2019.
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.

Reference Books:

1. "Textbook on Engineering Drawing", K. L. Narayana& P. Kannaiah, Scitech Publications, Chennai.
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
3. "Engineering Drawing", M. B. Shah and B.C. Rana, 1st Ed, Pearson Education, 2005.
4. "Engineering Drawing", P. J. Shah, C. Jamnadasand Co., 1stEdition, 1988.
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10thEdition, S. K. Kataria and Sons, 2005.

List of Laboratory Exercises:

1. Types of lines, Dimensioning practice, free-hand lettering, 1nd and 3rd angle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projection of Solids.

B.TECH (Computer Science and Engineering)

SEMESTER – II

COURSE SYLLABUS

Mathematics for Computing - II

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Total			100 Marks	Total	04

Course Objectives:

- Fourier series and integral transforms.
- Multiple integrals and its applications.
- Vector calculus and its applications.

Prerequisite:

The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use periodic functions as Fourier series.
2. Apply methods of finding Fourier and Z-transforms.
3. Apply methods of Laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface and volume integrals.

Unit I

06 Hours

Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis

Unit II

06 Hours

Fourier and Z-Transform: 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 III

06 Hours

Laplace Transform and its application: 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 IV

06 Hours

Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity

Unit V

06 Hours

Vector Differential Calculus: 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

06 Hours

Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

Textbooks:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune Vidyarthi Griha Prakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

List of Assignments:

Six assignments to be given by the course coordinator one from each unit.

Project Based Learning

Students are expected to prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation
15. Periodic functions

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Probability and Statistics

TEACHING SCHEME

EXAMINATION SCHEME

CREDIT SCHEME

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: 4 Hours/Week	End Semester Examination: 60 Marks	<u>Credits</u>
Practical: 2 Hours/Week	Internal Assessment: 40 Marks	Theory 4
	Term Work : 25 Marks	Practical 1
	Practical: 25 Marks	Total 5
	Total: 150 Marks	

Course Objectives:

- Probability theory and expected value.
- Probability distribution and its applications.
- Multiple regression and ANOVA.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply Bayes theorem to find probability.
2. Compute mathematical expectations.
3. Identify various theoretical distributions.
4. Use correlation coefficient to interpret numerical data.
5. Use regression to estimate the dependent variable.
6. Apply concept of graph in optimization.

Unit I

08 Hours

Probability Theory: Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities

Unit II

08 Hours

Random Variable and Mathematical Expectation. Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Joint and marginal probability distributions, Properties of expectation and variance with proofs, Examples

Unit III

08 Hours

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution

Unit IV

08 Hours

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples...

Unit V

08 Hours

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient

Unit VI

08 Hours

Multiple Regression and AVOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

Textbooks

- 1.S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
- 2.G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and company.
- 3.Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines
- Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.
- 5.Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, 3rd Edition, Wiley Publication
- 6.I.R. Miller, J.E. Freund and R. Johnson. Fun "Probability and Statistics for Engineers" (4th Edition)

List of Theory Assignments

One assignment on each unit

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and analyse the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Bayes theorem
2. Additive and multiplicative law of probability
3. Mathematical expectation
4. Joint and marginal probability distribution
5. Theoretical probability distribution
6. Coefficient of correlation
7. Regression estimates
8. Simple regression model
9. Multiple regression model
10. One way ANOVA
11. Two way ANOVA
12. Correlation
13. Multiple correlation

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Experiments (The course co-ordinator may frame 8-10 experiments)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Physics for Computing Systems

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objective:

To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite:

Basic understanding of physics and calculus.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure, and dimension etc.
3. Summarise the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types, and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics
6. Explain mechanical properties of solid matter and connect to applications in the field of engineering.

Unit I

06 Hours

Modern Physics Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II

06 Hours

Wave Optics: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings). Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation, Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III

06 Hours

Lasers :Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO₂ laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers)

Unit IV

06 Hours

Fibre Optic: Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages, and disadvantages of fibre optics.

Unit V

06 Hours

Quantum Mechanics: Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, 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, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI

06 Hours

Solid state physics: Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, 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.

Textbooks:

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, Dhanpat Rai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books:

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013)
2. Optics, Francis Jenkins and Harvey White, Tata McGraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013)
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013)
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer
6. Design and construction of remote control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as auto switch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting Materials.
12. Need of medium for propagation of sound wave
13. Tesla Coil
14. Thin film interference in soap film-formation of colours
15. LiFi- wireless data transfer system using light

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of Lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
4. Determination of wavelength of light using diffraction grating

5. Determination of resolving power of telescope
6. Determination of thickness of a thin wire by air wedge
7. Determination of refractive index for O-ray and E-ray
8. Determination of divergence of a laser beam
9. Particle size by semiconductor laser
10. Determination of wavelength of laser by diffraction grating
11. To study Hall effect and determine the Hall voltage
12. Calculation of conductivity by four probe method
13. Study of solar cell characteristics and calculation of fill factor
14. Determination of band gap of semiconductor
15. Determination of Planck's Constant by photoelectric effect

Syllabus for Unit Tests:

Unit Test -1

Unit:- Unit -I, Unit-II Unit-III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Electrical Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objective:

To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Prerequisite: NIL

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I

08 Hours

Magnetic Circuits: Magnetic effect of electric current, Cross & Dot Convention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.

Unit II

08 Hours

AC Fundamentals and circuits: AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems).

Unit III

08 Hours

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance, coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e.m.f. equation, voltage ratio, current ratio, KVA rating, determination of efficiency and regulation by direct load test, equivalent circuit, power losses, (simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

Unit IV

08 Hours

Introduction to Power System and Three Phase: Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V

08 Hours

Electrical Machines: DC & AC: Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI

08 Hours

Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

Textbooks:

1. B.L. Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand & Company Ltd. New Delhi
2. V.K. Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J. Nagarath and Kothari, Theory and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson)
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit.

Project Based Learning

1. Building a small resistive load lamp bank
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board
12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Plotting B-H characteristics for a material.
2. Load test on single phase transformer.
3. Testing and maintenance of batteries.
4. Verification of voltage and current relationships in star and delta connected 3-phase networks.
5. Load test on DC machine.
6. To find the performance of series R-L-C circuit at different condition
7. OS & SC test on single phase transformer to find efficiency and regulation
8. Speed control of DC motor
9. Study of different types of starters for DC & AC Machine
10. Load test on 3 phase Induction motor.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Linear Data Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks		
		Term Work	50 Marks	Practical	02
		Practical	50 Marks		
		Total	200 Marks	Total	06

Course Objective:

The objective of the course is to provide the students in-depth knowledge of different Linear Data structures and their use to solve the programming problems.

Prerequisite: Basic knowledge of computer

Course Outcomes: On completion of the course, students will have the ability to:

1. Use appropriate data structure to solve a particular problem
2. Demonstrate the use of linked list and compare it with array.
3. Demonstrate the use of stack as an ADT.
4. Perform the operations on queue.
5. Apply the searching and sorting algorithms
6. Demonstrate the use of Files and different File Organizations

Unit I

08 Hours

Introduction to Data structures: Introduction to algorithm, Algorithm analysis, Big O Notations, Need of Data structure, Classification of Data Structures, Operations on Data Structures. **Arrays:** Introduction, Array Operations, representation of Arrays in Memory, One- & Two-dimensional array in function, Implementation of One- & Two-Dimensional Arrays in Memory, Abstract Data Types.

Unit II

08 Hours

Linear Lists: Introduction, Singly linked list, Circularly Linked List, Doubly Linked lists, Basic operations, - Insertion, Deletion, retrieval, traversal, create List, insert node, delete node, List Search, Empty list, Destroy list, Applications of Linked List

Unit III

08 Hours

Stacks: Stack Structure, Operations on Stacks – create stack, Push stack, Pop stack, Array and Linked Representation, operations (For both array and Linked representation), Types of Notations, Applications of Stack: Reversing Data, Converts Decimal to Binary, Parsing, Postponement.

Unit IV

08 Hours

Queue: Introduction, Definition, Storage Methods Queue Operations- Enqueue, Dequeue, Queue front, Queue rear, Queue Example, Create Queue, priority Queue, Circular Queue, Application of Queue: Categorising Data, Queue. Simulation, Array and Linked representation of queue (operations on array and Linked representation).

Unit V

08 Hours

Implementation & Application: Searching: Linear Search, Binary Search, Hashing: Introduction. Hash Tables, Hash Functions, Collision, Applications
Sorting – Selection Sort, Bubble Sort, Insertion Sort, Merge Quick Sort, Shell Sort

Unit VI

08 Hours

Files and Organization: Introduction, Data Hierarch, FileAttributes, Text and Binary Files, Basic File Operations, File Organization, Sequential Organization, Relative File Organization, Indexed Sequential File `Organization.

Textbooks:

1. Richard F Gilberg&Behrouz A Forouzan, Data Structures (A Pseudocode Approach with C), second edition, Cengage Learning, 2004.
2. PAI, Data Structures, Tata McGraw-Hill Education, 2008
3. Data Structures Using C, ReemaThareja, OXFORD University Press

Reference Books:

1. Mayank Patel, Data Structure and Algorithm With C, Educreation Publishing, 2018
2. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2001.

List of Assignments:

1. Write an algorithm for a given problem and analyse it's complexity
2. Describe representation of a linked list in the memory and Write a pseudocode to perform deletion operation on list.
3. Illustrate the use of stack to solve the Tower of Hanoi problem.
4. Write a pseudocode to perform operations on priority queue.
5. Compare bubble sort and selection sort
6. Describe the sequential file organization.

Project Based Learning

1. Expression Evaluation
2. Traffic Management System
3. Library Management System for a small library in a department
4. Employee Record System
5. Dictionary
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet
9. Bank Management System that handles only savings account
10. Ticket booking system for bus

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Use of array and operations on Array.
2. Operations on singly and doubly linked list.
3. Polynomial operations using linked list.
4. Create stack and demonstrate it's use.
5. Develop a priority queue and perform the operations.
6. Demonstrate the use of different file organizations.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Computer System Workshop Technology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Practical:	02 Hours/Week	Term Work	25 Marks	Practical	1
		Practical	25 Marks		
		Total	50 Marks	Total	01

Course Objective:

Provide student a much-needed knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses

Prerequisite:

Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Learn the working of Internet.
5. Prepare document using Latex.
6. Learn GitHub tool for coding and collaboration.

Unit I

04 Hours

Computer hardware peripherals: Introduction to hardware components, random access memory (ram), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose & Why? How to choose a CPU type for different needs? Graphic Card & Types, How to install a Graphics Card, Installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II

04 Hours

Assembly of Computer and Software Installations: Assembling the motherboard, Replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of Ms Office.

Unit III

04 Hours

Basic Diagnostic of Hardware and Software :Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner

Unit IV

04 Hours

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools

Unit V

04 Hours

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc

Unit VI

04 Hours

Productivity tools: Open Source Tools Such as Latex, GitHubLaTeX: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

Textbooks:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A Handbook – Kate J. Chase PHI (Microsoft).
3. LaTeX Companion – Leslie Lampert, PHI/Pearson.
4. <https://nptel.ac.in/courses/106/105/106105081/>.
5. <http://nptel.ac.in/courses/106105084/>.
6. <https://guides.github.com/>.
7. Introduction to Linux: Installation and Programming B Venkateswarlu, BS Publication.

Reference Books:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani.

Project Based Learning

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.
4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTeX
10. Prepare Project report using LaTeX

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Scilab, Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important “layout” and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms
9. Assignment on Pull request, code review and collaboration using GitHub.
10. Demonstrate the Computer Hardware Components and explain its working.

B.TECH (Computer Science and Engineering)

SEMESTER – III

COURSE SYLLABUS

Non-Linear Data Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Tutorial:	01 Hours/Week	Term work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

The objective of the course is to provide the students the knowledge of different Non-linear data structures and how to use these to solve real world problems.

Prerequisite:

Basic Knowledge of Algorithm, programming fundamentals, Data types.ADT, Linear data Structure.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify and Apply appropriate algorithms on the graph to solve real world problems.
2. Demonstrate the use of trees and binary search trees to solve the real world problem.
3. Compare the different types of trees like AVL trees, BTree,B+ Tree, red Black tree and select an appropriate one to solve a particular one
4. Perform insertion and deletion operation on heap.
5. Apply appropriate hash function for a search process.
6. Explains the use of dictionaries and concept of text processing.

Unit I

06 Hours

Graphs: Introduction to Non-Linear data structure, Graphs, Representation of graph, AND/OR Graphs, ADT for Graph, Traversing a Graph, Dijkstra's Algorithm, Minimum Spanning Trees.

Unit II

06 Hours

Trees: Introduction, Binary Trees, Binary Tree Representation, Tree Traversal Algorithms, Threaded Binary Tree, Binary Search Tree, Operations on Binary Search Tree, Huffman's Algorithm.

Unit III

06 Hours

Special forms of trees:AVL Trees, m-way Search Trees, B Trees, B+ Trees, Red Black Tree, 2-3 Trees, Splay Trees, Applications of Trees.

Unit IV

06 Hours

Heaps:Heaps as priority queues, Heap Implementation, Insertion and Deletion operations, binary heaps, binomial and Fibonacci heaps, heapsort, heaps in Huffman coding.

Unit V

06 Hours

Hashing: Introduction, Hash functions, Collision Resolution Strategies, Types of Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit VI

06 Hours

Dictionaries & Text Processing: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Text Processing: String -+Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard tries, Suffix Tries, The Huffman Coding Algorithm.

Textbooks:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. Fundamentals of Data Structures in C by Horowitz, Sahni& Anderson-Freed, 2e Universal Press

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press, 3/e, 2009.
2. A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C and C++, Prentice Hall, 3/e.

List of Assignments:

The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Apply the shortest path algorithm on the given graph.
2. Apply the appropriate algorithm and find the solution for the problem.
3. Generate Huffman code
4. Write a pseudocode for tree traversal operation
5. Explain the concept of linear probing
6. Explain the steps in text processing

Project Based Learning

1. Hashing for cryptography
2. Payroll system
3. Network route identifier
4. Path finder
5. Telephone directory
6. Library Management system
7. Document indexing
8. Data Compressor
9. Railway reservation system
10. Supermarket stock management

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Apply Graph traversal technique.
2. Demonstrate use of Dijkstra's Algorithm.
3. Perform operations on binary search trees.
4. Perform on Tree Traversal Algorithms.
5. Applications and Demonstration on different types of trees.
6. Perform the operations on Heaps.
7. Apply Hash Function to solve the real time problem.
8. Demonstrate use of dictionaries and concept of text processing.
9. Mini Project

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Discrete Mathematical Structures

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Tutorial	00
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

The objective is to provide a mathematical foundation and skills those are required in further study of Computer Science and Engineering. The course Discrete Mathematical Structures deals with discrete objects, countable sets. It helps to develop logical thinking and a wide variety of real-world applications to computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Prerequisite:

Basic knowledge of Elementary Linear Algebra, Numerical Mathematical Computation, Programming basics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the ability to write the sentences in the symbolic logic and evaluate a proof technique.
2. Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3. Analyse the properties of relations and functions to determine their properties.
4. Apply the knowledge of Boolean algebra for building basic electronic and digital circuits.
5. Solve problems of combinatorics and recurrence relations.
6. Model problems in Computer Science using graphs and trees.

Unit I

06 Hours

Mathematical Logic: Propositional Logic, Predicate logic, First order logic, Rules of inference, Introduction to proof techniques, resolution, Mathematical induction, Methods of proofs.

Unit II

06 Hours

Set Theory: Types of sets, Sets operations and laws, Algebra of Sets, Multisets, Application of the principle of inclusion and exclusion.

Number Theory: Modular arithmetic, prime numbers, and properties, GCD, Chinese remainder theorem, Extended Euclidean algorithm.

Unit III

06 Hours

Relations: Basic definition, properties and types of relations, relations and digraphs, paths in relations and digraphs, equivalence and partially ordered relations, Transitive closure and Warshall's algorithm.

Functions: Types of functions, Identity functions, Composition of functions, Mathematical functions, Pigeonhole principle.

Unit IV

06 Hours

Algebraic Structures: Isomorphism and Homomorphism, Groups, Algebraic Structures with Binary Operations, rings, Cyclic groups, codes.

Lattice: Posets and Hasse Diagrams, Lattice as an algebraic system, Properties of lattices. Group Codes: The Communication Model and Basic notion of Error Correction, Generation of Group codes, Parity Check, Error Recovery

Unit V

06 Hours

Combinatorics and Recurrence Relations:

Combinatorics: Permutations, Sumrule, Product rule, Combinatorial proofs.

Recurrence Relations: Linear Recurrence relation, Second order RR with constant coefficients, Applications of Recurrence Relation.

Unit VI

06 Hours

Concepts of Graphs and Trees: Definition, Degree, Types, Operations on graphs, Paths, Circuits, Connectedness, Planar graphs and their properties, Eulerian and Hamiltonian graphs.

Trees: Basic properties of trees, Binary trees, Application: Minimum Spanning Tree, Shortest Path.

Textbooks:

1. J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.
2. Kolman and R.C. Busby: Discrete mathematical structures for computer science Prentice Hall, New-Delhi.
3. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.
4. R.M. Somasundaram: Discrete Mathematical Structures, Prentice Hall India Learning Private Limited.
5. C.L.Liu, Elements of Discrete Mathematics, second edition, McGraw-Hill Book Company.

Reference Books:

1. Kenneth H. Rosen: Discrete Mathematics and its applications Eighth Edition McGraw Hill Education.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI.

List of Assignments:

The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Given a fact or a statement prove or disprove using suitable technique.
2. Write the given English language sentences represent in the Symbolic logic.
3. Given the statement forms Infer the validity of the statement form.
4. Draw a Hasse diagram and find chains and antichains.
5. Find the number of ways for any event or given sample space.
6. Given a problem represent in a graph and compute the optimal solution.
7. Given a communication network find the path between the given nodes.

Project Based Learning

1. Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2. Object transformations using linear algebra.
3. Discrete mathematics in cryptography.
4. In Google maps to determine fastest driving routes and times.
5. In image processing
6. In relation database using sets.
7. In cyber security using graph theory.
8. Shortest path between two cities using a transportation system.
9. Data compression system with the help of Huffman coding.
10. Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

List of laboratory Exercise:

1. Perform set Operations.
2. Compute a power set of a given set.
3. List various properties of Relation and construct a program to evaluate it with a program.
4. Apply Warshall's algorithm to compute a Transitive Closure of a given relation entered by the user.(Use any suitable programming language).
5. Solve a programming problem based on application of Eulerian and Hamiltonian Graph.
6. Develop a program using RSA algorithm

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Machine Organization and Microprocessor

	<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits	
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04	
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01	
				Total	05	

Course Objective:

The course would provide students with an understanding of the design of fundamental blocks used in organization of computer system and interfacing techniques of these blocks to achieve different configurations of Machine organization. Students will learn the basic operations of computing hardware and how it interfaces to software.

Prerequisite:

The students should have basic Knowledge Digital electronics and logic design.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the architecture and functional blocks of Computer System.
2. List the functional requirements for implementing ALU.
3. Discuss design approaches implementing control unit.
4. Analyse the characteristics and hierarchy of memory system.
5. Describe Peripherals and Input-Output organization.
6. Describe the concepts of parallel processing and pipelining.

Unit I

08 Hours

CPU:-Machine architecture and organization, Von Neumann architecture Structure of IAS machine, memory, input-output subsystems, control unit. Introduction to 80x86 microprocessor, Architecture, Register organization, Segmentation, Instruction execution cycle, Addressing modes, and Instruction set. Instruction Formats, Instruction Types.

Unit II

08 Hours

ALU:-Computer arithmetic, Signed number representation, fixed and floating point representations, character representation. Integer addition and subtraction, signed number multiplication, Booth's multiplier's Hardware Implementation, Restoring and Non-restoring Division techniques, floating point arithmetic, IEEE 754 format.

Unit III

08 Hours

Control Unit :- Design approaches, Instruction cycle and micro operations, Control signals and timing sequence, design of Hardwired Control unit
Micro instructions and micro program, Organization and Optimization of micro-programmed Control unit, Microinstruction Sequencing, Sequencing Techniques, Address Generation, Microinstruction Execution, Microinstruction Encoding.

Unit IV

08 Hours

Memory:- Characteristics of Memory system, Memory hierarchy, Cache memory, cache size and block size, mapping functions, replacement algorithms, cache coherency, Multilevel Caches, Cache Coherence, Snooping & MESI Protocols, Memory Segmentation & Interleaved Memory System.

Unit V

08 Hours

I/O organization: - I/O module, Peripheral devices and their characteristics, Input-output subsystems, I/O device interface, I/O transfers, interrupt driven and DMA transfer, I/O device interfaces – SCSI, USB, Fire wire.

Unit VI

08 Hours

Parallel Organization – Overview of Instruction Pipelining, Performance Improvement, Flynn's classification for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Symmetric Multiprocessor (SMP) Organization, Multithreading – Fine Grained, Coarse Grained & Simultaneous (SMT) Threading, Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA. Multicore Architectures – Hardware & Software Issues in Multicore Organization.

Textbooks:

1. William Stallings. "Computer organization and architecture: designing for performance". Pearson Education India, 2010
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky. "Computer Organization", McGraw Hill, 2011.
3. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
4. Computer Architecture and Organization, John P. Hayes.

Reference Books:

1. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
2. David A. Patterson, John L. Hennessy. "Computer organization and design: the hardware/software interface". Elsevier, 2011

List of Assignments:

1. Describe the structure of IAS computer with neat block diagram.
2. Describe architecture of 8086 with neat block diagram.
3. Explain the concept of Segmentation and state its advantages and disadvantage.
4. Draw and explain working of Micro programmed Control Unit.
5. Describe structure of IAS computer with neat block diagram.
6. Describe architecture of 8086 with neat block diagram.

Project Based Learning

1. Automatic night lamp with morning alarm
2. Traffic light with sensor + 7segment
3. Multi pattern running lights.
4. .Washing machine
5. Simple Lock Using Keypad and 7 segment
6. Electronic quiz table
7. Electronic Digital Clock
8. .temperature controller
9. Plant Irrigation System
10. Car Parking Management
11. Customer counter for supermarket
12. Electronic queue management system in food stall
13. Safety box
14. Shop lot automatic door with 7segment display
15. Bank queue management system
16. Water level controller
17. Automatic home system
18. Commuter system
19. Automatic room light control
20. Elevator control system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test-2

Unit – I, Unit – II, Unit – III
Unit – IV, Unit – V, Unit – VI

Software Engineering

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

The main purpose of this course is to impart knowledge on the basic principles of software development life cycle.

Prerequisite:

Programming paradigms, Basic mathematical ability

Course Outcomes: On completion of the course, students will have the ability to:

1. Outline the basic concepts of software engineering lifecycle.
2. Analyse and categorize the requirements of software systems.
3. Design the software qualitatively.
4. Implement the software with the standard guidelines.
5. Validate the software with standard testing techniques.
6. Demonstrate troubleshooting of software application.

Unit I

08 Hours

Introduction:

Software and Software Engineering: The Nature of Software, The Software Process, Software Myths.

Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process.

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Agile Process Models.

Unit II

08 Hours

Requirement engineering and modelling:

Understanding Requirements: Requirements Engineering, Eliciting Requirements, Building the use case, Building Analysis Model, negotiating requirements and Validating Requirements. Drafting the software requirement specification.

Requirement Analysis and Modelling: Domain Analysis, Object Oriented Analysis, Scenario based Modelling, Class Based Modelling, Behaviour Modelling. CASE Tools.

Unit III

08 Hours

Software project management: Introduction to Software Project Management, Selection of a Project Approach, Project Estimation Techniques, Project Planning and Project Scheduling, Project Organization and Team Structures, Risk Management, Resource Allocation, Project Monitoring and Control, Software Configuration Management, Software Quality Management, CASE Tool.

Unit IV

08 Hours

Design

Design Concepts: The 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. CASE Tools in Software Design.

Unit V**08 Hours****Coding and Testing:**

Coding Approach, Coding Standards, Error, Bug, Defects.
Software Testing Life Cycle, Software Testing Principles, Verification and Validation,
Types of Testing, White Box Testing techniques, Black Box Testing techniques,
Testing OO Applications, Website Testing, CASE Tool.

Unit VI**08 Hours**

Implementation and maintenance: Software Maintenance-Software Supportability.
Reengineering-Business Process Reengineering- Software Reengineering- Reverse
Engineering, Restructuring.
Forward Engineering- Economics of Reengineering.

Textbooks:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Pearson Edu, "Software Engineering by Ian Sommerville", 9th edition, 2010.

Reference Books:

1. Van Vliet, "Software Engineering: Principles and Practices"–, 2008.
2. Richard Fairley, "Software Engineering Concepts", 2008..

List of Assignments:

1. Presentation on one topic related to this syllabus.
2. Conducting six Multiple choice question online test on each unit
3. Prepare a report based on the understanding by viewing the NPTEL videos of this subject.
4. Perform the following 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.

Project Based Learning

1. ATM system
2. Online Banking system
3. Airline reservation system
4. Railway reservation system
5. Library Management System
6. College Management System
7. Hospital Management system
8. Traffic Monitoring System
9. Hotel Management System
10. Bus ticket reservation system
11. Online shopping system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. For the given system, students are required to identify and document the Requirements Specifications.
2. To study and explore the working of any UML modelling CASE Tools.
3. For the given system, students are required to Model UML Use Case Diagrams and Capture the Use Case Scenarios.
4. For the given system, students are required to create data models like ER and EER.
5. For the given system, students are required to Model UML State chart and Activity diagrams.
6. For the given system, students are required to Model UML Class and sequence diagrams.
7. For the given system, students are required to Model UML collaboration, Component and Deployment diagrams.
8. To study and explore the working of any Software Testing CASE Tools.
9. For the given system, students are required to design and execute the test suites.
10. Prepare a case study on Agile Methodologies.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit – VI

Object Oriented Methodology

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Practical	01
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

- To teach fundamentals of object-oriented concepts and programming.
- To apply the concepts of object-oriented paradigm.
- To develop object-oriented programming skills.
- To design and implement applications for real life problems by using object-oriented programming.

Prerequisite:

Paradigms of Programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyse the basics of object-oriented programming with Java.
2. Identify class, objects, methods for real time problems.
3. Make use of constructor, garbage collector and methods of string class.
4. Explore the concept of inheritance and polymorphism with the help of real time applications.
5. Handle exception with exception handling mechanism and understand the concept of multithreading.
6. Design the graphical user interface by using Applets AWT and SWING.

Unit I

08 Hours

Introduction: History and Features of Java, Difference between Java, C, C++, Internals of Java Program, Difference between JDK, JRE and JVM, Internal Details of JVM, Basics of Java Language-Variable and Reserve / Keywords present in Java, Primitive Data types, Java Operators, Decision making and branching statements in Java.

Unit II

08 Hours

Classes, Objects and Methods: Creating a Class, Visibility/Access Modifiers, Encapsulation, Methods: Adding a Method to Class, returning a Value, adding a Method That Takes Parameters, 'this' Keyword, Method Overloading, Object Creation, Using Object as a Parameters, Returning Object, Array of Objects, Memory Allocation: 'new', Static Data Members, Static Methods.

Unit III

08 Hours

Constructors, Destructors and String Handling: Use of Constructor, Characteristics of Constructors, Types of Constructor, Constructor Overloading, Constructor with Default Arguments, Symbolic Constants, Garbage Collection, Destructors and Finalizers.
String Handling: String: Immutable String, String Comparison, String Concatenation, Substring, Methods of String class, String Buffer class, StringBuilder class, Creating Immutable class, to String method.

Unit IV

08 Hours

Inheritance and Polymorphism: Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.

Unit V

08 Hours

Exception Handling and Multithreaded programming:

Exception Handling: try and catch block, catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception

Introduction to threads, life cycle of a thread, thread states, threadproperties, methods in Threads and Runnable, setting priority of threads,synchronization and inter thread communication Life Cycle of a Thread.

Unit VI

08 Hours

Designing Graphical User Interfaces in Java: Applet and its use, Design Patterns using Applet and JApplet. Run Applet application by browser and applet tool. Applet Architecture. Parameters to Applet Life Cycle.

Basics of Components Using Containers, Layout Managers and User defined layout. Border Layout, Flow Layout, Grid Layout, Grid bagLayout, Box Layout. AWT Components, Adding a Menu to Window, Extending GUI Features Using SWING, Components Designing GUI, Advanced swing components like Progress, JSlider, JRadioButton, JTree, JTable, JToggleButton, etc.

Textbooks

1. E. Balaguruswamy, “Object Oriented Programming Using C++ and Java”, Tata McGrawHill
2. Steven Holzner et al. “Java 2 Programming”, Black Book, Dreamtech Press, 2009.

Reference Books

1. Java The complete reference, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 9th edition, 2014, ISBN: 978-0-07-180856-9 (E-book).
2. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094.
3. MitsunoriOgihara, “Fundamentals of Java Programming”, Springer; 2018, ISBN 978-3-319-89490-4.
4. Brahma DathanSarnathRamnath, “Object-Oriented Analysis, Design and Implementation An Integrated Approach”, Springer; 2nd ed. 2015, ISSN 1863-7310 ISSN 2197-1781 (electronic) Undergraduate Topics in Computer Science ISBN 978-3-319-24278-1, ISBN 978-3-319-24280-4.
5. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
6. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

List of Assignments:

1. Write a program to implement Class and object.
2. Write a program to differentiate between method overloading and method overriding.
3. Write a program to implement Constructor Overloading
4. Write a program to implement different Types of Inheritance in Java
5. Write a program to implement concept of Exception Handling &Multithreaded Programming
6. Write a program to use different controls of AWT classes.
7. Write a program to implement Applet swings.

1. Project Based Learning

1. **Smart City Project**
2. Currency Converter
3. Online Exam Project in Java
4. Moving Balls mini project using Java Applet
5. Text Editor in Java using AWT controls.
6. Album Manager Project in Java
7. Vehicle Management System in Java
8. Music Player project in Java
9. Student Management System Project in Java
10. Simple Calculator project in Java
11. Image to PDF Converter in java
12. Simple Chat System
13. Online Quiz project
14. Pong game in java
15. Tokenize implementation.

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises

1. Write a program that checks whether a given string is a palindrome or not.
2. Write a program that describes a class person. It should have instance variables to record name, age and salary. Create a person object. Set and display its instance variables.
3. Write a program that creates a class circle with instance variables for the centre and the radius. Initialize and display its variables.
4. Write a program that counts the number of objects created by using static variable.
5. Write a program to demonstrate the constructors in java.
6. Write a program to demonstrate the constructor overloading.
7. Write a program to display the use of this keyword.
8. Write a program to implement Class and Inheritance Concept.
9. Write an application that creates an interface' and implement it.
10. Write a program that can count the number of instances created for the class.
11. Write a program to implement the concept of Multithreaded Programming.
12. Create an abstract class shape. Let rectangle and triangle inherit this shape class. Add necessary functions.
13. Write an application that shows the usage of try, catch, throws and finally.
14. Write an Applet that displays —Hello World (Background colour-black, text colour-blue and your name in the status window).
15. Develop mini project using Applet and Swings.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

B.TECH (Computer Science and Engineering)
SEMESTER – IV
COURSE SYLLABUS

Theory of Computation

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Total			100 Marks	Total	04

Course Objective:

This course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton and Turing machine. This subject not only forms the basic models of computation, it also includes the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Prerequisite:

Discrete Mathematics

Course Outcomes: On completion of the course, students will have the ability to:

1. Estimate the importance of automata theory in designing computer languages.
2. Demonstrate and understand the relationships between language classes and regular expression
3. Design grammars and recognizers for different formal languages
4. Identify the equivalence of languages described by pushdown automata
5. Evaluate the Language Acceptability by Turing Machine
6. Explain the basics of compiler

Unit I

06 Hours

Preliminaries and Finite state machines: Introduction to Theory of Computation- Automata, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.

Unit II

06 Hours

Regular Languages -Definition and Examples. Conversion of RE To FA, FA to RE, algebraic laws, applications of RE. Pumping lemma for regular languages and applications. Closure properties of regular Languages Union, Concatenation, Complement, Intersection and Kleene closure. Decidability- Decision properties.

Unit III

06 Hours

Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF),Chomsky Hierarchy, Programming problems based on the properties of CFGs.

Unit IV

06 Hours

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).

Unit V

06 Hours

Turing Machines: The Turing Machine Model and Definition of TM, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction,

Modifications of Turing Machine, Composite and Iterative Turing machines, Multi Tape Turing machine, Multi Stack and Multi Track Turing machine, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Halting Problem.

Unit VI

06 Hours

Applications: Applications of Regular expressions, Lexical analyser, Text editor, and searching using RE, Context free grammar, Basics of parsing techniques, application of leftmost and rightmost derivations during parsing, Primitive recursive functions, Recursive and recursively enumerable languages, Introduction to Natural language Processing.

Textbooks:

1. Vivek Kulkarni "Theory Computation" Oxford higher education
2. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition.
3. E.V. Krishnamurthy, "Theory of Computer Science", EWP Publication.

Reference Books:

1. Hopcroft Ullman, "Introduction to Automata Theory, Languages & Computations, Narosa.
2. Daniel A. Cohen, "Introduction to Computer Theory", Wiley Publication.
3. Automata Theory, Languages, and Computation, John E. Hopcroft Cornell University, Rajeev Motwani Stanford University, Jeffrey D. Ullman Stanford University, 3rd Edition.

List of Assignments:

1. Study of JFLAP tool for Constructing FA.
2. Construct regular expressions defined over the alphabet $\Sigma = \{a, b\}$, which denote the given languages.
3. Translate the following Mealy machine into its equivalent Moore machine.
4. Write a context-free grammar (CFG) which generates the language L denoted by: $(a+ b)^*bbb(a+ b)^*$.
5. Construct a PDA that accepts the language defined by the following regular grammar.
6. Design a TM to recognize an arbitrary string divisible by 4, from $\Sigma = \{0, 1, 2\}$.

Project Based Learning

1. Develop a tool to illustrate the algorithm for converting an arbitrary NFA to a DFA .
2. Develop a tool to draw a transition diagram for any given DFA.
3. Approximation algorithms
4. Greedy algorithms.
5. Enumeration of finite automata
6. Enumeration of PDA
7. Enumeration of Turing machines
8. Ambiguous grammars
9. Disambiguation of Grammars
10. Enumeration of Context-free languages
11. . Enumeration of Turing machines
12. . Universal Turing machines.
13. Randomized Turing machines
14. NP Complete Algorithm
15. Problem solvability using Reduction
16. Design of TM to emulate a finite automata
17. . Design of TM to emulate a PDA
18. Complexity analysis of encryption algorithms using TM.
19. . Design of TM to perform sorting
20. Design TM to perform searching.

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit – VI

System Programming and Operating System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objectives:

- To help the students understand functioning of various system programs and Compiler, Loaders and Linkers.
- To help students for different concepts of operating system and management with file system.

Prerequisite:

Knowledge of Microprocessor concepts and Assembly language and Concept of system software, application software, knowledge of input output devices and its usage.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills of system programming.
2. Design and Demonstrate working of assemblers, Loaders and Linkers.
3. Compare and evaluate different scheduling algorithms.
4. Outline the concept of concurrency and deadlocks.
5. Analyse of Memory Management and Virtual Memory.
6. Prepare a comparison report of different operating system.

Unit I

08 Hours

Introduction to Systems Programming: Introduction: Components of System Software, Language Processing Activities, Fundamentals of Language Processing. Assemblers: Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler. Macro Processors: Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a two-pass macro-processor, Case study related to unit contents.

Unit II

08 Hours

Compiler, Loaders and Linkers: Compilers: Basic compilers function, Phases of compilation, memory allocation, compilation of expression, Compilation of expressions, compilation of control structures, Code of optimization. Loaders: Loader Schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Design of an absolute loader. Linkers: Relocation and linking concepts, Design of linker, self-relocating programs, Static and dynamic linker, Case study related to unit contents.

Unit III

08 Hours

Introduction to OS and Process management: Introduction to OS: Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S. Process Management: Process Concept, Process states, Process control, Threads, Scheduling: Types of scheduling: Pre-emptive, Nonredemptive, Scheduling algorithms: FCFS, SJF, RR, Case study on Unix /Linux OS.

Unit IV

08 Hours

Concurrency control: Concurrency: Interprocess communication, Mutual Exclusion, Semaphores, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock,

Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Case study related to unit contents.

Unit V

08 Hours

Memory Management: Basics of memory management, Swapping, Memory Allocation, Paging, Segmentation, Virtual memory, Demand Paging, Page replacement, Page replacement algorithms – Optimal FIFO, LRU, LRU approximation, Allocation of frames, Case study related to unit contents.

Unit VI

08 Hours

Input and Output, File System: I/O management & Disk scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS), RAID, Disk Cache. File Management: Concepts, File Organization, File Directories, File Sharing, Record Blocking, Allocation methods, Free Space management, Case study related to unit contents.

Textbooks:

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.

Reference Books:

1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.
2. Operating Systems 5th Edition, William Stallings, Pearson Education India.
3. D. M. Dhamdhere : “Systems programming and operating system”, Tata McGraw Hill.

List of Assignments:

1. Describe the types of errors that can be identified in the process of language translation. Illustrate the same with example
2. Explain the different types of optimization techniques
3. Compute average waiting time and average response time for the given set of processes.
4. Apply page replacement algorithm and compute the number of page faults.
5. Case study 1
6. Case study 2

Project Based Learning

1. Develop Heap Memory Manager in C
2. Design the Processes and thread management with deadlock's, synchronization
3. Design Preemptive Priority Scheduling algorithm implementation in any language.
4. Java program to analyze page fault for a given page frame using NRU with paging.
5. The project on simulating the multiprogramming of a specific operating system and dealing with CPU scheduling and Job scheduling.
6. Design the project that computes FCFS, SSTF, and SCAN disk-scheduling algorithms
7. Operating Systems mini-project to explore the different algorithms of main memory page replacement
8. Develop any one project on one or two pass assemblers.
9. design a simple language and develop a compiler for the three-address code generation and evaluation using Lex and Yacc.
10. Construct a parser that recognizes a specific language.

Note:-*Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Exercises:

1. Design one pass assembler
2. Design two pass assembler
3. Write a program to create Dynamic Link Library for any mathematical operation and write an application program to test it
4. Write a program using Lex specifications to implement lexical analysis phase of compiler to count no. of words, lines and characters of given input file.
5. Implement UNIX system calls like ps, fork, join, exec family, and wait for process management.
6. Implementation of various scheduling algorithm.
7. Implementation of Banker's algorithm.
8. Find out the page fault of any given string.
9. Implementation of various Page replacement Algorithm.
10. Study assignment on process scheduling algorithms for latest OS.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Computer Graphics and Multimedia

<u>Teaching Scheme</u>	<u>Examination Scheme</u>	<u>Credit Scheme</u>
Lecture: 03 Hours/Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Credits Theory 03 Total 03

Course Objectives:

- To introduce the principles of computer graphics and the components of a graphics system.
- To introduce basic algorithms for drawing line, circle and curves.
- To develop understanding of the basic principles of 2D and 3D computer graphics and how to transform the shapes to fit them as per the picture definition.
- To introduce multimedia architecture and hardware.
- To introduce multimedia file formats.

Prerequisite:

Knowledge of C programming language, Linear Algebra.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills in computer graphics.
2. Design and apply two-dimensional graphics.
3. Implement and use classic and modern algorithms and data structures in computer graphic to 3-D geometry.
4. Apply Illumination and colour models.
5. Identify suitable file format to develop a multimedia application.
6. Design Basic 3- D Scenes using Blender.

Unit I

08 Hours

Introduction to computer graphics and devices: Introduction to computer graphics, Graphics Primitives: Raster scan & random scan displays, display processor, display file structure, Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives. GRAPHIC DEVICES Cathode Ray Tube, Quality of Phosphors, CRTs for Colour Display, Beam Penetration CRT, The Shadow -Mask CRT, Direct View Storage Tube, Tablets, The light Pen, Three Dimensional Devices.

Unit II

08 Hours

Two-dimensional graphics: Two dimensional geometric transformations — Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing — viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations — point, line, and polygon clipping algorithms.

Unit III

08 Hours

Three-dimensional graphics: Three dimensional concepts; Three-dimensional object representations — Polygon surfaces- Polygon tables- Plane equations — Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations — Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations — Translation, Rotation, Scaling, composite transformations; Three-dimensional viewing — viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

Unit IV

08 Hours

Illumination and colour models: Light sources, basic illumination models, halftone patterns and dithering techniques; Properties of light, Diffused illumination, point

source illumination, Standard primaries and chromaticity diagram; Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model ,HSV colour model; Colour selection, ray tracing.

Unit V

08 Hours

Multimedia system design & multimedia file handling:Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies.

Unit VI

08 Hours

Hypermedia: Multimedia authoring and user interface-Hypermedia messaging - Mobile messaging – Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards– Integrated document management – Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals—Drawing Basic Shapes— Modelling—Shading & Textures.

Textbooks

1. Donald Hearn and Pauline Baker M, Computer Graphics”, Prentice Hall, New Delhi, second edition.
2. Andleigh, P. K and KiranThakrar, Multimedia Systems and Design, PHI, 2015.

Reference Books

1. Foley, Vandam, Feiner and Hughes, Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamentals of Computer Graphics, CRC Press, 2010.

List of Assignments:

1. Study on any latest data generating device in computer Graphics .
2. Describe in detail any one color model process.
3. Using the determinant to calculate the signed areas, determine whether the point $p=[23]T$ is in the triangle formed by the points $s=[22]T$, $t=[51]T$ and $r=[35]T$. Show all of your work.
4. Elaborate in detail the any one curve generation methods.
5. Describe how Multimedia system architecture process is used in real time.

Project Based Learning

1. Helicopter game
2. Sinking Ship
3. Scientific calculator
4. Traditional wall Clock
5. Tower of Hanoi game
6. Windmill
7. Steam engine
8. Traffic signal
9. Aquarium
10. Prepare a PowerPoint Presentation
11. Mobile app for online shopping
12. Arrival and departure of the train with announcement and signal
13. Mobile application for online tour guidance app
14. Create a small video on the given topic
15. Story tell mobile app

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of Fundamental Graphics Functions.
2. Implementation of Line drawing algorithms: DDA Algorithm, Bresenham's Algorithm.
3. Implementation of Circle drawing algorithms: Bresenham's Algorithm, Mid-Point Algorithm.
4. Programs on 2D and 3D transformations.
5. Write a program to implement Cohen Sutherland line clipping algorithm.
6. Using Flash/Maya perform different operations (rotation, scaling move etc..) on objects Create a Bouncing Ball using Key frame animation and Path animation.
7. Write a program to make wave audio file.
8. Write a program to create links in HTML.
9. Write a program to create file split.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Design of Algorithms

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture	04 Hours/Week	End Semester Examination:	60 Marks	Theory	04
Practical	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work:	25 Marks		
		Practical:	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

The Course gives an overview of about the Performance and Analysis of Algorithms.

Prerequisite:

The students should possess the knowledge of Data Structures and Discrete Mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyze the asymptotic performance of algorithms by providing Optimal Solution.
2. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Analyze the performance of Greedy Methods and describe its limitations.
4. Analyse Dynamic Programming Problems.
5. Solve Problems using Backtracking Approach.
6. Compare NP-Hard, NP-Complete Problems and Online Algorithms.

Unit I

06 Hours

Models of Computation: Algorithm Specification, Pseudocode Conventions Recursive Algorithms, PERFORMANCE ANALYSIS, Space Complexity Time Complexity Asymptotic Notation, Practical Complexities, Performance Measurement Randomized Algorithms Iterative Algorithms: Measures of Progress and Loop Invariants. Steps to develop Iterative Algorithms.

Unit II

06 Hours

Divide-and-Conquer: Binary Search Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement: Best Case and Worst-Case Analysis. Strassen's matrix Multiplication.

Unit III

06 Hours

The Greedy Method: Knapsack Problem, Job Sequencing with deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single-Source Shortest Paths.

Unit IV

06 Hours

Dynamic Programming: Multistage graph, All Pairs Shortest paths, Single-Source Shortest Path, Optimal Binary search trees, 0/1-knapsack, The Traveling Salesperson Problem, Basic Traversal and Search Technique.

Unit V

06 Hours

Backtracking: Backtracking: The General Method, The 8- Queens Problem, Sum of Subsets, Graph Colouring, 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.

Unit VI

06 Hours

Files: NP-HARD AND NP-COMPLETE PROBLEMA Algorithm Complexities: Nondeterministic 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. Online Algorithms: The Online Paging Problem, Adversary Models, Paging against an Oblivious Adversary, Relating the Adversaries, The Adaptive Online Adversary, The k-Server Problem

Textbooks:

1. Alfred Aho, John E. Hopcroft, "Design and Analysis of Computer Algorithms", Pearson Education.
2. Thomas Cormen, Charles E Leiserson, Ronald Rivest, "Introduction to Algorithms, Tata Mc-Graw Hill Publication, Second Edition.
3. Rod Stephens, "Essential Algorithms: A Practical Approach to Computer Algorithms", John Wiley and Sons Publications.
4. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Education.
5. Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publication, Second Edition.
6. Jeff Edmonds, How to think about Algorithms, York University, Cambridge University Press.
7. Python Algorithms: Mastering Basic Algorithms in the Python Language, by Magnus Lie, Hetland ,APress.
8. Ian Parberry and William Gasarch, WProblems on Algorithms, Second Edition, Prentice Hall Inc.
9. Rajeev Motwani, Prabhakar Raghavan, Randomized Algorithms, Cambridge University Press.

Reference Books:

1. Elitz Horowitz and Sartaj Sahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.

List of Assignments:

1. Calculate the space complexity of various algorithms.
2. Implement Knapsack Algorithm.
3. Implement Prim's Algorithm
4. Implement Kruskal's Algorithms
5. Study and analysis of 8-Queens Problem.
6. Implement Optimal Binary Search Tree.

Project Based Learning

1. Design a Sudoku using Recursion
2. Design a Phonebook
3. Simulate 15 Puzzle Problem
4. Design Tic Tac Toe
5. Travelling Salesman Problem
6. Design a board for simulating N-Queen Problem
7. Implement Multistage Graphs
8. Prime Number Generator
9. Random Number Generator
10. Devise and algorithm for large sparse matrix multiplication

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Database Systems

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks	Credits	
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

This course focuses on the core principles and techniques required in the design and implementation of database systems.

Prerequisite:

Discrete mathematics, Data structures and Programming languages.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use the basic concepts of Database Systems in Database design.
2. Design a Database using ER Modelling
3. Apply SQL queries to interact with Database.
4. Apply normalization on database design to eliminate anomalies.
5. Analyse database transactions and can control them by applying ACID properties.
6. Investigate the knowledge about emerging trends in the area of database for unstructured data and applications for it.

08 Hours

Unit I

Introduction to Databases and Database Design: Introduction, purpose of database system, Data Independence, view of data, Database System architecture- Levels, Mappings, Database users and DBA, applications of DBMS, The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction., Database Design Process, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, extended ER features, Generalization, Specialization, Aggregation, Conceptual design with the E-Rmodel.

Unit II

Relational Model: Introduction to the relational model, Integrity constraints over relations, enforcing integrity constraints, querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.
Relational Algebra and Calculus: Preliminaries, relational algebra operators, relational calculus - Tuple and domain relational calculus, expressive power of algebra and calculus.

08 Hours

Unit III

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, case studies.

08 Hours

Unit IV

SQL: Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any,

08 Hours

All, view and its types. transaction control commands – Commit, Rollback, Save point, cursors, stored procedures, Triggers.

Unit V

Transactions Management:Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Serializability, recoverability, implementation of isolation, transaction definition in SQL, testing for Serializability.

Concurrency Control and Recovery System: Concurrency control, lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity. Recovery system - failure classification, storage structure, recovery and atomicity, log- based recovery, shadow paging, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems.

08 Hours

Unit VI

08 Hours

Emerging Database Technologies:Introduction to unstructured data, NOSQL, Introduction to unstructured data, NOSQL, spatial and geographic databases, Database Analysis Tools multimedia databases, Massive Datasets and Hadoop.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi,India.
2. ElmasriNavate, Fundamentals of Database Systems, Pearson Education,India.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), Database System Concepts, 5th edition, McGraw-Hill, New Delhi,India.
2. Peter Rob, Carlos Coronel (2009), Database Systems Design, Implementation and Management, 7thedition.

List of Assignments:

1. Define Database. Explain Importance of Data Models in detail
2. Write a short note on Following:
 - a) Relational Algebra and Calculus
 - b) Integrity Constraints
3. Define Normalization. Explain all Normal forms in detail
4. Explain DDL, DML and DCL in detail.
- 5.Explain ACID properties of TCL in detail.\
6. Explain NOSQL and Database Analysis Tools in detail.

Project Based Learning

1. Inventory Management System.
2. Online Jewelry Shopping System
3. Library Management System
4. Online Examination System
5. Hospital Management System
6. Railway Reservation System
7. Payroll Management System
8. Cooking Recipe Portal
9. Art Gallery Management System
10. Student Database Management System

11. Restaurant Management Database System
12. Electric Bill System Database
13. Online Examination System
14. Event Management System
15. Attendance Management System

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Laboratory Exercises:

1. Draw E-R Diagram and extended ER Diagram (as given by course coordinator) on given System.
2. Demonstrate Queries on Relational Algebra(as given by course coordinator).
3. To discuss normalization and build normalized schema (as given by course coordinator)on given System.
4. Write a SQL Statement ((as given by course coordinator) on DDL,DML and DCL.
5. Demonstrate Queries on Joins(as given by course coordinator).
6. Demonstrate Queries on aggregate functions(as given by course coordinator).
7. Use WEKA tool to derive analytical model for the given dataset.
8. Case study on NOSQL database: MongoDB.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit – VI

CSE Skill Lab - I

<u>Teaching Scheme</u>	<u>Examination Scheme</u>	<u>Credit Scheme</u>
Hours/Week	Marks	Credits
Practical: 04 Hours/Week	Term Work	
	Practical	02
	Total	02
	25 Marks	
	25 Marks	Practical
	50 Marks	Total

Course Objective:

The objective of this course is to impart students with the knowledge to setup the development environment, design and develop dynamic database driven web applications using PHP.

Prerequisite:

1. Create PHP programs that use various php library functions,
2. Design interactive forms using PHP.
3. Implement various operations on arrays and control structures in PHP
4. Create database and demonstrate the manipulation of Files, Directories and relational data.
5. Implement cookies and session
6. Develop dynamic web Content.

Unit I

08 Hours

Introduction to Dynamic Web Content & Environment: Overview of HTTP & HTML, Request/Response Procedure, Advantage of PHP, MySQL, JavaScript, CSS & HTML 5, The Apache Web Server, Overview of Open Source. Basics of WAMP, MAMP, LAMP, Installation, Accessing document root, Working Remotely – Looking In, Using FTP, Using IDE.

Unit II

08 Hours

Introduction to PHP, Expression & Control Flow: Incorporating PHP within HTML, Structure of PHP – Comments, Basic Syntax, variables, operators, Assignments, multiline commands, constants, echo & print commands, Functions, variable Scope. Expressions: TRUE or FALSE, Literals & Variables. Operators: Precedence, Associativity, Relational Operators. Conditionals – if, else, elseif, switch operator. Looping: While, do-while, breaking out of loop, continue statement

Unit III

08 Hours

PHP Functions, Objects & Arrays: PHP Functions: Defining, returning a value, Returning an Array, do not Pass arguments by reference, Returning Global Variables, Include statement: include once, require & require once.
PHP Objects: Declaring a class, creating an object, accessing objects, constructors, PHP 5 Destructors, writing methods, declaring properties & constants, inheritance. Arrays: Basic Access, foreach as loop, multidimensional Arrays, Using Array functions.

Unit IV

08 Hours

PHP in Action & Introduction to MySQL: Using Printf, Date and Time Functions, File handling, System Calls. Introduction to MySQL: Basics, Database Terms, Accessing MySQL via Command line, MySQL Commands, Data types, Indexes, MySQL Functions, Accessing MySQL via PhpMyAdmin, Primary Keys, Relationships, Select Queries, creating mysqldump, backup file, dumping data in CSV format.

Unit V

08 Hours

Cookies, Sessions, Authentications and Accessing: Using cookies in PHP, HTTP Authentication, Using Sessions. Accessing: Querying a MySQL Database with PHP – The

Process, create login file, connecting to database, Practical Example, Preventing Hacking Attempts: Using Placeholders, HTML Injection. Building Forms, Retrieving submitted Data.

Unit VI

08 Hours

Exploring JavaScript: JavaScript and HTML Text – using within a Document Head, Older & Nonstandard Browsers, Including Javascripts, debugging Javascript errors, using variables, semicolon, variables, operators, variable typing, functions, global variables, local variables, Document Object Model, Document.write.

Textbooks:

1. Learning PHP, MySQL & Javascript, Robin Nixon, OREILLY, 4th Edition, 2015.
2. Head First PHP & MySQL-Lynn Beighley & Michael Morrison-O'Reilly.
3. PHP: A Beginner's Guide-Vikram Vaswani- McGraw-Hill Education.

Reference Books:

1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill.
2. The Joy of PHP Programming: A Beginner's Guide – Alan Forbes, BeakCheck LLC, 6th edition.

List of Laboratory Exercises:

1. Write a PHP function to count total number of vowels from the string. Accept a string using HTML form.
2. Write a PHP script to print Fibonacci series.
3. Create a student registration form using text box, check box, radio button, select, submit button. Display the user inserted value in new PHP page.
4. Write a program to perform the following operations on an associative array.
Display elements of an array along with their keys.
Display size of array.
Delete an element from an array from the given index.
5. Write a Program to insert a roll no and student name in a database (use PostgreSQL data to create a database).
6. Write PHP script to demonstrate passing variables with cookies.
7. Implement Admin login/logout functionality and cookie wherever required.
8. Write a PHP script to connect MYSQL server from your web application. Write a PHP script to create and drop database.
9. Create database using phpMyAdmin. Write a program to read input data from table and display the information in tabular form.
10. Develop PHP application using forms and database.

Project Based Learning

1. Design personal website using HTML and CSS
2. Login page with user credentials and data base
3. Drawing palette based web page
4. Student registration form with data base connectivity
5. Dummy social networking website
6. Image editing using we page
7. Animation based website

8. Simple game website
9. Ecommerce website with data base connectivity
10. Any Complete web project with real time database connectivity
11. Login authentication
12. Design Survey Form
13. Quiz Game
14. Implement Employee Management System
15. Social Media Dashboard
16. Search Application
17. E-Commerce Website
18. Develop Freelance platform
19. Hospital Management System

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

B.TECH (Computer Science and Engineering)
SEMESTER – V
COURSE SYLLABUS

Software Testing and Quality Assurance

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

- To study the basics of testing ,various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution
- To learn the software quality assurance ,metrics, defect prevention techniques
- To learn the techniques for quality assurance and applying for applications.

Prerequisite:

1. Software Engineering.

Course Outcomes: On completion of the course, students will have the ability to:

7. Perform functional and non functional tests in the life cycle of the software product.
8. Understand system testing and test execution process.
9. Identify defect prevention techniques and software quality assurance metrics.
10. Apply techniques of quality assurance for typical applications.
11. Choose appropriate quality assurance models and develop quality.
12. Ability to conduct formal inspections, record and evaluate results of inspections.

Unit I - SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES 06 Hours

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building.

Unit II - SYSTEM TESTING 06 Hours

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

Unit III - SYSTEM TEST CATEGORIES 06 Hours

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote. system test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness,

Metrics, Test Case Design Effectiveness. system test execution- Modeling Defects, Metrics for Monitoring Test Execution .Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

Unit IV - SOFTWARE QUALITY

06 Hours

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement ,Testing Maturity Model.

Unit V - SOFTWARE QUALITY ASSURANCE

06 Hours

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

Unit VI – TEST AUTOMATION

06 Hours

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics. TestNG Testing Framework for Selenium.

Textbooks

3. Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc,2008
4. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.

Reference Books

1. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004
2. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

List of Assignments

6. To Prepare Test Plan for the implemented system under test. The Test Plan shall be based on System Requirement Specification. The Test plan consists of following issues. a. Purpose of the test. /Location and schedule of the test. b. Test descriptions. /Pass and Fail Criteria
7. To identify and narrate Test cases, Test scripts/procedures and Test incident Report identifier for the system under test. Refer Use case analysis document to prepare mentioned/ identified test documents. The expected specifications/ behaviors can be stated with the help of Test Oracle
8. To perform Unit testing especially indicating the traced Independent data paths, Control paths and Error handling paths. Prepare control flow graphs for the unit under test. Compute the Cyclomatic complexity of the unit.
9. 4. To perform Data Flow testing for the Program Segments by identifying the Definition-Use chain and type of data flow anomaly.
10. To perform Mutation Analysis of the Program Segments along with mutant history, mutation score and type of mutation by using any Code analysis Tool / Mutation Testing Tool (JUNIT, MuJava).
11. To perform Black-Box Testing for all the units contained in the architectural segments using Equivalence Partitioning, Boundary Value Analysis and Orthogonal

Array testing methods. To study exploratory Testing for the Module under Test and merits/demerits of this technique.

12. To perform Regression Testing / GUI Testing of the System under construction with Unit and Integration profiles by using any Functional Testing Tool.
13. To perform Automated Testing using suitable CASE tool addressing Higher-Order testing strategies.
14. To perform Web Based Testing for Web Application incorporating any Open Source Tool. To study Performance Testing, Load Testing, Security Testing, Stress Testing, Demonstrate on link Test expectation.
15. To perform Software Audit (Checklist and Template-based) for the software developed and improve the Code Quality.

Project Based Learning

1. Every Student should select different websites/Applications and perform the each phase of STLC.

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Big Data Analytics

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04	University	60 Marks		
	Hours/Week	Examination:			
Practical:	00	Internal Assessment:	40 Marks	Lecture	04
	Hours/Week	Term Work & Practical	0 Marks	Practical	00
		Total	100 Marks	Total	04

Course Objective:

To know the fundamental concepts of big data and analytics.

To explore tools and practices for working with big data

To learn about stream computing.

To know about the research that requires the integration of large amounts of data.

Prerequisite:

a Big Data Analyst needs to be very comfortable with coding, Data Warehousing, Data Visualisation, Business Knowledge etc.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand how to leverage the insights from big data analytics
2. Analyze data by utilizing various statistical and data mining approaches
3. Perform analytics on real-time streaming data
4. Understand the various NoSql alternative database models
5. Understand the Stream Data Model and Real Time Sentiment Analysis.
6. Understand the pig Data Model and Aggregated data model.

Unit I INTRODUCTION TO BIG DATA

08 Hours

Big Data – Definition, Characteristic Features – Big Data Applications - Big Data vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis vs Reporting - Modern Data Analytic Tools.

Unit II HADOOP FRAMEWORK

08 Hours

Distributed File Systems - Large-Scale FileSystem Organization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN

Unit III DATA ANALYSIS

08 Hours

Statistical Methods:Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods,Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics – Data analysis using R.

Unit IV MINING DATA STREAMS

08 Hours

Streams: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Unit V CLUSTERING AND CLASSIFICATION

08 Hours

Advanced Analytical Theory and Methods: Overview of Clustering – K-means – Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions .- Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Trees in R – Naïve Bayes – Bayes' Theorem – Naïve Bayes Classifier.

Unit VI BIG DATA FRAMEWORKS

08 Hours

Introduction to NoSQL – Aggregate Data Models – Hbase: Data Model and Implementations – Hbase Clients – Examples – .Cassandra: Data Model – Examples – Cassandra Clients – Hadoop Integration. Pig – Grunt – Pig Data Model – Pig Latin – developing and testing Pig Latin scripts. Hive – Data Types and File Formats – HiveQL Data Definition – HiveQL Data Manipulation – HiveQL Queries

Textbooks

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Reference Books

1. .Bill Franks, —Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics|, Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.

List of Assignments

16. List the main characteristics of big data architecture with a neat schematic diagram.
17. Explain in detail about the challenges of conventional system

18. How would you show your understanding of the tools, trends and technology in big data
19. What are the best practices in Big Data analytics? Explain the techniques used in Big Data Analytics
20. Discuss the following features of Apache Hadoop in detail with diagram as necessary.
21. Describe briefly about Hadoop input and output and write a note on data integrity
22. Explain clustering and classifications in detail.

Project Based Learning:

1. Market Basket Analysis
2. Airline Dataset Analysis
3. Data Analysis using Clustering

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

HUMAN MACHINE INTERACTION

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	00 Hours/Week	Internal Assessment:	40 Marks	Practical	00
		Term Work&Practical	00 Marks		
		Total	100 Marks	Total	04

Course Objective:

1. To introduce the need for human- Machine -interaction study or human-entered software design.
2. To gain an understanding of the human part of human- Machine -interactions.
3. Develop meaningful user interface.
4. Design and implement useful, usable, and engaging graphical Machine interfaces.
5. To apply HMI to real life use cases.
6. To familiarize information, interaction and GUI design process for enhancing user-experience

Prerequisite:

Basic knowledge of designing tools and languages like HTML, Java, etc

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify User Interface (UI) design principles.
2. Apply Interactive Design process in real world applications
3. To develop understanding of human factors in HMI design.
4. To design effective user-interfaces
5. To apply cognitive models for predicting human-Machine-interactions.
6. To develop understanding of models, paradigms and context of interactions

Unit I

08 Hours

INTRODUCTION:

Introduction to HMI, Importance of user Interface - definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Web user - Interface popularity, characteristics- Principles of user interface.

Unit II

08 Hours

INTERACTIVE DESIGN:

Basics – process – scenarios – navigation – screen design Iteration and prototyping. HMI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Unit III

08 Hours

SCREEN DESIGNING:

Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, visually pleasing composition, amount of information, focus and emphasis, presentation information simply and

meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

Unit IV

08 Hours

INTERFACE DESIGN FOR MOBILE DEVICES:

Mobile Ecosystem: Platforms, Application frameworks: Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools

Unit V

08 Hours

HMI MODELS:

Goal and task hierarchy model, Linguistic model, Physical and device models, Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW. Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations, Computer mediated communication, Ubiquitous Computing, Finding things on web Future of HMI

Unit VI

08 Hours

INTERACTION DEVICES:

Keyboard and Function Keys - Pointing Devices - Speech Recognition Digitization and Generation -Image and Video Displays -Drivers.

Textbooks

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2004.
5. Wilbert O. Galitz, The Essential Guide to User Interface Design, Wiley publication.
6. Alan Cooper, Robert Reimann, David Cronin, About Face3: Essentials of Interaction design, Wiley publication.
7. Jeff Johnson, Designing with the mind in mind, Morgan Kaufmann Publication.
8. Donald A. Normann, Design of everyday things, Basic Books; Reprint edition 2002.
9. Brian Fling, Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009

Reference Books

3. Rogers Sharp Preece Interaction Design: Beyond Human Computer Interaction, Wiley.
4. Guy A. Boy the Handbook of Human Machine Interaction, Ashgate publishing Ltd
5. Kalbande, Kanade, Iyer, Galitzs Human Machine Interaction, Wiley Publications.

List of Assignments

23. Explain the characteristics of GUI.
24. Compare and contrast GUI and web interface design.
25. Explain contrast between printed pages versus web pages.
26. Explain the general principles of UID.
27. Mention the advantages & disadvantages of GUI in detail

28. Explain the concept of direct and indirect manipulation and when it leads to infeasible situation?
29. Write short notes on human characteristics in interface design
30. Explain the direct and indirect methods for determining business requirements analysis on user interface design

Project Based Learning

1. Project Web Site and Brainstorming
2. UI Critique
3. Ethnography
4. Prototyping
5. Heuristic Evaluation

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

COMPUTER NETWORKS

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

1. To understand the fundamental concepts of networking and technologies
2. To learn different techniques for framing, error control, flow control and routing
3. To learn different layer protocols in the Network layer
4. To understand modern network architectures with respect to design and performance.

Prerequisite:

Computer Systems Workshop Technology

Course Outcomes: On completion of the course, students will have the ability to:

1. Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
2. Illustrate the working and functions of data link layer
3. Analyze the working of different routing protocols and mechanisms
4. Implement client-server applications using sockets
5. Illustrate role of application layer with its protocols, client-server architectures
6. Illustrate the different multiplexing techniques

Unit I : Basics of Computer Networks

08 Hours

Introduction to computer network, Types of computer network, Ad-hoc Network, Network Architectures: Client-Server; Peer To Peer; Distributed and SDN, OSI Model, TCP/IP Model, Topologies: Star and Hierarchical; Design issues for Layers, Transmission Mediums: CAT5, 5e, 6, OFC and Radio Spectrum, Network Devices: Bridge, Switch, Router, Brouter and Access Point.

Unit II : Data Link Layer

08 Hours

Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth

Unit III : Network Layer

08 Hours

Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet: RIP, OSPF, BGP.

Unit IV : Transport Layer **08 Hours**
Transport Service, transport layer protocols for flow control, Elements of Transport Protocols, Multiplexing, Congestion Control, Example protocols: UDP, TCP.

Unit V : Application Layer **08 Hours**
Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), WWW, HTTP, SNMP, Bluetooth, Firewalls.

Unit VI: Network Security **08 Hours**
Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.

Textbooks

1. Fourauzan B., "Data Communications and Networking", 5 th Edition, Tata McGraw-Hill, Publications, ISBN:0-07 – 058408 – 7
2. Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson India, 2012.

Reference Books

1. Kurose, Ross, “Computer Networking a Top Down Approach Featuring the Internet”, Pearson, ISBN-10: 0132856204
2. L. Peterson and B. Davie, “Computer Networks: A Systems Approach”, 5th Edition, Morgan-Kaufmann, 2012.
3. Douglas E. Comer & M.S Narayanan,”Computer Network & Internet”, Pearson Education

List of Assignments

31. Study of LAN environment.
32. Explain OSI Model in detail.
33. Explain error detection and correction methods with example.
34. Study the concept of subnetting at network layer.
35. Discuss switching techniques in detail.
36. Explain multiplexing methods in detail.
37. Assignment on Application Layer
38. Assignment on Bandwidth utilization techniques.

List of Laboratory Exercises

1. Setup a wired LAN using Switch, Router and then IP switch of minimum four computers, configuration machine using IP addresses, testing using PING utility using Network Simulation tool Cisco Packet Tracer.
2. Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes and CRC.
3. Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer to peer mode.
4. Write a program to demonstrate subnetting and find the subnet masks
5. Configure RIP/OSPF/BGP using packet Tracer
6. Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa

7. Write a program using TCP socket for wired network.
8. Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines
9. Use network simulator NS2 to implement: Monitoring traffic for the given topology
10. Study of Installation and configuration of DHCP server

Project Based Learning

1. Chat Application
2. Multiuser Chat Application
3. Network monitoring System
4. Intruder Detection System
5. Computing shortest path between nodes
6. Client-Server based Instant Messenger
7. File Transfer Protocol
8. Network Security Protocol with Cryptography
9. Peer to peer resource monitoring system
10. Distance-Vector-Routing-and-Flow-Control-Simulator
11. Link state routing protocol to find suitable path for transmission.
12. analyse following packet formats captured through Wireshark for wired network

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

ARTIFICIAL INTELLIGENCE

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

1. To impart artificial intelligence principles, techniques, and its history
2. To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering
3. To develop intelligent systems by assembling solutions to concrete computational problems

Prerequisite:

Discrete mathematics, Data structures

Course Outcomes: On completion of the course, students will have the ability 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

08 Hours

Introduction to Artificial intelligence and Agents: Introduction–Human Intelligence, comparison between Man and Machine, Definition -The Turing Test, Definitions - Importance of AI, Evolution of AI - Applications of AI, 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. Introduction to Basic concept of Machine Learning (ML), Deep Learning (DL) and Data Science. (DS). AI vs ML vs DL vs DS,

Case Study- 1 : AI for everyone/ Building AI Projects

Case Study- 2 : AI and Society / Ethics for AI

Unit II

08 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

08 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. Case Study - 3 : State of Art Game Programs and Analysis

Unit IV

08 Hours

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

08 Hours

Knowledge Inference and Planning: Production based system; Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster – Shafer theory.

Planning – Block world problem, components of a planning systems, Goal stack planning, Non-linear planning, Hierarchical planning, least commitment strategy

Unit VI

08 Hours

Learning And Expert System: Definition of learning, Forms of learning, Rote learning, learning by taking advice, learning in problem solving, Induction leaning, Explanation based learning, Formal learning theory. Connectionist models- learning in Neural network

Expert systems - Intelligent System Vs Expert system, Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta Expert systems shells, Typical expert systems - MYCIN, DART, XOON, RI,.

Textbooks

1. Artificial Intelligence: A Modern Approach by Peter and Norvig, Reference Books:
2. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
3. Artificial Intelligence by Patrick Henry Winston, Addison-Wesley Publishing Company

Reference Books

1. Prolog Programming for A.I. by Bratko, TMH
3. Artificial Intelligence by Saroj Kausik
2. Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press
3. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India)
4. Expert Systems, Giarranto, VIKAS

List of Assignments

39. What is AI and what are the problems associated with AI
40. Describe in detail Techniques of AI
41. What is Agent and Intelligent Agent. Also explain the Agent and environment in detail.
42. Discuss the concept of AO* algorithm with suitable example
43. Define Memory bound search? Explain working of IDA* and SMA* algorithm with suitable example.
44. Define the Constraint Satisfaction Problems. Describe the elements in the

Definition

45. Explain Iterative Deepening search method with suitable example
46. . Prove given examples using natural deduction rules
 1. $p \rightarrow q \vdash (q \rightarrow r) \rightarrow ((r \rightarrow s) \rightarrow (\neg s \rightarrow \neg p))$
 2. $p \wedge q \vdash (p \rightarrow q) \wedge (q \rightarrow p)$
47. Describe Dempster-Shafer theory using suitable example
48. Describe Goal stack planning with example.
49. Explain Architecture of Expert system? Give its 3 application areas.
50. Discuss the expert system in domain of medicine using suitable case study.

List of Laboratory Exercises

1. Implement Tic-Tac-Toe game for 3×3 grid.
 1. Implement Water jug problem
 2. Implement concept of Breadth First Search Technique
 3. Implement concept of Depth First Search Technique
 4. Implement Best first search for given Problem
 5. Implementation of A* algorithm (Always gives optimal solution) for solving Puzzle problems
 6. To solve Travelling Salesman Problem (TSP) using Hill climbing Algorithm
 7. To implement graph colouring algorithm using Constraint Satisfaction problem.
- OR
- Implementation of Constraint Satisfaction Problem for solving Crypt-arithmetic Problem
8. Implementation of MinMax Search Procedure with alpha beta pruning for finding the solutions of games.
9. To design a simple expert system using decision trees.

Project Based Learning

1. Expert system
2. Game development
3. NLP
4. Solving problem with AI
5. Voice-based Virtual Assistant for Windows
6. Heart Disease Prediction Project
7. Stock Price Prediction
8. Predict Housing Price
9. Facial Emotion Recognition and Detection
10. Banking Bot

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

CSE Skill Lab –II

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	00 Hours/Week	University Examination:	-	Lecture	00
Practical:	04 Hours/Week	Internal Assessment:	-	Practical	02
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	50 Marks	Total	02

Course Objective:

1. To learn basics, features and future of Python programming.
2. To acquaint with data types, input output statements, decision making, looping and functions in Python
3. To learn features of Object Oriented Programming using Python
4. To acquaint with the use and benefits of files handling in Python

Prerequisite:

Students are expected to have a good understanding of basic computer programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python
2. Demonstrate experience with the Python program development environment by implementing various functions and libraries
3. Understand file handling in Python.
4. Understand Introductory R language fundamentals, basic syntax and how to use R; what R is and how it's used to perform data analysis.
5. Understand and practically demonstrate the working in Data using R.
6. Understand file handling in R.

Unit I: Python Programming Basics

08 Hours

Introduction: Features of Python, history, writing and executing Python program, literal constants, variables and identifiers, data types (set, tuple, dictionary and list) operators and expressions

Decision Control Statement: branching statements, loops, break, continue, pass.

Unit II: Functions and Libraries in Python

08 Hours

Functions and Libraries: definition, call, variable scope and lifetime, the return statement. Defining functions, Lambda or anonymous function.

Libraries: Various useful libraries (Pandas, Numpy, Pytorch, Matplotlib, Scipy etc)

Unit III: File Handling in Python

08 Hours

Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files

Unit IV: Basics of R programming

08 Hours

Introduction: advantages of R over other programming language, handling and installing packages, R variables, R data types, R decision making, R loops

Unit V: Working with Data using R**08 Hours**

Working with Data: R Vectors, R matrices, R factors, R Lists, R Datasets

Unit VI: File handling in R**08 Hours**

File handling: Loading and handling Data in R: Getting and Setting the Working Directory – getwd(), setwd(), dir() - R-CSV Files - Input as a CSV file, Reading a CSV File, Analyzing the CSV File: summary(), min(), max(), range(), mean(), median(), apply() - Writing into a CSV File – R -Excel File – Reading the Excel file.

Textbooks

1. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford University Press, ISBN 13: 978-0-19-948017-6
2. Sandip Rakshit, R Programming for Beginners, McGraw Hill Education (India), 2017, ISBN: 978-93-5260-455-5.

Reference Books

1. Martin C. Brown, “Python: The Complete Reference”, McGraw Hill Education, ISBN-10: 9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943
2. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
3. Hands-on Programming with R - Garrett Grolemund
4. Seema Acharya, Data Analytics using R, McGraw Hill Education (India), 2018, ISBN: 978-93-5260-524-8

List of Laboratory Exercises

1. Study and implement data structures in Python
2. Write a Python program to implement decision control statements: if, if-else, nested if, if-elif-else statements
3. Write Python Program to implement various looping structures.
4. Write Python program to demonstrate implementation of functions.
5. Demonstrate data visualization using various packages and libraries in Python.
6. Implement various conditional statements in R.
7. Write a R program to implement looping structures
8. Write a R program to demonstrate use of vectors and matrices in R.
9. Demonstrate reading of a file in R and implement various functions on a file.

Project Based Learning

1. Implement rock paper scissors game.
2. Develop an email slicer
3. Implement an Alarm clock
4. Develop a tic tac toe game
5. Develop a Phonebook.
6. Design a Sentiment Analysis System
7. Develop a system to detect credit card fraud
8. Design a Music recommendation system

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

B.TECH (Computer Science and Engineering)
SEMESTER – IV
COURSE SYLLABUS

Business Intelligence System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Lecture	03
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

1. Learn Business Intelligence.

Prerequisite:

Basic information about the business, its model and structure of business administrative policies

Course Outcomes: On completion of the course, students will have the ability to:

1. To gain knowledge of Business Intelligence
2. To do BI Deployment, Administration & Security.
3. To analyse the BI building process
4. To generate and manage BI reports
5. To build business projects
6. To deploy and administer BI in the real-life scenario

Unit I: Introduction to Business Intelligence

06 Hours

Understanding the scope of today's BI solutions and how they fit into existing infrastructure Assessing new options such as SaaS and cloud-based technology. Describe BI, its components & architecture, previewing the future of BI Crafting a better experience for all business users, End User Assumptions, Setting up Data for BI, The Functional Area of BI Tools, Query Tools and Reporting, OLAP and Advanced Analytics, Supporting the requirements of senior executives, including performance management.

Unit II: Elements of Business Intelligence Solutions

04 Hours

Reports & ad hoc queries; Analyse OLAP data; Dashboards & Scorecards development, Metadata Models; Automated tasks & events; Mobile & disconnected BI; Collaboration capabilities; Real time monitoring capabilities; Software development kit; Consume BI through portals, web applications, Desktop applications.

Unit III: Building the BI Project

06 Hours

Planning the BI project, Project Resources; Project Tasks, Risk Management and Mitigation, Cost-justifying BI solutions and measuring success

Unit IV: BI building Process

06 Hours

Collecting User Requirements, Requirements-Gathering Techniques; Prioritizing & Validating BI Requirements, Changing Requirements; BI Design and Development, Best Practices for BI Design; Post-Implementation Evaluations, Maintaining Your BI Environment

Unit V Reporting authoring

06 Hours

Building reports with relational vs Multidimensional data models; Types of Reports – List, crosstabs, Statistics, Chart, map, financial etc; Data Grouping & Sorting, Filtering Reports, Adding Calculations to Reports, Conditional formatting, Adding Summary Lines to Reports. Drill up, drill- down, drill-through capabilities. Run or schedule report, different output forms – PDF, excel, csv, xml etc.

Unit VI Deployment, Administration & Security

06 Hours

Centralized Versus Decentralized Architecture, BI Architecture Alternatives, phased & incremental BI roadmap, System Sizing, Measurements and Dependencies, System Sizing, Measurements, and Dependencies. Setting Early Expectations and Measuring the Results. End-User Provisos. OLAP Implementations. Expanding BI Authentication Authorization, Access Permissions, Groups and Roles, Single-sign on Server Administration, Manage Status & Monitoring, Audit, Mail server & Portal integration, Back Up and Restore.

Textbooks

1. Business Intelligence (IBM ICE Publication).

Reference Books

1. Business Management “Derrick Foresight · Tom Hendrix · Gerard Howles · Nathan Sides
2. Dec 2020 · Eفالon Acies · Narrated by Aaron Miller, Doug Greene, Chloe Jacobson and Wes Grant”

List of Assignments

51. Define the structure, scope and importance of BI in the business.
52. Explain the different elements of BI and prepare an authenticate model of the same.
53. Elaborate the importance of BI modelling and prepare one in the real time scenario.
54. What are different types of reports? State the importance of each of them.
55. Explain the different requirements of BI and how do they help in preparing a model.
56. State the significance of the decentralized structure of the BI.

List of Laboratory Exercises

1. Introduction to BI tools, their pros and cons and limitations.
2. Demonstration of BI techniques ETL on Application Financial Analysis.
3. Demonstration of BI techniques ETL on Application Student result pattern and ranking analysis
4. Demonstration of BI modelling preparation and its analysis
5. Demonstration of measuring techniques and their analysis
6. Demonstration of BI various BI reports
7. Demonstration of Sorting and modelling techniques
8. Demonstration of Exploring Excel Modelling capabilities to solve business problems
9. Demonstration of decision tree
10. Demonstration of BI authentication, mail server and portal integration

Project Based Learning

1. Problem definition, identifying which data sorting task is needed.
2. Identify and use a standard methods of data sorting and measuring available for the problem.
3. Prepare a case study on the significance of the BI in light of any business organization.
4. Prepare a case study on the process of building a BI
5. Prepare a case study on the requirement of BI

6. Prepare a case study on the authorising different reports in the Business setting

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

CRYPTOGRAPHY AND NETWORK SECURITY

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	02
		Term Work	25 Marks		
		Oral	25 Marks		
		Total	150 Marks	Total	06

Course Objective:

1. To understand basics of cryptography, how it has evolved, and some key encryption techniques.
2. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

Prerequisite:

Basic knowledge of computer network.

Course Outcomes: On completion of the course, students will have the ability to:

1. To understand basics of Cryptography and Network Security
2. Use symmetric and asymmetric key algorithms for cryptography
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threats in the networks.
5. Be able to configure simple firewall architectures
6. Apply knowledge of network security and cryptography in real life

Unit I

08 Hours

Security Concepts:

Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

Unit II

08 Hours

Symmetric and Asymmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, Blowfish), Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution. Principles of public key cryptosystems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution.

Unit III

08 Hours

Hash and MAC Algorithms : Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures

Unit IV

08 Hours

System Security:

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**08 Hours****Web Security:**

Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. FIREWALL: Firewall Design principles, Trusted Systems.

Unit VI**08 Hours****Case Studies on Cryptography and Security:**

Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

Textbooks

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGrawHill
2. William Stallings, “Cryptography and Network Security”, Pearson Education.

Reference Books

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.Hancock – Elseviers. “Cyber Security Operations Handbook”.
4. Menezes, van Oorschot and Vanstone, “Handbook of Applied Cryptography”.

List of 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 it’s 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

List of Laboratory Exercises

1. Introduction to Cryptography based Security Tools [Key Distribution and Authentication](#)
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.

Project Based Learning

1. Keylogger projects
2. Build your own encryption software
3. Network traffic analysis
4. Caesar Cipher Decoder
5. Antivirus

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

NATURAL LANGUAGE PROCESSING

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

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.
3. To relate mathematical foundations, Probability theory with Linguistic essentials such as syntactic and semantic analysis of text.

Prerequisite:

Students should have knowledge of:

Probabilities and statistics, Algorithms and programming experience.

Course Outcomes: On completion of the course, students will have the ability 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. Apply 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.

Unit I

08 Hours

Introduction of NLP: Knowledge in Speech and Language processing, Various stages of NLP-ambiguity, and models and algorithm, language and understanding, brief history, Why NLP Is Difficult Parts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory: Entropy, perplexity, The relation to language, Cross Entropy NLP-Language and Grammar-Processing: Origins and challenges, Language models: Uni-gram, N-gram –Statistical Language Model, NLP Applications.

Unit II

08 Hours

Natural Language and Formal Language: Text Pre-processing, Regular Expressions, patterns, FA, Formal Language, NFSA, Regular Language and FSAs, Raw Text Extraction and Tokenization, Extracting Terms from Tokens, Vector Space Representation and Normalization, Similarity Computation in Text, lexicon. Phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax.

Unit III

08 Hours

Part-of-Speech Tagging, Speech recognition and Hidden Markov Models: Speech Recognition Architecture The concept of parts-of-speech, Tagging, Tagsets, and Morphology, The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Overview of Hidden Markov models (HMMs). The Viterbi Algorithms Revisited, Advanced Methods for Decoding, Acoustic Processing of Speech, Computing Acoustic Probabilities, Training a Speech Recognizer, Waveform Generation for Speech Synthesis, Human Speech Recognition

Unit IV

08 Hours

Grammars & Parsing Algorithms: Context-free Grammars, Context-Free Rules and Trees, Sentence-Level Constructions, The Noun Phrase, Coordination, Agreement and The Verb Phrase and Subcategorization, Auxiliaries, Spoken Language Syntax, Parsing Regular Grammars, Parsing Context Free Grammars, Example Toy NL Grammar, Shift-Reduce Parsers, Probabilistic Parsing: Introduction, Grammars & Human Processing

Unit V

08 Hours

Matrix Factorization and Topic Modeling: Vector space model, Matrix factorization, Singular Value Decomposition, Nonnegative Matrix Factorization, Probabilistic Latent Semantic Analysis, Latent Dirichlet Allocation, Word2Vec and Doc2Vec, Word-character and sentence embedding, Topic modelling term weighting, homonymy, polysemy, synonymy, Improving user queries. Machine Translation– Overview, Applications of NLP- Spell-checking, Summarization.

Unit VI

08 Hours

Linguistics resources: 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.

Textbooks

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 NLTK – Natural Language Tool Kit - <http://www.nltk.org/>
4. Journals: Computational Linguistics, Natural Language Engineering, Machine Learning, Machine Translation, Artificial Intelligence.

List of Assignments

57. Write note on word normalization and stemming. Explain case folding with suitable example.
58. What is significance of decision tree in sentence segmentation also give implementation of decision tree for suitable example.
59. Discuss challenges of Machine translation. What are classical approaches of machine translation?

60. Case study on IBM translation model.
61. Case study on WordVET and VerbNet
62. Study of Hidden Markov Model and POS tagging
63. Study assignment on Python—Analysing Text with the Natural Language.
64. Research paper reading, analysing and demonstrating.
65. Research paper reading, analysing and demonstrating.
66. Describe different techniques for removal of ambiguity.

List of Laboratory Exercises

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 NLTK Toolkit.
10. Implement program in Python to calculate frequency distribution.

Project Based Learning

1. Question Answering
2. Text Classification
3. Text Summarization
4. Sentiment Analysis
5. Sentence Similarity
6. Speech Recognition
7. Neural Machine Translation
8. Document Summarization
9. Conversational Bots: ChatBots
10. Grammar Autocorrector
11. Summary Writer
12. Image-Caption Generator

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Quantitative Techniques, Communication and Values

TEACHING SCHEME:

Theory: 04Hours / Week

Tutorial: 00Hour / Week

EXAMINATION SCHEME:

Semester End Examination: 60 Marks

Internal Assessment: 40 Marks

CREDITS:

Credits:4

Course Pre-requisites: The students should have knowledge of

- 1 Basic math's and reasoning, and comprehensive ability
- 2 Basic knowledge of communication process, soft skills
- 3 Basic knowledge and idea about leaders and leadership qualities, ethics, etiquettes and values

Course Objective:

The **Quantitative Techniques, Communication and Value** saims 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 communication and values section focuses on the aspects of communication and soft skills such as grooming personality for leading team, presentation, business communication which would enable graduates to project themselves as a professionals in the corporate sector and/or otherwise.

Course Outcomes: The student will be able to

- 1 Solve the aptitude test in the recruitment and competitive exam by applying short techniques and solve the question in less amount of time
- 2 Apply the short mnemonics and techniques to solve the questions of logical reasoning in the placement and competitive exam in lesser time.
- 3 Develop the verbal ability to communicate effectively using suitable vocabulary and proper sentence pattern
- 4 Understand the concept of soft skills and its implication at workplace
- 5 Build up the ability to study employment business correspondences and its proper implications
- 6 Understand business ethics, etiquettes and values and apply them in the professional ventures.

Course Content:

- Unit-I **QUANTITATIVE APTITUDE** :Number system, Percentage, profit and loss, (8 Hrs)
Simple Interest and Compound Interest, Ratio, Proportion and Average,
Mixture and Allegation, Time, Speed & Distance, Time & Work , Permutation
& Combination, Probability, Pipes and Cisterns**
- Unit-II **NON-VERBAL REASONING** : Coding, Decoding, Number series, Blood (8 Hrs)
relation Directions, cubes & dices , Data Interpretation, Data Sufficiency, Set
Theory & Syllogisms, Matching, Selection & Arrangement, Clocks &
Calendars, Visual Reasoning, Input, Output & Flow Chart.**
- Unit-III **VERBAL REASONING:** Sentence Patterns, Sentence correction and spotting (8 Hrs)
errors, Vocabulary, antonyms and synonyms and analogy, Phrasal Verbs,
idiomatic expressions, reading comprehension, closest, sentence rearrangement
and theme detection**
- Unit-IV **SELF AWARENESS AND SOFT SKILLS DEVELOPMENT:** (8 Hrs)
Concept of SWOT, Importance of SWOT, Individual & Organizational SWOT
Analysis, Soft skills, meaning, need and importance, difference between soft
skills and hard skills, life skills and personal skills, Leadership skills,-
Importance ,Types, Attributes of good leader Motivational theories and
leadership ,Emotional intelligence in personal and professional lives its**

importance need and application, Team Building and conflict resolution Skills ,Problem solving skills, Time Management and Stress Management Skills Pareto Principle(80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management

Unit-V COMMUNICATION AND HONING EMPLOYMENT SKILLS: (8 Hrs)

Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effective Technical writing, Email writing and Netiquettes, **Letter writing** – formal letters, job application letter, cover letter, structure of technical report writing, Building Resume and CV, Tips to build an effective Resume Group discussion, Skills required for Group Discussion Interview skills, Ways of handling telephonic interviews, Importance of body language, grooming & etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, ,Structure & flow of presentation,

Unit-VI BUSINESS ETHICS ,ETIQUETTES AND VALUES: (8 Hrs)

The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplace values of a good manager Key features of corporate etiquette, Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the work place, Corporate social responsibility (CSR) its importance and need.

Reference Books:

- 1 Quantitative Aptitude by R. S. Agarwal published by S. Chand
- 2 The Book of Numbers by Shakuntala Devi
- 3 A Modern Approach To Logical Reasoning by R. S. Agarwal published by S. Chand
- 4 A New Approach to Reasoning Verbal & Non-Verbal by Indu Sijwali
- 5 Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition
- 6 Communication Skills by Sanjay Kumar, Pushp Lata, published by Oxford University press, second edition
- 7 Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
- 8 Developing Communication Skills by Krishna Mohan, Meera Banerji published by Macmillan India Pvt Ltd
- 9 Soft Skills by Meenkashi Raman, published by Cengage publishers
- 10 Soft Skills by Dr. K Alex published by Oxford University press
- 11 Soft skills for Managers by Dr. T. Kalyana Chakravarthi and Dr. T. Latha Chakravarthi published by biztantra

Project Based Learning Topics:

- 1 Prepare mock Tests on Unit –I and solve it in given time(use of PSD lab manual)
- 2 Prepare mock Tests on Unit –I and solve it in given time(use of PSD lab manual)
- 3 Prepare online model test based on Unit-II and solve it in specific time(use of PSD lab manual)
- 4 Prepare online model test based on Unit-II and solve it in specific time(use of PSD lab manual)
- 5 Form a model for spoken and written communication skills which avoid grammar mistakes and common errors

- 6 Develop various activity models for enriching and developing vocabulary
- 7 Preparing strategies by using SWOT and TWOS analysis
- 8 Analysing differences between Soft Skills, Hard skills, and Personal skills
- 9 Develop Bruce Tuchman's Team Building Models with classmates/Teammates
- 10 To study different personalities of Leaders from various sectors and find out their attributes and success stories
- 11 Preparing a model for Time Management Skills and Stress Management and conduct activities for effective implementation of it.
- 12 Form a model to develop LSRW and communication Skills
- 13 Conduct mock interview and practice GD activities to build competencies for actual selection process
- 14 Preparing a model for evaluating Values and Ethics of Good Managers
- 15 Preparing a model of dress codes and attire for different professional situations Corporate etiquettes and its implications
- 16 Develop some good activities to understand the importance and need of Corporate social responsibility (CSR)

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Design Thinking

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks		
Practical:	-	Internal Assessment:	40 Marks	Lecture	04
			-		
		Total	100 Marks	Total	04

Course Objective:

1. Recognize the importance of DT
2. Explain the phases in the DT process
3. Apply each phase in the DT process
4. Create value proposition statements as part of their presentations

Prerequisite: Students should be well versed Completion of all units from Semesters 1, 2, 3 and 4

Course Outcomes: On completion of the course, students will have the ability 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

Unit I

08 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

08 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

08 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

08 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 of storytelling in presenting ideas and prototypes, What is Storytelling in DT?

Unit V

08 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

08 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.

Textbooks

1. “Designing for growth: A design thinking tool kit for managers”, by Jeanne Liedtka and Tim Ogilvie., 2011, ISBN 978-0-231-15838-1
2. “Design Thinking: New Product Development Essentials from the PDMA”, by Abbie Griffin, Michael G. Luchs, Scott Swan, Wiley Publications

Reference Books

1. Hooked by Nir Eyal
2. The Art of Creative Thinking by Rod Judkins
3. Start Up nation by Dan Senior and Saul singer
4. Start with Why by Simon Sinek

List of Assignments

67. Identify problem using DT.
68. Use thinking tool for development of the idea.
69. Use DT to develop the solution.
70. Develop a prototype using DT
71. Study the challenges faced during implementing DT in an Organization

Project Based Learning

1. Use of DT to improve classroom education.
2. Use of DT to improve cab services.
3. Use of DT to improve banking system.
4. Use of DT to identify and give solution to a society related problem
5. Use of DT to improve medical services

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

CSE Skill Lab –III

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	00 Hours/Week	University Examination:	-	Lecture	00
Practical:	04 Hours/Week	Internal Assessment:	-	Practical	02
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	50 Marks	Total	02

Course Objective:

To develop analytical skills among the students using data analysis methods and Python.

Prerequisite:

The Students should have knowledge of basics of statistics and python programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand and demonstrate fundamentals of Python programming
2. Demonstrate visualization in Python.
3. Understand basics of normal distribution and linear regression model
4. Design various clusters.
5. Understand basics H plots.
6. Understand basics clustering and segmentations.

Unit I : Introduction to Python Programming

08 Hours

Python programming environment, statements, Expressions, Flow Controls, Functions, Numeric Types, Sequences and Class Definition, Constructors, Text & Binary Files- Reading and Writing.

Visualization in Python: Matplotlib package, Plotting Graphs, Controlling Graph, Adding Text, More Graph Types, Getting and setting values, Patches.

Unit II : Descriptive Statistics:

08 Hours

Type of data- univariate bivariate and multivariate. Descriptive measures - central tendency and dispersion.

Bivariate data-Summarization, marginal and conditional frequency distribution. Regression and correlation. Least squares method. Rank correlation. Graphical representation, Frequency curves, Scatter diagram.

Unit III: Probability Theory

08 Hours

Probability Theory: concept of experiments, sample space, event. Definition of Combinatorial Probability. Conditional Probability, Bayes Theorem.

Probability distribution: Type of data, Bernoulli Distribution, Uniform Distribution, Binomial Distribution, Normal Distribution, Poisson Distribution, Exponential Distribution. Visualization of distribution

Unit IV: Regression

08 Hours

Linear regression: Linear regression model, Model assumptions, Validation of model and model assumptions.

Multiple regression: Multiple linear regression model, Model assumptions, Validation of model and model assumptions

Unit V : Principal Component Analysis:

08 Hours

Principal Component Analysis: Principal components, Algorithm for conducting principal component analysis, deciding on how many principal components to retain, H-plot.

Unit VI: Clustering and Segmentation Analysis:**08 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 Cluster

Textbooks

1. Tim Hall and J-P Stacey “Python 3 for Absolute Beginners”, A press.
2. Wes Mc Kinney. “Python for Data Analysis”, O'Reilly Media, Inc.

Reference Books

1. Jake Vander Plas, “Python Data Science Handbook: Essential Tools for Working with Data” O'Reilly Media
2. David Spiegelhalter “The Art of Statistics” Pelican

List of Laboratory Exercises

72. Introduction to python programming (String operation, Mathematical operation, loops, branching)
73. Write a program to perform basic operations using Python Functions.
74. Write a program to perform to read, write and modify text file data using OO Python.
75. . Implement various pre-defined libraries in Python like Panda, NumPy, Cbor (Drawing of statistical graph)
76. Exercise different functionalities of Matplotlib package.
77. Write a program to measure central tendency and dispersion of given data.
78. Write a program to visualize different types of distributions.
79. Write a program to develop linear and multiple regression model.
80. Implementation of clustering and segmentation

Project Based Learning:**Syllabus for Unit Tests:**

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

B.TECH (Computer Science and Engineering)

SEMESTER – VII

COURSE SYLLABUS

Machine Learning

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

1. To provide a strong formal foundation of Machine Learning concepts and technique

Prerequisite:

Artificial intelligence, Discrete Mathematics, Database Management System, Engineering Mathematics, Programming Languages.

Course Outcomes: On completion of the course, students will have the ability to:

1. To understand the need for Machine learning
2. To explore various data pre-processing methods.
3. To study and understand classification methods
4. To understand the need for multi-class classifiers.
5. To learn the working of clustering algorithms
6. To learn fundamental neural network algorithms

Unit I

06 Hours

Introduction To ML: Introduction to statistics, Comparison of Machine learning with traditional programming, ML vs AI vs Data Science. Introduction to Learning Systems, Structure of Learning System, Testing vs Training, learning vs Designing, Elements of Machine Learning- Data formats, Learnability, Statistical learning approaches, Elements of information theory

Unit II:

06 Hours

Machine Learning Techniques: Introduction to Machine Learning Techniques: Supervised Learning(SL) Vs Semi-Supervised Learning(SSL) vs Unsupervised Learning(USL), Reinforcement Learning, 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- Regression:

06 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-IV- Classification:

06 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 Measure

Unit-V- Unsupervised Learning

06 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:

06 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.

Textbooks

1. K.P. Soman, R. Loganathan, V. Ajay, “Machine Learning with SVM and Other Kernel Methods”
2. C. M. Bishop ,” Pattern Recognition and Machine Learning”, Springer 1st Edition-2013.
3. Ethem Alpaydin, “Introduction to Machine Learning”

Reference Books

1. Tom Mitchell, —Machine learning, McGraw-Hill series in Computer Science, 1997
2. Shalev-Shwartz, Shai, and Shai Ben-David, —Understanding machine learning: From theory to algorithms, Cambridge university press, 2014.
3. Jiawei Han, Micheline Kamber, and Jian Pie, —Data Mining: Concepts and Techniques, Elsevier Publishers Third Edition, ISBN: 9780123814791, 9780123814807
4. Hastie, Trevor, et al., —The elements of statistical learning: data mining, inference, and prediction, Vol. 2. New York: springer, 2009.
5. McKinney, —Python for Data Analysis —, O' Reilly media, ISBN : 978-1-449- 31979-3
6. Trent hauck, —Scikit-learn, Cookbook , Packt Publishing, ISBN: 9781787286382

List of Practical

1. Predict the price of the Uber ride from a given pickup point to the agreed drop-off location.

Perform following tasks:

1. Pre-process the dataset.
2. Identify outliers.
3. Check the correlation.
4. Implement linear regression and random forest regression models.
5. Evaluate the models and compare their respective scores like R², RMSE, etc.

Dataset link: <https://www.kaggle.com/datasets/yasserh/uber-fares-dataset>

2. Classify the email using the binary classification method. Email Spam detection has two states: a) Normal State – Not Spam, b) Abnormal State – Spam. Use K-Nearest Neighbors and Support Vector Machine for classification. Analyze their performance.

Dataset link: The emails.csv dataset on the Kaggle

<https://www.kaggle.com/datasets/balaka18/email-spam-classification-dataset-csv>

3. Given a bank customer, build a neural network-based classifier that can determine whether they will leave or not in the next 6 months.

Dataset Description: The case study is from an open-source dataset from Kaggle. The dataset contains 10,000 sample points with 14 distinct features such as

CustomerId, CreditScore, Geography, Gender, Age, Tenure, Balance, etc.

Link to the Kaggle project:

<https://www.kaggle.com/barelydedicated/bank-customer-churn-modeling>

Perform following steps:

1. Read the dataset.
2. Distinguish the feature and target set and divide the data set into training and test sets.
3. Normalize the train and test data.
4. Initialize and build the model. Identify the points of improvement and implement the same.
5. Print the accuracy score and confusion matrix (5 points).

4. Implement Gradient Descent Algorithm to find the local minima of a function. For example, find the local minima of the function $y=(x+3)^2$ starting from the point $x=2$.

5. Implement K-Nearest Neighbors algorithm on diabetes.csv dataset. Compute confusion matrix, accuracy, error rate, precision and recall on the given dataset.
Dataset link : <https://www.kaggle.com/datasets/abdallahgoub/diabetes>
6. Implement K-Means clustering/ hierarchical clustering on sales_data_sample.csv dataset. Determine the number of clusters using the elbow method.
Dataset link : <https://www.kaggle.com/datasets/kyanyoga/sample-sales-data>

Project Based Learning

1. Zillow Home Value Prediction ML Project ...
2. BigMart Sales Prediction ML Project – Learn about Unsupervised Machine Learning Algorithms
3. Music Recommendation System ML Project
4. Iris Flowers Classification ML Project
5. Stock Prices Predictor using TimeSeries
6. Predicting Wine Quality using Wine Quality Dataset
7. MNIST Handwritten Digit Classification
8. Build a Movie Recommender System MovieLens Dataset

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Internet Of Things

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Lecture	04
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objective: Students will try:

1. To understand fundamentals of Internet of Things (IoT)
2. To learn methodologies for IoT application development
3. To learn the IoT protocols, cloud platforms and security issues in IoT
4. To learn real world application scenarios of IoT along with its societal and economic impact using case studies and real time examples

Prerequisite:

Data structures and algorithms

Course Outcomes: On completion of the course, students will have the ability to:

- 1: Understand the fundamentals and need of Embedded Systems for the Internet of Things
- 2: Apply IoT enabling technologies for developing IoT systems
- 3: Apply design methodology for designing and implementing IoT applications
- 4: Analyze IoT protocols for making IoT devices communication
- 5: Design cloud based IoT systems
- 6: Design and Develop secured IoT applications

Unit I : Introduction to Internet of and Things (IoT) 08 Hours

Introduction: Enabling Technologies of IoT, Logical Design of IoT, IoT communication Models, IoT Communication API's Cloud Services: IAAS, PAAS, SAAS, IoT Specific Cloud Services RFID: Introduction to RFID and its Applications in IoT.

Unit II: PHY/MAC Layer 08 Hours

PHY/MAC Layer: Wireless HART, ZWave, Bluetooth Low Energy, Zigbee Smart Energy Network Layer: IPv4, IPv6, 6LoWPAN, ICMP, RPL, COAP

Unit III: IoT Design Methodology 08 Hours

Transport Layer: (TCP, UDP, DCCP, SCTP)-(TLS, DTLS) Session Layer: HTTP, CoAP, XMPP, AMQP, MQTT

Unit IV: IoT Protocols 08 Hours

Protocol Standardization for IoT, M2M and WSN Protocols, RFID Protocol, Modbus Protocol, Zigbee Architecture. IP-based Protocols: MQTT (Secure), 6LoWPAN, LoRa.

Unit V: IoT Security 08 Hours

Vulnerabilities Security Requirements and Threat Analysis, Misuse Cases, IoT Security Tomography, and Layered Attacker Model, Identity Management and Establishment, Access Control, and Secure Message Communication, Security Models, IoT Security Protocols.

Unit VI: System Software for IoT

08 Hours

Software for IoT Development Boards like Arduino, Raspberry Pi, Beagle Bone, Intel Galileo: IDE, Simulator, Emulator, Debugger, OS , Software Libraries for Internet connectivity Devices, Gateways, Internet, and Web/Cloud Services Software Development Prototyping Online Component API and Web APIs

Textbooks

1. Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on Approach)”, University Press 1st Edition, 2014
2. Jeeva Jose, “Internet of Things”, ISBN-10 : 938617359X, Khanna Book Publishing, 2018
3. Raj Kamal, Internet of Things: Architecture and Design Principle” , ISBN-13: 978-93-5260- 522-4, McGraw Hill Education (India) 2017

Reference Books

1. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning
2. Designing the Internet of Things , Adrian McEwen (Author), Hakim Cassimally
3. HakimaChouchi, “The Internet of Things Connecting Objects to the Web”, ISBN 078 -1-84821-140-7, Wiley Publications Asoke K Talukder and Roopa R Yavagal, “Mobile Computing,” Tata McGraw Hill, 2010.
4. Computer Networks; By: Tanenbaum, Andrew S; Pearson Education Pte. Ltd., Delhi, 4th Edition
5. Data and Computer Communications; By: Stallings, William; Pearson Education Pte.Ltd., Delhi, 6th Edition

List of Laboratory Exercises:

1. Case Studt on IOT Smart Cities,
2. Agriculture,
3. Health and Lifestyle,
4. Industry,
5. Home Automation,
6. Telecom/5G.

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Optimization Techniques

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	University Examination:	60 Marks	Lecture	04
		Internal Assessment:	40 Marks		
		Total	100 Marks	Total	04

Course Objective:

5. To recognize the importance of applications of Optimization Techniques
6. To understand the framework of optimization problem
7. To inculcate modelling skills necessary to describe and formulate optimization problems in design
8. To train the students to solve optimization problems using software tools

Prerequisite: Students should be well versed with concepts of Linear Algebra, Probability and Statistics and Artificial Intelligence, Completion of all semesters 1 to 6

Course Outcomes: On completion of the course, students will have the ability to:

1. To understand the basic principle of optimization.
2. To apply linear programming to real world problem.
3. To analyze constrained and unconstrained optimization techniques.
4. To evaluate optimization using dynamic programming
5. To build problems using integer programming
6. To make student aware about modern optimization techniques

Unit I

08 Hours

Introduction to Optimization: What are optimization techniques, the Importance of Optimization, Mathematical problem formulation, engineering applications of optimization, classification of optimization problems

Unit II

08 Hours

Linear Programming: Standard form of Linear Programming, Graphical Method, Simplex Algorithm, Simplex Criterion, Duality in Linear Programming, Transportation Problem, Assignment Problem. Case study.

Unit III

08 Hours

Non-Linear Programming Introduction to Non-Linear Programming, Examples of Non-Linear Programming, Constrained and Unconstrained Optimization, Gradient Based and Steepest Descent Methods, Methods of Non-Linear Programming. Case Study.

Unit IV

08 Hours

Dynamic Programming: Introduction to Dynamic Programming, Sequential Optimization, Computational Procedure, Discrete Dynamic Programming, Continuous Dynamic Programming. Case Study.

Unit V

08 Hours

Integer Programming: Introduction to Integer Programming, Examples of Linear and Non-Linear Programming, Methods for Integer Programming. Case Study.

Unit VI

08 Hours

Modern Optimization: Genetic Algorithm, Particle Swarm Optimization, Ant Colony Optimization, Neural Network based Optimization, Fuzzy Optimization Techniques

Textbooks

1. S. S. Rao, Engineering Optimization: Theory and Practice, New Age International
2. K. Deb, Optimization for Engineering Design, Prentice Hall of India
3. Hillier & Lieberman, Introduction to Operations Research, TMH

Reference Books

1. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou
2. An introduction to Optimization by Edwin P K Chong, Stainslaw Zak
3. Nonlinear Programming by Dimitri Bertsekas
4. Start with Why by Simon Sinek

Project Based Learning

1. Project optimization plan for business
2. Project on Supply Chain Management
3. Applications of diet or nutrition-based problems
4. Linear Programming in a restaurant style
5. Maximize discount at a bookstore
6. Student project allocation

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective-I Deep Learning

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03Hours/Week	University Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Lecture	03
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

1. To acquire knowledge of Deep Learning Concepts
2. To learn various types of Artificial Neural Networks
3. To gain knowledge to apply optimization strategies

Prerequisite:

Knowledge of Programming, Engineering Mathematics, Artificial Intelligence

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand basic concepts of Deep Learning.
2. Learn concept of Gradient Decent and Regularization
3. Understand different methodologies to create applications using deep nets.
4. Understanding of RNN to model for real-world applications.
5. Design the test procedures to assess the efficacy of the developed model.
6. Examine the case studies of Deep Learning techniques

Unit I

06 Hours

Introduction To Deep Learning: Introduction to Deep Learning: Basics: Biological Neuron, Idea of computational units, History of Deep Learning McCulloch Pitts Neuron, Thresholding Logic, Perceptron's, Perceptron Learning Algorithm, Multilayer Perceptron's (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Feedforward Neural Networks, Representation Power of Feedforward Neural Networks.

Unit II

06 Hours

Gradient Descent and Regularization

Gradient Descent -Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp

Regularization- Concept of Hyper parameters their purpose in training deep learning models, types and examples L1 regularization, L2 regularization and difference between L1, L2 and dropout, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at the input.

Unit III

06 Hours

Convolutional Neural Networks

Convolutional Neural Networks- Convolutional Neural Networks, Architectures, convolution/pooling layers, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Visualizing Convolutional Neural Networks, Guided Backpropagation.

Unit IV

06 Hours

Recurrent Neural Networks- Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs. Encoder, decoder architecture, recursive neural network and difference between feed forward neural network and recurrent neural.

Unit V

06 Hours

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies, and Meta-Algorithms, Representation Learning and transfer learning.

Unit VI

06 Hours

Recent Trends in Deep Learning: Pre-trained models: VGG-16 or ResNet-5, Image net-Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection-Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions, Computer Vision, ChatGPT learning using both supervised and reinforcement learning techniques.

Textbooks

1. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
2. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
3. Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications.

Reference Books

1. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioners Approach",
2. O'REILLY, SPD, ISBN: 978-93-5213-604-9, 2017 Edition 1st.
3. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
4. Giancarlo Zaccane, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
5. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
6. Francois Chollet "Deep Learning with Python", Manning Publications, 2017

List of Laboratory Exercises

1. Implement Simple Programs like vector addition in TensorFlow
2. Implement a simple problem like regression model in Keras.
3. Implement an Image Classifier using CNN in TensorFlow/Keras
4. Implement a Transfer Learning concept in Image Classification.
5. Implement an Autoencoder in TensorFlow/Keras
6. Object detection using Convolution Neural Network
7. Recommendation system from sales data using Deep Learning
8. Perform Sentiment Analysis in the network graph using RNN

Project-Based Learning:

1. Image Classification
2. Visual tracking system
3. Face detection system
4. Digit Recognition System
5. Music genre classification system
6. Drowsiness detection system
7. Image caption generator
8. Detecting Gender and Age:
9. Traffic Sign Classification
10. News Aggregation and Fraud News Detection
11. Language Translations
12. Automatic Handwriting Generation

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective-I Game Theory

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work	25 Marks		
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

1. Knowledge and understanding of game theory at a level required to read current research in economics in applied theory
2. The ability to develop game theory models

Prerequisite: Students should be well versed with concepts of Programming Language, good understanding of Algorithms, Artificial Intelligence

Course Outcomes: On completion of the course, students will have the ability to:

1. To understand game theory strategies.
2. To apply the extended form of games.
3. To analyze how to use bargaining in real life.
4. To evaluate the working of repeated games.
5. To create real time static game.
6. To understand dynamic games of incomplete information.

Unit I 06 Hours

Games in Strategic Form: Decision Theory versus Game Theory, Equilibrium Analysis, Nash Equilibrium, Finding Nash Equilibria in 3 x 3 Games, Games with Infinity Strategy Sets.

Unit II 06 Hours

Games in extension form: Dynamic Games, Game Theory and Experiments, Self-Confirming, Backward Induction, Subgame -Perfect Equilibrium

Unit III 06 Hours

Applications of multistage games with observed actions: Bargaining, Political Economy of Institutional Reform.

Unit IV 06 Hours

Introduction to repeated games: Repeated Games, Folk Theorem for Supportable Equilibrium Payoffs, Minimax Payoffs.

Unit V 06 Hours

Static games of incomplete information: Bayesian Games, The role of Uncertainty, Baye's Rule, Bayesian Nash Equilibrium

Unit VI 06 Hours

Dynamic games of incomplete information: Sequential Equilibrium and Perfect Bayesian Equilibrium. Signaling Games, Social Learning, Reputation Effects and the Chain Store Game.

Textbooks

1. Fudenberg, D. and J. Tirole: Game Theory
2. "Game theory for applied economists," by Robert Gibbons
3. "Games of strategy" by Dixit, Skeath, and Reily

Reference Books

6. Game Theory: An Introduction by Steven Tadelis
7. A Course in game Theory by Osborne M. and A. Rubinstein
8. The Theory of Learning in games by Fudenberg, D. and D. Levine

List of Laboratory Exercises

Subject teacher can give any suitable laboratory experiments.

Project Based Learning

1. Rock Paper Scissor
2. Gambit Play
3. Prisoner's Dilemma
4. The Battle of Sexes
5. The k-server problem

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Elective-I Semantic Web

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term work:	25 Marks		
		Oral:	25 Marks		
		Total	150 Marks	Total	04

Course Objective:

1. To Introduce Semantic Web Vision
2. Understanding about XML,RDF,RDFS,OWL

Prerequisite: Students should be well versed with concepts of Web Technology and HTML.

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand the semantic web Vision and technologies
2. To analyse the descriptive logic with language extension
3. To understand the XML queries in detail
4. To understand and reflect on the principles of Ontology Engineering
5. To analyse query ontologies using SPARQL
6. Understanding about Data Web (Linked open data Cloud)

Unit I **06 Hours**

Foundation of Semantic Web Technologies

Introduction, Current web vs Semantic Web, Semantic Web Technologies, A layered approach.

Unit II **06 Hours**

Descriptive Logic

Introduction, Definition of the basic formalism, Reasoning algorithms, Language extensions

Unit III **06 Hours**

Structured Web Documents in XML

Introduction, XML, Structuring, Namespaces, Addressing and querying XML document, Processing

Unit IV **06 Hours**

Web Ontology Language: OWL

Introduction, OWL and RDF/RDFS, Three Sublanguages of OWL, Description of the OWL Language, Layering of OWL, Examples OWL in OWL

Unit V **06 Hours**

SPARQL

SPARQL simple Graph Patterns, Complex Graph Patterns, Group Patterns,
Queries with Data Values, Filters
OWL Formal Semantics,

Unit VI

06 Hours

Linked Open data

Introduction, Principles of Linked Data, Web of Data, LOD Cloud,
Linked Data Source : Dbpedia, Freebase

Textbooks

1. A Semantic Web Primer by Grigoris Antoniou Frank van Harmelen, The MIT Press Cambridge
2. Foundation of Semantic Web Technologies, Pascal Hitzler, Markus and Sebastian
3. Linked Data : Evolving the Web into a Global Data space by Tom Heath, Christian Bizer , Morgan & Claypool publication

Reference Books

1. Basic Description Logic by Franz Baader, Warner Nutt

List of Assignments

1. Working with XML,
2. Working with XML Schema, DTD
3. Design Of Ontology using RDF
4. Design RDF document with different Serialization format (e.g. turtle,N-triple)
5. Design Of Ontology using RDFS
6. Design Of Ontology using OWL

Project Base Learning:

1. Case study : Pizza Ontology
2. Querying Ontology using SPARQL
3. Design of any domain specific Ontology in Protégé
4. Case Study : Dbpedia
5. Case study : LOD Cloud

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective -I Text Mining

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks	Credits	
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objectives:

1. To provide an overview of common text mining and social media data analytic activities.
2. To understand the complexities of processing text and network data from different data sources.
3. To enable students to solve complex real-world problems for sentiment analysis and Recommendation systems.

Prerequisite:

Mathematical analysis; Linear Algebra; Probability and Statistics; Machine Learning; Basic programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. To examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system
2. To explore DWH and OLAP, and devise efficient and cost-effective methods for maintaining DWHs.
3. To discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes
4. To comprehend the roles that data mining plays in various fields and manipulate different data mining techniques
5. To evaluate systematically supervised and unsupervised models and algorithms with respect to their accuracy.

Unit I

06 Hours

Introduction to Text Mining: Text Data and Where to Find Them? unstructured vs. (semi-)structured data, Data File Types, Metadata, Steps to Create Quality Metadata, Digital Data Creation, Different Ways of Getting Data, Web Scraping/Screen Scraping, What is text mining- benefits and limitations.

Unit II

06 Hours

Text Pre-Processing: Level of Text Representation, Text Transformation, Dictionary Creation, Text Pre-Processing, Tokenization, Stemming, Stopwords, Lemmatization, Object Standardization, Semantic Parsing, Bag of Words (BOW), N-Grams, Term Frequency-Inverse Document Frequency (TF-IDF), Syntactical Parsing, Parts-of-Speech Tagging (POS), Named Entity Recognition (NER), Word Embedding

Unit III

06 Hours

Topic Modeling: Topic Evolution, Application and Visualization, Available Tools and Packages, When to Use Topic Modeling, When *Not* to Use Topic Modeling, Methods and Algorithms, Topic Modeling and Libraries mixture models and how they work, Expectation-Maximization (EM) algorithm and how it can be used to estimate parameters of a mixture model, the basic topic model, Probabilistic Latent Semantic Analysis (PLSA), and how Latent Dirichlet Allocation (LDA) extends PLSA.

Unit IV

06 Hours

Mining Textual Data: Text Clustering, Clustering techniques, Text Classification

Unit V

06 Hours

Network Text Analysis: Two-Mode, Networks, Centrality, Measures, Graph Algorithms, Comparison of Network Text Analysis with Others, Available Tools and Packages, Applications, Advantages, Limitations, Topic Maps, Constructs of Topic Maps, Topic Map Software Architecture, Typical

Unit VI

06 Hours

Sentiment Analysis: Levels of Granularity, analyzing topics in text, Approaches for Sentiment Analysis, How to Perform Sentiment Analysis, Available Tools and Packages, Latent Aspect Rating Analysis (LARA)

Textbooks:

1. Michael Geatz and Richard Roiger, Data Mining: A Tutorial Based Primer, Pearson Education
2. Thomas W. Miller, Data and Text Mining: A Business Applications Approach, Pearson Education
3. Markus Hofmann, Andrew Chisholm, Text Mining and Visualization: Case Studies Using Open-source tools, CRC press, Taylor & Francis, 2016

Reference Books:

1. Murugan Anandarajan, Practical Text Analytics: Maximizing the Value of Text Data, Springer; 2018
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education
3. R. Baeza-Yates and B. Ribeiro-Neto, Modern Information Retrieval, Pearson Education, 1999

List of Assignments :

1. Demonstrate advantages and disadvantages of Text Mining.
2. different terms used in text pre-processing.
3. Explain different algorithms used in topic modeling.
4. Explain text clustering and text classification?

List of Laboratory Exercises:

1. Interpret the contribution of text mining to generate new knowledge from natural language text
2. Extract useful information from the textual data using various classifiers and Predictors
3. Identify the various components of a web that can be used for mining process
4. Analyse social media data using appropriate web mining techniques
5. Discover interesting patterns from Social Media Networks using linear methods and models
6. Provide solutions to the emerging problems of social media analytics with sentiment analysis and opinion mining

Project Based Learning:

1. systems to find promising targets for drug discovery,
2. Application to match CVs to job profiles,
3. System to carry out business news analysis for competitive intelligence,
4. System to aid discovery of disease-gene associations,
5. System to monitor reports of terrorist activity,
6. System to help generate hypotheses for scientific research,
7. System to direct customer queries to appropriate support staff,
8. System to discover positive and negative opinions on topics of interest,
9. System to discover hot topics and trends.

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit – VI

CSE Skill Lab IV

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
			Marks		Credits
Lecture:	00 Hours/Week	University Examination:	00 Marks	Lecture	00
Practical:	04 Hours/Week	Internal Assessment:	00 Marks	Practical	02
		Term Work	25 Marks		
		Practical	25 Marks		
		Total	50 Marks	Total	02

Course Objective:

The objective of this course is to teach the learner how to use Object Oriented paradigm to develop code and understand the concepts of Core Java and to cover-up with the pre-requisites of Core java.

Prerequisite:

Object Oriented Programming and C++,java

Course Outcomes: On completion of the course, students will have the ability to:

1. Object oriented programming concepts using Java.
2. Knowledge of input, its processing and getting suitable output.
3. Understand, design, implement and evaluate classes and applets.
4. Knowledge and implementation of AWT package.
5. Use Java APIs for program development.
6. Handle abnormal termination of a program using exception handling

Unit I

08 Hours

Introduction: History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name

Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.

Unit II

08 Hours

Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement

Iterations: The While Loop, The Do ... While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement

Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection.

Unit III

08 Hours

Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From

An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.

Packages: Creating Packages, Default Package, Importing Packages, Using Package.

Unit IV

08 Hours

Enumerations, Arrays: Two Dimensional Arrays, Multi- Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.

Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.

Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause

Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file

Unit V

08 Hours

Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, TextFields, Text, Scrolling List, Scrollbars, Panels, Frames **Layouts:** Flow Layout, Grid Layout, Border Layout, Card Layout.

Unit VI

08 Hours

Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class

AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, Checkbox, Radio Button, Choice, List, Menu, Text Field, Text Area

Textbooks

1. Herbert Schildt, Java The Complete Reference, Ninth Edition, McGraw-Hill Education, 2014

Reference Books

- 1) E. Balagurusamy, Programming with Java, Tata McGraw-Hill Education India, 2014
- 2) Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press
- 3) Core Java Volume I - Fundamentals By Cay S. Horstmann, 11th Edition, Prentice Hall
- 4) The Complete Reference By Herbert Schildt, 11th Edition, McGraw Hill Education
- 5) Java Beginners Guide By Herbert Schildt, 8 th Edition, McGraw-Hill Education

List of Laboratory Exercises

1. WAP to find the average and sum of the N numbers Using Command line argument.
2. WAP to Demonstrate Type Casting.
3. WAP to find the factorial of a given number using Recursion
4. WAP to handle the Exception using try and multiple catch block.

5. WAP to design a class using abstract Methods and Classes
6. WAP to Create a package that access the member of external class as well as same package
7. WAP that show the partial implementation of Interface.
8. WAP to Handle the user defined Exception using throw keyword.
9. WAP to calculate the Simple Interest and Input by the user.
10. WAP to Test the Prime number.

Project Based Learning:

1. Online bank management system.
2. Smart city project.
3. Online survey system.
4. Supply chain management system.
5. e-healthcare management system.
6. Data visualization software.

Project Stage -I

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: Hrs/Week	End Semester Examination: 00 Marks	Theory
Practical: 2 Hrs/Week	Continuous Assessment: 00 Marks	
Tutorials: Hrs/Week		
	Oral: Marks 50	Oral: 03
	Term Work : Marks 50	
	Total Marks 100	Total 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: On completion of the course, students will have the ability to:

7. Review and understand how previous experiences had an impact on affective states and intellectual performance
 8. Identify and define the problem.
 9. Decide critically to solve the problem.
 10. Demonstrate the ability to synthesize complex information from a variety of sources in decision-making.
 11. Predict and develop a group process and desired outcomes.
 12. 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

INTERNSHIP

<u>TEACHING SCHEME</u>		<u>EXAMINATION SCHEME</u>		<u>CREDIT SCHEME</u>	
Lecture:	Hrs/Week	End Semester Examination: 00 Marks		Theory	
Practical:	Hrs/Week	Continuous Assessment: 00 Marks			
Tutorials:	Hrs/Week				
		Oral:	Marks 25	Oral:	03
		Term Work	Marks 25		
		Total	Marks 50	Total	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: On completion of the course, students will have the ability to:

- Propose a solution to solve real world problems with the help of technology.
- Apply software engineering principles.
- Evaluate and compare the various methodologies to solve a real-world problem.
- Report hands on experience of using modern software development tools.
- Assess their skills, values, beliefs, interests and personal abilities and act in congruence with them.
- Identify social and ethical responsibilities and develop skills to compete for lifelong learning.

As a part of the B. Tech Computer Science Engineering curriculum, Industrial Training is a Practical course, which the students B. Tech Computer Science Engineering should undergo in reputed Private / Public Sector / Government organization / companies as industrial training of 60 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 VI

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:

- Length of training
- Preliminary information
- 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.
- Finally, a conclusion should include comprehensive comments on the type and value of experience gained, and how this relates to your professional career.
- 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.

B.TECH (Computer Science and Engineering)
SEMESTER – VIII
COURSE SYLLABUS

Data Visualization and Reporting

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03	University	60	Theory	03
	Hours/Week	Examination:	Marks		
Tutorial	01 Hour/Week	Internal Assessment:	40 Marks	Tutorial	01
		Term Work	25 Marks		
		Total	125 Marks	Total	04

Course Objective:

1. To understand the mechanism of Data visualization and Reporting.
2. To understand the functionality of current implementation of Data Visualization and Reporting.
3. To design virtual reality of current trends.

Prerequisite:

Business Intelligence System, Data Mining, Machine learning

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand fundamentals of data visualization concepts.
2. Understand and Apply data visualization stages on chosen data.
3. Develop a toolkit for exploring and communicating complex data using visualization
4. Describe how effectively a visualization conveys target data
5. Understand data customization parameters in Tableau.
6. Design various Virtual Reality Applications.

Unit I

06 Hours

Introduction to Visualization: Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

Unit II

06 Hours

Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson 's Affordance theory – A Model of Perceptual Processing.

Unit III

06 Hours

Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three-Dimensional Data - Dynamic Data - Combining Techniques.
Geospatial Data: Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization

Multivariate Data: Point-Based Techniques - Line Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks

Unit IV

06 Hours

Introduction to Tableau: Dive into Tableau, Connecting Data Sources, Tableau Generated Fields, Data Manipulation in Tableau, Working with Dates in Tableau
Data Customization with Calculations: Adding Dynamism to a View with Parameters, Geographical Analysis & Maps, Creating Visualizations, Adding Statistics to Data, Formatting & Annotation, Dashboards & Stories
Introduction to Zohosheet: Import data from a variety of data sources for in-depth analysis.

Unit V

06 Hours

Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space -Data Space -Attribute Space- Data Structure Space - Visualization Structure - Animating Transformations -Interaction Control

Unit VI

06 Hours

Current Trends
Design – Virtual Reality: Tools used for Creation of Virtual Reality, Interactive Medical Application – Tactile Maps for visually challenged People – Animation Design for Simulation – Integrating Spatial and Nonspatial Data – Innovating the Interaction

Textbooks and Reference Books

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010.
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Morgan Kaufmann Publishers, 2004.
3. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2 nd Edition, 2007.
4. Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd, 2008
5. Joerg Osarek, “Virtual Reality Analytics”, Gordon’s Arcade, 2016.
6. <https://www.tableau.com/products/techspecs>
7. <https://www.tableau.com/tft/activation>
8. Visualization Analysis & Design by Tamara Munzner (2014) (ISBN 9781466508910)

List of Assignments

1. Explain the process which you use to transform raw data into visualization.
2. Explain the stages in data visualization.
3. List and explain most common problems in data visualization.

4. Explain characteristics of data visualization.
5. Describe interaction concepts in data visualization.

List of Laboratory Exercises: (Practicing below mentioned lab exercises will help students in Project based learning)

1. Demonstrate Tableau Desktop by connecting to the dataset.
2. Filter and sort data by using Tableau.
3. Create common visualizations like bar chart, line chart.
4. Assemble dashboard layout by using dashboard filters
5. Create simple calculations in Tableau.
6. Demonstrate interactivity with text and visual tooltips.
7. Create more advanced chart types
8. Create a data story in Tableau.

Project-Based Learning:

1. Develop a system to apply data customization with calculations.
2. Collect data source and connect it with the existing data through Tableau to show various fields.
3. Apply geographical analysis for any data set.
4. Design dashboard for given data set.
5. Design stories by using data visualization.
6. Design – Virtual Reality: Interactive Medical Application.
7. Design – Virtual Reality: – Tactile Maps for visually challenged People

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Augmented and Virtual Reality

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>		
	Hours/Week		Marks		Credits	
Lecture:	04	University Examination:	60 Marks			
	Hours/Week					
Practical	02	Internal Assessment:	40 Marks	Lecture	04	
:	Hours/Week			Term Work	Oral	01
				Oral	25 Marks	
		Total	125 Marks	Total	05	

Course Objective:

1. To gain knowledge of historical and modern overviews and perspectives on virtual reality.
2. TO Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction Techniques related to VR/AR
3. Discuss and Examine VR/AR Technologies

Prerequisite:

Mathematics, Physics, Programming and Problem Solving, Engineering Graphics, Solid Modelling and Drafting, Numerical & Statistical Methods, Mechatronics, Artificial Intelligence & Machine Learning, Computer-Aided Engineering

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand fundamental Computer Vision, Computer Graphics and Human-Computer Interaction Techniques related to VR/AR
2. Understand Geometric Modeling Techniques
3. Understand the Virtual Environment
4. Analyze and Evaluate VR/AR Technologies
5. Apply various types of Hardware and Software in Virtual Reality systems
6. Design and Formulate Virtual/Augmented Reality Applications

Unit I

08 Hours

Introduction to Augmented and Virtual Reality: Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR,VR, and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.

Unit II

08 Hours

VR Systems: VR as a discipline, Basic features of VR systems, Architecture of VR systems, **VR hardware:** VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.

Unit III

08 Hours

Computer Graphics and Geometric Modelling: The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modeling, 3D clipping, Illumination models, Reflection models, Shading algorithms, Geometrical Transformations: Introduction, Frames of reference, Modelling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection

Unit IV

08 Hours

Virtual Environment Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices) Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system

Unit V

08 Hours

Augmented Reality (AR)

Taxonomy, Technology, and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, enhancing interactivity in AR Environments, Evaluating AR systems

Unit VI

08 Hours

Development Tools, Frameworks, and AR / VR Applications

Human factors: Introduction, the eye, the ear, the somatic senses

Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems

Software: Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML

AR / VR Applications: Introduction, Engineering, Entertainment, Science, Training, Game Development, VR Technology in Film & TV Production. VR Technology in Physical Exercises

Textbooks

1. Coiffet, P., Burdea, G. C., (2003), "Virtual Reality Technology," Wiley-IEEE Press, ISBN: 9780471360896
2. Schmalstieg, D., Höllerer, T., (2016), "Augmented Reality: Principles & Practice," Pearson, ISBN: 9789332578494
3. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), "Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications," Springer, ISBN: 9783030941017

Reference Books

1. Craig, A. B., (2013), "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, ISBN: 9780240824086
2. Craig, A. B., Sherman, W. R., Will, J. D., (2009), "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann, ISBN: 9780123749437
3. John Vince, J., (2002), "Virtual Reality Systems," Pearson, ISBN: 9788131708446
- Anand, R., "Augmented and Virtual Reality," Khanna Publishing House

List of Laboratory Exercises

1. Study of different game engines
2. Implementation of Video/ Feature Viewing
3. Implementation of Virtual tour
4. Implementation of material animation
5. Implementation to show portal planets

6. Explore projects in Unity 2D and 3D

Project-Based Learning:

1. Modern Apartment Walk Simulation using Virtual Reality
2. Farming in Village Simulation Using VR Tractor
3. Large Warehouse Simulation with Forklift Virtual Reality
4. Industry safety training simulation virtual reality
5. Control and monitoring of IoT devices using mixed reality in unity engine using Arduino
6. Factory machine simulation using virtual reality.
7. Augmented Reality in Education
8. Product video promotion app using augmented reality.
9. AR in the automotive industry
10. Graphics processor unit using virtual reality.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Block Chain and Digital Currency*

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03	University Examination:	60 Marks		
	Hours/Week				
Practical:	02	Internal Assessment:	40 Marks	Lecture	03
	Hours/Week	Term Work	-	Practical	01
		Practical	25 Marks		
		Total	125 Marks	Total	04

Course Objective:

1. To understand the mechanism of Blockchain and Cryptocurrency.
2. To understand the functionality of current implementation of blockchain technology.
3. To understand the required cryptographic background.
4. To explore the applications of Blockchain to cryptocurrencies and understanding limitations of current Blockchain.
5. An exposure towards recent research

Prerequisite:

Computer Networks; Operating Systems; Cryptography and Network Security.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the importance of Blockchain technology
2. Interpret the fundamentals and basic concepts in Blockchain
3. Interpret the need and working of crypto currency
4. Recall about Bitcoin and Ethereum
5. Summarize the different technologies and latest trends in Blockchain
6. Analyze the importance of blockchain in finding the solution to the real-world problems.

Unit I - INTRODUCTION TO BLOCKCHAIN

06 Hours

Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain

Unit II - COMPONENTS OF BLOCKCHAIN

06 Hours

Components of Blockchain: Core components of Blockchain, Types of Block chains; Blockchain Protocol, Permission & Permission less Block chains

Unit-III- CRYPTOCURRENCIES AND BITCOIN

06 Hours

Introduction to Cryptocurrencies, Tokens – Cryptosecurities, Players involved - Cryptocurrency Users, Miners, Cryptocurrency exchanges, Trading platforms, Wallet providers, Coin inventors, Coin offerors. Distributed Ledger Technology (DLT), Bitcoin (BTC) – Genesis Block, Buy Bitcoin, Transactions, Unspent Transaction Output (UTXO), Bitcoin Mining, Value of Bitcoin, Advantages and Disadvantages,

Unit-IV- ETHEREUM CRYPTOCURRENCY

06 Hours

Ethereum (ETH) – Smart Contracts, UTXO, Types of Accounts - Externally controlled accounts and Contract account, Merkle Tree, Ether, Components of Ethereum Transaction, DApps, Hard & Soft Fork, Bitcoin Stack versus Ethereum Stack.

Unit-V- ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS

06 Hours

Cloud-based block chain, Multi chain, Geth , Stellar , Ripple, R3 Corda, Blockchain API, Blockchain Sandboxes

Unit VI- BLOCK CHAIN USE CASES

06 Hours

Block Chain Use Cases: Supply Chain Management, Finance, Health Care, Internet of Things (IoT), Remittance, Land Records, Voting and election, Loyalty Programs, Go Green (Renewable Energy)

Textbooks

1. Artemis Caro, “Blockchain: The Beginners Guide to Understanding the Technology Behind Bitcoin & Crypto currency”.
2. Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley
3. Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

Reference Books

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

List of Practical

1. Installation of MetaMask and study spending Ether per transaction.
2. Create your own wallet using Metamask for crypto transactions
3. Write a smart contract on a test network, for Bank account of a customer for following operations:
 - Deposit money
 - Withdraw Money

Show balance

4. Write a program in solidity to create Student data. Use the following constructs:
 - Structures
 - Arrays
 - Fallback

Deploy this as smart contract on Ethereum and Observe the

transaction fee and Gas values

5. Write a survey report on types of Blockchains and its real time use cases
6. Write a program to create a Business Network using Hyperledger
7. **Mini Project** - Develop a Blockchain based application dApp (de-centralized app) for e-voting system.

Project Based Learning

1. Trusted Crowdfunding Platform Using a Smart Contract.
2. Exact Shipment Location Data.
3. Peer To Peer Ridesharing.
4. A Fake Product Identification System.
5. Transparent and Genuine Charity Application.
6. Blockchain-Based Voting System.
7. Anti-Money Laundering System using Blockchain

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective-II PATTRN RECOGNITION

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Oral	01
		Term Work & Practical			
		Oral	25 Marks		
		Total	125 Marks	Total	04

Course Objective:

To develop the mathematical tools required for the pattern recognition.

Prerequisite:

It is assumed the students have a working knowledge of calculus, linear algebra, and probability theory. It is also assumed the students have some experience programming in a scientific computing environment.

Course Outcomes: On completion of the course, students will have the ability 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 apply the concept of pattern recognition and its different phases.
4. To develop understanding of models, paradigms and context of interactions
5. To apply knowledge/ skills for solving real world problems
6. To learn about applications of pattern recognition

Unit I

06 Hours

Background:

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

06 Hours

Image Enhancement:

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

06 Hours

Basics of Pattern Recognition:

Introduction and examples, Clustering vs. Classification; Supervised vs. unsupervised, Decision Boundaries, Decision region/ Metric spaces/ distances, Object detection.

Unit IV

06 Hours

Different Paradigms of Pattern Recognition:

Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors; Bayes Decision Theory

Unit V**06 Hours****Clustering and Classification:**

Clustering: Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Minimum within cluster distance criterion. K-means algorithm, DBSCAN-Density-based Spatial clustering of application with Noise.

Unit VI**06 Hours****Applications and Linear discriminant functions:**

Gradient descent procedures; Perceptron; Support vector machines

Textbooks

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Reference Books

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.

List of Assignments

1. To enhance contrast using Histogram Equalization
2. Write and explain K-means algorithm.
3. Write and explain DBSCAN.
4. Case study on radiographic images to reduce noise in image.
5. Case study on pattern recognition.

List of Laboratory Exercises

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.

Project Based Learning

1. Iris Flowers Classification
2. Face Recognition
3. Digit Recognition
4. Wine Quality Analysis
5. Speech Emotion Recognition

Syllabus for Unit Tests:

Unit Test -1
Unit Test -2

Unit – I, Unit – II, Unit - III
Unit – IV, Unit – V, Unit - VI

Elective-II Industrial IOT

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
Hours/Week		Marks		Credit	
Lecture:	03Hours/Week	University	60 Marks	Lecture	03
Practical	02Hours/Week	Internal Assessment:	40 Marks	Oral	01
		Oral	25 Marks		
		Total	125 Marks	Tota	04

Course Objective:

To understand fundamentals of Internet of Things (IoT)

Prerequisite:

Digital Electronics, DC, MPMC, CN, Python programming

Course Outcomes:

1. Identify the components of IOT
2. Analyses networking protocols in IOT
3. Evaluate the connectivity technologies in in IOT
4. Understand Wireless Sensor networks
5. Understand applications of IOT
6. Comprehend Architecture of Raspberry Pie

Unit I Introduction to IOT

06 Hours

Technologies involved in IoT development, Infrastructure, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards, Types of Sensors and Actuators.

Unit II Networking in IOT

06 Hours

Internet web and Networking technologies, Functional components of IOT, IOT gateways, IP V4 and IPV6, IOT protocols- MQTT , Components and methods, CoAP, XMPP,AMQP.

Unit III Connectivity Technologies

06 Hours

Communication protocols like 802.15.4, Zigbee, 6LOWPAN, Bluetooth, Wireless HART, RFID, Z Wave. Remote monitoring and sensing, remote controlling, and performance analysis

Unit IV Sensor Networks

06 Hours

Wireless sensor networks, Sensor nodes, Sensor web, social sensing in WSN, Target Tracking, WSN coverage, Stationary and mobile WSN, Mobile nodes, Role of M2M in IoT, SCADA (Supervisory control and data acquisition)

Unit V Smart cities and Smart Homes

06 Hours

Privacy and Trust in IoT-Data-Platforms for Smart Cities, Smart Economy, Data Aggregation for the IoT in Smart Cities, Data fusion, Smart parking, smart home infrastructure, HAN network standards and architecture

Unit VI Introduction to Raspberry Pi

06 Hours

Specifications, Architecture, Basic set up, Integration of sensors and actuators, Capturing Image with Raspberry Pi, Implementation of IOT with with Raspberry Pi

Textbooks

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, November 2013,
 - a. John Wiley and Sons
3. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, January 2012, McGraw Hill Professional

Reference Books

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”. 1st Edition. Apress Publications. 2013
2. Cuno Pfister, Getting Started with the Internet of Things, O’Reilly Media, 2011. ISBN: 978- 1-4493- 9357

List of Laboratory Exercises

1. Identify different types of sensors and Actuators
2. To Install Raspian on SD card
3. Use Python-based IDE (integrated development environments) for the
4. LED Interfacing with Raspberry Pi
5. To interface push button with Raspberry Pi
6. To interface Bluetooth Raspberry Pi
7. To interface temperature sensor with Raspberry Pi
8. To interface camera with Raspberry Pi to capture image
9. Study MQTT protocol
10. Project

Project Based Learning

1. Home Automation System.
2. Car Parking Management System.
3. Health Monitoring System.
4. Air & Noise Pollution Monitoring System.
5. Smart Street Light Monitoring System.

Syllabus for Unit Tests:

Unit Test -1

Unit Test -2

Unit – I, Unit – II, Unit - III

Unit – IV, Unit – V, Unit - VI

Elective-II Information Retrieval

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	03 Hours/Week	University Examination:	60 Marks	Lecture	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Oral	01
		Oral	25 Marks		
		Total	125 Marks	Total	04

Course Objective: Students will try:

1. To learn the fundamentals of information retrieval system.
2. To classify various Information retrieval models.
3. To demonstrate the query processing techniques and operations
4. To compare the relevance of query languages for text and multimedia data
5. To evaluate the significance of various indexing and searching techniques for information retrieval.
6. To develop an effective user interface for information retrieval.

Prerequisite:

Data structures and algorithms

Course Outcomes: On completion of the course, students will have the ability to:

1. define and describe the objectives the basic concepts of Information retrieval system.
2. evaluate the taxonomy of different information retrieval models.
3. solve and process text and multimedia retrieval queries and their operations
4. compare the relevance of query languages for text and multimedia data
5. evaluate the significance of various indexing and searching techniques for information retrieval
6. develop an effective user interface for information retrieval.

Unit I: Introduction

06 Hours

Motivation, Basic Concepts, The retrieval Process, Information System: Components, parts and types on information system; Definition and objectives on information retrieval system

Unit I: IR Models

06 Hours

Modelling: Taxonomy of Information Retrieval Models, Retrieval: Ad-hoc and filtering, Formal Characteristics of IR models, Classic Information Retrieval, Alternative Set Theoretic models, Probabilistic Models, Structured text retrieval Models, models for Browsing; Multimedia IR models: Data Modelling

Unit III: Query Processing and Operations

06 Hours

Query Languages: Keyword based Querying, Pattern Matching, Structural Queries, Query Protocols; Query Operations: User relevance feedback, Automatic local analysis, Automatic global analysis, Multimedia IR Query Languages

Unit IV: Text Processing

06 Hours

Text and Multimedia languages and properties: Metadata, Markup Languages, Multimedia; Text Operations: Document Pre-processing, Document Clustering, Text Compression, Comparing Text Comparison Technique.

Unit V: Indexing and searching

06 Hours

Inverted files, other indices for text, Boolean Queries, Sequential Searching, Pattern Matching, Structural Queries, Compression; Multimedia IR: Indexing and Searching: - Spatial Access Methods, A Generic Multimedia indexing approach, one dimensional time series, two-dimensional color images, Automatic Feature extraction; Searching Web: Challenges, Characterizing the web, Search Engines. Browsing, Meta searches, searching needle in haystack, Searching using Hyperlinks

Unit VI: User Interface and Visualization

06 Hours

Human Computer interaction, the information access process, starting points, query specifications, context, using relevance judgments, interface support for the search process

Textbooks

1. Modern Information Retrieval, Ricardo Baeza-Yates, Berthier Ribeiro- Neto, ACM Press- Addison Wesley
2. Information Retrieval Systems: Theory and Implementation, Gerald Kowaski, Kluwer Academic Publisher
3. Storage Network Management and Retrieval by Dr. Vaishali Khairnar, Nilima Dongre, Wiley India

Reference Books

1. Introduction to Information Retrieval by Christopher D. Manning and Prabhakar Raghavan, Cambridge University Press
2. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons
3. Introduction to Modern Information Retrieval. G.G. Chowdhury. Neal Schuman

List of Laboratory Exercises:

1. Write a program to demonstrate bitwise operation.
2. Implement Page Rank Algorithm.
3. Implement Dynamic programming algorithm for computing the edit distance between strings s1 and s2. (Hint. Levenstein Distance)
4. Write a program to Compute Similarity between two text documents.
5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
6. Implement a basic IR system using Lucene.
8. Write a program for mining Twitter to identify tweets for a specific period and identify trends and named entities
9. Write a program to implement simple web crawler
10. Write a program to parse XML test, generate web graph and compute topic specific page rank

Project Based Learning:

1. Information retrieval of documents using user generated query
2. Processing, Retrieving, and Ranking Documents in a Wikipedia collection
3. Sentiment analysis for Twitter
4. Chemistry community analysis
5. Email processing utilities for smartphones/email client

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

Elective-II Knowledge Management System

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks	Credits	
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Oral	25 Marks	Oral	01
		Total	125 Marks	Total	04

Course Objective:

- The objective of this course is to prepare students to understand the current theories, practices, tools and techniques in knowledge management (KM) to deal with the challenges with the organization and management of knowledge.

Prerequisite:

System Testing, Data Mining

Course Outcomes: On completion of the course, students will have the ability to:

- Understand a knowledge management system.
- Create a knowledge management plan to leverage opportunities to create, capture, represent and share knowledge.
- Analyze the role of knowledge management in attainment of financial objectives, quality and process improvement, and innovation.
- Apply knowledge management models and technologies to situations.
- Understand a knowledge management system tools.
- Understand a knowledge management system ethical.

Unit I **06 Hours**

Introduction to KM: History of KM, Importance of KM, Information Management to Knowledge Management, K M Cycle, Industrial Economy to Knowledge Economy

Unit II **06Hours**

KM Cycle: Knowledge creation, capturing tacit knowledge, Types of knowledge and its implications for KM

Unit III **06 Hours**

Knowledge codification and system development: codification, system testing and deployment, Knowledge transfer and knowledge sharing- the role of culture and structure

Unit IV **06 Hours**

KM system: Analysis design and development: Knowledge infrastructure, Knowledge audit, and knowledge team

Unit V **06 Hours**

KM tools and Portals: inferences from data, data mining and knowledge portals

Unit VI **06Hours**

Evaluation of KM effectiveness: Tools and metrics Ethical, legal and managerial issues

Textbooks

5. Dalkir, K. (2011). Knowledge Management in Theory and Practice (2nd edition). Cambridge, Massachusetts: The MIT Press.
6. We will use Knowledge Management in Theory and Practice - 2nd edition by Kimiz Dalkir

Reference Books

1. Awad, E.M (2007). Knowledge Management. Pearson India, Delhi.
2. Fernandez I. B. and Sabherwal, R. (2010). Knowledge Management: System and Resources. PHI Delhi.
3. Kimiz Dalkir (2005). Knowledge Management in Theory and Practice. Elsevier.
4. Tiwana Amrit (1999). The Knowledge Management Toolkit. Prentice Hall PTR.

Project Based Learning:

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Impact of knowledge management on organizational competitiveness (a case study)
2. knowledge management on organization continuity
3. impact of knowledge management on organizational performance (a case study of selected it firms and logos)

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1

Unit – I, Unit – II, Unit - III

Unit Test -2

Unit – IV, Unit – V, Unit - VI

CSE Skill Lab V

<u>Teaching Scheme</u>		<u>Examination Scheme</u>		<u>Credit Scheme</u>	
	Hours/Week		Marks		Credits
Lecture:	Hours/Week	University Examination:	00 Marks	Lecture	00
Practical	04	Internal Assessment:	00 Marks		
:	Hours/Week	Term Work	25Marks	Practical	02
		Practical	25Marks		
		Total	50 Marks	Total	02

Course Objective:

1. To Prepare Students to Excel and Succeed In Industry / Technical Profession Through Global, Rigorous Education.
2. Excellence Through Application Development.
3. To Provide Students with A Solid Foundation on Tools, Technology and Framework
4. To Learn Server-Side Programming Using Servlets and Java Server Pages.

Prerequisite:

1. Understanding Of the Java Language
2. Understanding Of Software Development
3. Understanding Of the Software Development Life Cycle

Course Outcomes: On Completion of The Course, Students Will Have The Ability To:

1. Understand The Concepts Related to Java Technology
2. Explore And Understand Use of Java Server Programming
3. Manipulate Window Interfaces Using Swing Objects
4. Understand The Concepts of Hypertext Markup Language
5. Implement Web Based Applications Using Features of HTML And XML
6. Apply The Concepts of Server-Side Technologies For Dynamic Web Applications

Unit I

**06
Hours**

Swing Components – I: Introduction to JFC and Swing, Features of the Java Foundation Classes, Swing API Components, JComponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, Check Boxes, Menus, Pane, JScrollPane, Desktop pane, Scrollbars, Lists and Combo Boxes, Text-Entry Components.

Unit II

**06
Hours**

Swing Components – II: Toolbars, Implementing Action interface, Colors and File Choosers, Tables and Trees, Printing with 2D API and Java Print Service API. Schedules Tasks using JVM, Thread-safe variables, Communication between threads.

Unit III

**06
Hours**

Servlets: Introduction, Web Application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, Genericservlet, Httpservlet, Servlet Life Cycle, Servletconfig, Servletcontext, Servlet Communication, Session Tracking Mechanisms JSP: Introduction, JSP Lifecycle,

JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard Actions And Customized Actions,

Unit IV

**06
Hours**

Java Beans: Introduction, Javabeans Properties, Examples Struts 2: Basic MVC Architecture, Struts 2 Framework Features, Struts 2 MVC Pattern, Request Life Cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL JSON: Overview, Syntax, Datatypes, Objects, Schema, Comparison With XML, JSON With Javainterfaces.

Packages: Creating Packages, Default Package, Importing Packages, Using Package.

Unit V

**06
Hours**

JDBC: JDBC Introduction, JDBC Architecture, Types of JDBC Drivers, The Connectivity Model, The java.sql package, Navigating the ResultSet object's contents, Manipulating records of a ResultSet object through User Interface , The JDBC Exception classes, Database Connectivity, Data Manipulation (using Prepared Statements, Joins, Transactions, Stored Procedures), Data navigation.

Unit VI

**06
Hours**

Networking With JAVA: Overview Of Networking, Working With URL, Connecting To A Server, Implementing Servers, Serving Multiple Clients, Sending E-Mail, Socket Programming, Internet Addresses, URL Connections. Accessing Network Interface Parameters, Posting Form Data, Cookies, Overview Of Understanding The Sockets Direct Protocol. Introduction To Distributed Object System, Distributed Object Technologies, RMI For Distributed Computing, RMI Architecture, RMI Registry Service, Parameter Passing In Remote Methods, Creating RMI Application, Steps Involved In Running The RMI Application, Using RMI With Applets.

Textbooks

1. Advanced Java Programming, Uttam K. Roy, Oxford University Press.
2. JDBC, Servlets, And JSP, New Edition, Santhosh Kumar K , Kogent Learning Solutions Inc, Dreamtech Press

Reference Books

1. Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR,9th Edition
2. Herbert Schildt, Java2: The Complete Reference, Tata Mcgraw-Hill,5th Edition
3. Joe Wigglesworth And Paula Mcmillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD) ,3rd Edition
4. Core Servlets And Java Server Pages Volume 1 Core Technologies , Marty Hall And Larry Brown Pearson

List of Laboratory Exercises

10. Write A Database Application That Uses Any JDBC Driver
11. Write A Simple JSP Program for User Login Form With Static & Dynamic Database
12. Write A Program to Demonstrate the Use of AWT Components.
13. Write A Program Using Swing to Display a Scrollpane And Jcombobox In An Japplet With The Items- English, Marathi, Hindi, Sanskrit.
14. Write A Program to Create a Jtree

15. Develop A Program Which Will Implement Special Keys Such as Function Keys and Arrow Keys.
16. Write A Program to Change The Background Color Of Applet When User Performs Events Using Mouse.
17. Write A Program Using Jtextfield to Perform The Addition Of Two Numbers
18. Write A Program to Implement Chat Server Using Server Socket And Socket Class.

Project Based Learning

1. Food Ordering System
2. Media Player Application
3. Quizzing app
4. Temperature Converter

Syllabus for Unit Tests:

Project Stage -II

<u>TEACHING SCHEME</u>	<u>EXAMINATION SCHEME</u>	<u>CREDIT SCHEME</u>
Lecture: Hrs/Week	End Semester Examination: 00 Marks	Theory
Practical: 4 Hrs/Week	Continuous Assessment: 00Marks	
Tutorials: Hrs/Week		
	Oral: Marks 100	Oral: 06
	Term Work Marks 100	
	Total Marks 200	Total 06

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: On completion of the course, students will have the ability to:

- Understand how to solve the problem.
- Demonstrate the ability to synthesize complex information from a variety of sources in decision-making
- Plan and perform collaboratively towards a common purpose.
- Demonstrate self-advocacy skills and self-reliant behaviour.
- Demonstrate the ability to develop and maintain satisfying interpersonal relationships.
- Evaluate and conclude the results with documentation.

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.

