ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

B.Tech Four Year Degree Course

(Applicable for the batches admitted from 2017-18)

GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

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VISION, MISSION
OF THE
COLLEGE & DEPARTMENT
PEOs, POs & PSOs
ACADEMIC REGULATIONS
AND
CURRICULAR COMPONENTS

VISION & MISSION OF THE COLLEGE

Vision

To be a leading institution of engineering education and research, preparing students for leadership in their fields in a caring and challenging learning environment.

Mission

- To produce quality engineers by providing state-of-the-art engineering education.
- To attract and retain knowledgeable, creative, motivated and highly skilled individuals whose leadership and contributions uphold the college tenets of education, creativity, research and responsible public service.
- To develop faculty and resources to impart and disseminate knowledge and information to students and also to society that will enhance educational level, which in turn, will contribute to social and economic betterment of society.
- To provide an environment that values and encourages knowledge acquisition and academic freedom, making this a preferred institution for knowledge seekers.
- To provide quality assurance.
- To partner and collaborate with industry, government, and R and D institutes to develop new knowledge and sustainable technologies and serve as an engine for facilitating the nation's economic development.
- To impart personality development skills to students that will help them to succeed and lead.
- To instil in students the attitude, values and vision that will prepare them to lead lives of personal integrity and civic responsibility.
- To promote a campus environment that welcomes and makes students of all races, cultures and civilizations feel at home.
- Putting students face to face with industrial, governmental and societal challenges.

VISION & MISSION OF THE DEPARTMENT

Vision

To be a Centre of Excellence in Computer Science and Engineering education and training to meet the challenging needs of the industry and society.

Mission

- To impart quality education through well-designed curriculum in tune with the growing software needs of the industry.
- To serve our students by inculcating in them problem solving, leadership, teamwork skills and the value of commitment to quality, ethical behavior & respect for others.
- To foster industry-academia relationship for mutual benefit and growth.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- Identify, analyze, formulate and solve Computer Science and Engineering problems both independently and in a team environment by using the appropriate modern tools.
- Manage software projects with significant technical, legal, ethical, social, environmental and economic considerations.
- Demonstrate commitment and progress in lifelong learning, professional development, leadership and communicate effectively with professional clients and the public.

IV. PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

V. PROGRAM SPECIFIC OUTCOMES (PSOs)

Students will be able to

* Design, develop, test and maintain reliable software systems and intelligent systems.
* Design and develop web sites, web apps and mobile apps.

VI. ACADEMIC REGULATIONS

Applicable for the students of B.Tech from the Academic Year 2017-18.

1. UG – B.Tech Programs

The following B.Tech Programs are offered at present

i. Civil Engineering (CE)
ii. Electrical and Electronics Engineering (EEE)
iii. Mechanical Engineering (ME)
iv. Electronics and Communication Engineering (ECE)
v. Computer Science and Engineering (CSE)
vi. Information Technology (IT)

2. Duration of the Program

The duration of the program is four academic years consisting of eight semesters. However, a student is permitted to complete the course work of B.Tech program in the stipulated time frame of **EIGHT** years from the date of joining. Students admitted into third semester of B.Tech program directly, through Lateral Entry (LE), shall have to complete the course work of B.Tech program in the stipulated time frame of **SIX** years from the date of joining.

3. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

4. Program Credits

i) Each discipline of the B.Tech program is designed to have a total of **160** credits and the student shall have to complete the four year course work and earn all the **160** credits for the award of B.Tech Degree.

ii) Students joining the B.Tech program into the II year 1st semester directly through Lateral Entry (LE) Scheme shall have to complete the three year course work and earn **120** credits for the award of B.Tech degree.

iii) Students may register for optional elective courses beyond 160 (120 for Lateral Entry) credits for a maximum of 20 credits from II year 2nd semester to IV year 1st semester, five credits in each semester, subject to the condition that there shall not be any backlogs up to previous semester with CGPA not less than 7.5. Optional elective courses shall be treated on par with self study courses, but performance in optional elective courses shall not be included in calculating the SGPA.

iv) Student shall register for a course only once in any semester in the entire program. He shall not register that course as open elective or optional elective or professional elective further.

v) Students with no backlogs up to III year 1st semester with CGPA not less than 7.5 may register for two professional elective courses offered in IV year 2nd semester in advance i.e. one in III year 2nd semester and another one in IV year 1st semester so as to have exclusive project work during the IV year 2nd semester.

5. Attendance Regulations

5.1 A student shall be eligible to appear for End Semester Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

5.2 Condoning of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester will be considered for genuine reasons such as medical grounds and participation in co-curricular and extra-curricular activities and shall be granted only after approval by a committee duly appointed by the college. The student should submit application for medical leave along with medical certificate from a registered medical practitioner within three days from reporting to the class work after the expiry of the Medical Leave. In case of participation in co-curricular and extra-curricular activities, either in the college or other colleges, students must take prior written permission from HoD concerned and should also submit the certificate of participation from the organizer of the event within three days after the completion of the event. Only such cases will be considered for condoning attendance shortage.

5.3 A student shall be eligible to claim for condonation of attendance shortage for a maximum of two times during the four year (eight semesters) course work of B.Tech / three year (six semesters) course work of B.Tech, Lateral Entry. However, additional one time condonation exclusively during IV Year shall be considered on genuine valid reasons.

5.4 A student will not be promoted to the next semester unless he satisfies the attendance requirement of the current semester. He may seek re-admission for that semester when offered next.

5.5 Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

5.6 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

5.7 A fee stipulated by the college shall be payable towards condonation of attendance shortage.

5.8 A student is required to put up a minimum of 75% of attendance in the mandatory non-credit courses such as Sports & Games /Cultural and Fine Arts/ Yoga /Self Defence /NSS despite satisfactory performance / participation in the activities organized under each event for getting the satisfactory grade.

6. Examinations and Scheme of Evaluation

6.1 Theory / Elective / Self Study Courses (2 or 3 or 4 credits):

Each theory course shall be evaluated for a total of 100 marks, consisting of 40 marks for internal assessment and 60 marks for semester end examination.

Internal Assessment:

i) Of 40 marks for internal assessment, 10 marks are for continuous assessment in the form of two quiz or subjective tests and 30 marks are based on two mid-term examinations. The first mid-term examination shall be from the first three units of syllabus and second mid-term from the last three units of syllabus, conducted during the semester.

ii) Two quiz or subjective tests, one before first mid-term examination from I & II units of syllabus and another before second mid-term examination from IV & V units of syllabus, each for 10 marks, with 45 minutes duration, are conducted in a semester and the average marks of the two tests are taken as the marks for the continuous evaluation process.

iii) Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of five questions, each for 10 marks and four questions need to be answered. First question shall have 5 short questions from all the three units, each of two marks or 10 objective questions each of one mark and is compulsory, three questions are of descriptive type, one from each unit of syllabus and the fifth question is from all the three units of syllabus.

iv) Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 30 marks.

v) For the subjects such as Engineering Graphics, Engineering Drawing, Machine Drawing, Design & Drawing of R.C., Structures, Steel Structures, Irrigation Structures, Estimation Cost and Valuation, Building Planning and Drawing etc., the distribution of 40 marks for internal evaluation shall be 20 marks for day-to-day work, and 20 marks based on two mid-term examinations. Each mid-term examination is conducted for 40 marks with two hours duration. Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 20 marks.

vi) For subjects like Functional English and Professional Communication, the pattern of mid-term examination is given along with the syllabus of respective subject.

vii) For the integrated course with theory and laboratory, the distribution of 40 marks for internal evaluation shall be 20 marks for theory based on two mid-term examinations and 20 marks for laboratory. Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of five questions, each for 10 marks and four questions need to be answered. First question shall have 5 short questions from all the three units, each of two marks or 10 objective questions each of one mark and is compulsory, three questions are of descriptive type, one from each unit of syllabus and the fifth question is from all the three units of syllabus. Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 20 marks. Of 20 marks for laboratory, 10 marks for day-to-day performance and 10 marks for semester end internal examination.

viii) For the project based theory course, the distribution of 40 marks for internal evaluation shall be 20 marks for theory, based on two mid- term examinations and 20 marks for project. Each mid-term examination is conducted for 40 marks with two hours duration. Each mid-term examination consists of five questions, each for 10 marks and four questions need to be answered. First question shall have 5 short questions from all the three units, each of two marks or 10 objective questions each of one mark and is compulsory, three questions are of descriptive type, one from each unit of syllabus and the fifth question is from all the three units of syllabus. Sum of the 75% marks of better scored mid-term examination and 25% marks of less scored mid-term examination are scaled down for 20 marks.

External Assessment:

i) Semester End Examination will have six questions with internal choice, one question from each unit. All questions carry equal marks of 10 each.

ii) For the integrated theory and laboratory course, the pattern of examination is same as above. There will not be any external assessment for laboratory component.

iii) For the project based theory course, semester end examination will have three questions, each for 20 marks, with internal choice. All the questions need to be answered. There will be no external assessment for project component.

iv) For subjects like Functional English, Professional Communication, Building Planning & Drawing, etc, the pattern of semester end examination is given along with the syllabus of respective subject.

6.2 Laboratory Courses (1 or 2 credits) :

i) For practical courses the distribution shall be 40 marks for Internal Evaluation and 60 marks for the semester end examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 40 internal marks of which 25 marks shall be for day-to-day performance (15 marks for day-to-day evaluation and 10 marks for Record) and 15 marks shall be evaluated by conducting an internal laboratory test towards the end of semester.

ii) Semester end examination shall be conducted by the teacher concerned and external examiner for 60 marks.

6.3 Mandatory Non-Credit Courses:

A student is required to take up two Non-Credit courses, viz. Sports & Games / Cultural and Fine Arts/Yoga,/Self Defence/NSS, one in II year 1st semester and the other in II year 2nd semester. Marks are awarded based on the day-to-day participation and performance in the activities organized under each event. A student is required to score 40 marks out of 100 marks despite putting up a minimum of 75% attendance to be declared satisfactory in each mandatory non-credit course. The B.Tech degree shall only be awarded if a student gets satisfactory grade in each of the two mandatory non-credit courses and besides acquiring 160 (120 for Lateral Entry) credits of the B.Tech degree course.

A student whose shortage of attendance is condoned in the case of credit courses in that semester shall also be eligible for condoning shortage of attendance up to 10% in the case of mandatory non-credit courses also.

A student has to repeat the course if he does not get satisfactory grade in each non-credit course for getting the degree awarded.

6.4 Internship / Industrial Training / Practical Training:

Industrial / Practical training shall be evaluated for a total of 100 marks. Of 100 marks, 40 marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 60 marks are for final Viva–Voce examination conducted by the committee consisting of an External Examiner and the Head of the Department at the end of IV B.Tech 1st semester.

6.5 Mini Project / Field Work :

Mini Project / field work shall be evaluated for a total of 100 marks.

i) Of 100 marks, 40 marks shall be awarded by the project supervisor based on student's involvement in carrying out the project and the remaining 60 marks are based on presentation and viva-voce before a committee consisting of supervisor and a senior faculty of the department.

ii) There will be no external assessment for mini project / field work.

6.6 Project work:

i) The final project work shall be carried out during the IV year 2nd semester and will be evaluated for 100 marks.

ii) Of 100 marks, 40 marks shall be for Internal Evaluation and 60 marks for the project evaluation and semester end viva-voce examination.

iii) Each student needs to give two seminars on the topic of his project, and each seminar is evaluated for 20 marks by a committee consisting of the supervisor and a senior faculty of the department. The sum of the mark of two seminars is taken as internal marks for 40.

iv) The project evaluation and semester end Viva–Voce shall be conducted by the committee consisting of an External Examiner, Head of the Department and the supervisor of the project. The evaluation of project work shall be conducted at the end of the fourth year second semester.

7. Criteria for Passing a Course and Award of Grades:

7.1 Criteria for Passing a Course:

i) A candidate shall be declared to have passed in individual theory / integrated theory and laboratory / Project based theory / drawing course if he secures a minimum of 40% aggregate marks (internal & semester end examination marks put together), subject to securing a minimum of 35% marks in the semester end examination.

ii) A candidate shall be declared to have passed in individual laboratory/ project / mini project / field work / industrial intership / practical training course if he secures a minimum of 50% aggregate marks (internal & semester end examination marks put together), subject to securing a minimum of 40% marks in the semester end examination.

iii) On passing a course of a program, the student shall earn the credits assigned to that course.

7.2 Method of Awarding Letter Grade and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his performance, as per the grading system given below.

Theory / Drawing / Elective / Self Study Course (%)	Laboratory / Industrial / Practical Training / Mini Project / Project Work (%)	Grade Points	Letter Grade
≥ 90	≥ 90	10	O (Outstanding
≥ 80 & < 90	≥ 80 & < 90	9	A+ (Excellent)
≥ 70 & < 80	≥ 70 & < 80	8	A (Very Good)
≥ 60 & < 70	≥ 60 & < 70	7	B+ (Good)
≥ 50 & < 60	≥ 50 & < 60	6	B (Above Average)
≥ 45 & < 50	–	5	C (Average)
≥ 40 & < 45	–	4	P (Pass)
< 40	< 50	0	F (Fail)

7.3 Calculation of Semester Grade Point Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as given below:

SGPA = $\frac{\sum (CR\ X\ GP)}{\sum CR}$ for each semester.

where CR = Credits of a course

GP = Grade Points awarded for a course

* SGPA is calculated for a candidate who passed all the courses in that semester.

* Performance in optional elective courses shall not be included in calculating the SGPA.

7.4 Eligibility for Award of B.Tech Degree:

A student will be declared eligible for the award of the B.Tech. Degree if he fulfills the following academic regulations.

i) 4 Year B.Tech Course:

(a) Pursued a course of study for not less than four academic years and not more than eight academic years.

(b) Registered for prescribed **160** credits and secured **160** credits.

(c) Students, who fail to complete their Four years Course of study within Eight years or fail to acquire the **160** Credits for the award of the degree within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

ii) 3 Year B.Tech Course under Lateral Entry:

(a) Pursued a course of study for not less than three academic years and not more than six academic years.

(b) Registered for prescribed **120** credits and secured **120** credits.

(c) Students, who fail to complete their Three years Course of study within Six years or fail to acquire the **120** Credits for the award of the degree within six academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

7.5 Calculation of Cumulative Grade Point Average (CGPA) for Entire Program:

The CGPA is calculated as given below:

CGPA = $\frac{\sum (CR\,X\,GP)}{\sum CR}$ for entire program.

where CR = Credits of a course

GP = Grade points awarded for a course

7.6 Award of Division:

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of B.Tech Degree and shall be placed in one of the following grades:

CGPA	Class
≥ 7.5	First Class with Distinction
≥ 6.5 & < 7.5	First Class
≥ 5.5 & < 6.5	Second Class
< 5.5	Pass Class

7.7 Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidate will be issued after completion of the four year B.Tech program.

8. Supplementary Examinations

i) Supplementary examinations will be conducted twice in a year at the end of odd and even semesters.

ii) Semester end supplementary examinations shall be conducted till next regulation comes into force for that semester, after the conduct of the last set of regular examinations under the present regulation.

iii) Thereafter, supplementary examinations will be conducted in the equivalent courses as decided by the Board of Studies concerned.

iv) There is no makeup examination in case of supplementary examinations.

9. Conditions for Promotion

i) A student shall be eligible for promotion to next Semester of B.Tech program, if he satisfies the conditions as stipulated in Regulation 5.

ii) The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Regulation 5 for promotion into III Year I semester and IV year I semester.

a) 4 Year B.Tech Program:

i) A student shall be promoted from II year to III year only if he acquires the academic requirement of a minimum of 50% credits up to second year second semester as shown below.

1. Two regular and two supplementary examinations of I year I semester,
2. Two regular and one supplementary examinations of I year II semester,
3. One regular and one supplementary examinations of II year I semester
4. One regular examination of II year II semester,

irrespective of whether the candidate takes the examination or not.

ii) A student shall be promoted from III year to IV year only if he acquires the academic requirement of a minimum of 50% of credits upto third year second semester as shown below.

1. Three Regular and three supplementary examinations of I year I sem.,
2. Three Regular and two supplementary examinations of I year II sem.,
3. Two Regular and two supplementary examinations of II year I semester,
4. Two Regular and one supplementary examinations of II Year II semester,
5. One Regular and one supplementary examinations of III Year I semester,
6. One regular examination of III Year II semester,

irrespective of whether the candidate takes the examination or not.

b) 3 Year B.Tech Program under Lateral Entry Scheme:

i) A student shall be promoted from III to IV year only if he acquires the academic requirement of a minimum of 50% credits up to third year second semester as shown below.

1. Two regular and two supplementary examinations of II year I semester,
2. Two Regular and one supplementary examinations of II year II semester,
3. One regular and one supplementary examinations of III year I semester
4. One regular examination of III year II semester,

irrespective of whether the candidate takes the examination or not.

10. Revaluation

i) Students can submit the applications for revaluation, along with the prescribed fee receipt for revaluation of his answer script(s) of theory course(s) as per the notification issued by the Controller of Examinations.

ii) The Controller of Examinations shall arrange for revaluation of such answer script(s).

iii) An examiner, other than the first examiner, shall revaluate the answer script(s).

iv) If the variation in marks of two evaluations is less than 15% of total marks, the best mark of two evaluations shall be taken into consideration.

v) If the variation in marks of two evaluations is more than 15% of total marks, there shall be third evaluation by an examiner other than the first two examiners. The best marks of two evaluations (which are nearer) shall be taken into consideration.

11. Re-admission Criteria

i) A candidate, who is detained in a semester due to lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee and special fee in addition to paying an administrative fee of Rs.1,000/-.

ii) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated in regulation 10 by paying the required tuition fee and special fee in addition to paying an administrative fee of Rs. 1,000/-.

12. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of B.Tech program only with the prior permission of the Principal of the College, provided such candidate shall follow the transitory regulations applicable to the batch he joins. An administrative fee of Rs.2,000/- per each year of break in study in addition to the prescribed tuition and special fees should be paid by the candidate to condone his break in study.

13. Transitory Regulations

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

Transfer candidates (from an autonomous college affiliated to JNTUK)
A student who has secured the required credits upto previous semesters as per the regulations of other autonomous institutions shall only be permitted to be transferred to this college. A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

14. Withholding of Results

If the student has not paid the dues, if any, to the College or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will also be withheld in such cases.

15. Malpractices

i) The Principal shall refer the cases of malpractices in internal assessment tests and semester end examinations to a malpractice enquiry committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

ii) Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder.

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices / Improper conduct	Punishment
If the candidate		
1.a	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination.)	Expulsion from the examination hall and cancellation of the performance in that subject only.
b	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through Cell phones with any candidates or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The hall ticket of the candidate shall be cancelled.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for the examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of performance in that subject.

6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in or around the examination hall or organises a walkout or instigates others to walkout or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the Officer-in-charge or any person on duty in or outside the examination hall of any of his relations or indulges in any other act of misconduct or mischief which results in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the Officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat.

9	If student of the college who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and a police case is registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be referred to the Chief Superintendent of Examinations for future action towards suitable punishment.	

iii) The involvement of the staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and appropriate disciplinary action will be taken after thorough enquiry.

16. Other Matters

i) Physically challenged candidates who have availed additional examination time and a scribe during their Intermediate/EAMCET examinations will be given similar concessions on production of relevant proof/documents. Students who are suffering from contagious diseases are not allowed to appear either for internal or semester end examinations.

ii) The students who participated in coaching / tournaments held at State / National / International levels through University / Indian Olympic Association during semester end external examination period will be promoted to subsequent semesters as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated 18-08-1994.

iii) The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the Departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the Departments shall be reported to the Academic Council for ratification.

17. General

i) The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and /or syllabi.

ii) The academic regulations should be read as a whole for the purpose of any interpretation.

iii) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman of the Academic Council is final.

iv) Wherever the word he, him or his occurs, it will also include she, her and hers.

VII. CURRICULAR COMPONENTS

Sl. No.	Course Work - Subject Areas	Total No.of Credits	% of Total Credits	% of Credits as per UGC
1	Baisc Sciences (BS)	21	13.13	15 - 20
2	Humanities and Social Sciences (HSS)	14	8.75	10 - 15
3	Engineering Sciences (ES)	28	17.50	10 - 20
4	Professional Core (PC)	53	33.12	25 - 35
5	Professional Electives (PE)	18	11.25	8 - 12
6	Open Electives (OE)	12	7.50	5 - 10
7	Others (Project, Survey Camp, Internship, etc.)	14	8.75	8 - 10
8	Mandatory Non-Credit Courses	-	-	-

COURSE STRUCTURE

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SYLLABUS

VIII. COURSE STRUCTURE

I Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG2501	Functional English	4	-	-	3
2	MA2502	Linear Algebra and Integral Transforms	4	1	-	4
3	CH2506	Chemistry	4	-	-	3
4	EN2501	Environmental Studies	3	-	-	2
5	EE2506	Basic Electrical Engineering	3	-	-	2
6	CT2502	Problem Solving through Computer Programming	4	-	-	3
7	EG2502	Functional English Lab	-	-	2	1
8	CT2503	Computer Programming Lab	-	-	4	2
		Total	**22**	**1**	**6**	**20**

I Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG2503	Professional Communication	3	-	-	2
2	MA2506	Numerical Methods and Differential Equations	4	1	-	4
3	PH2506	Applied Physics	4	-	-	3
4	EN2502	Engineer and Society	3	-	-	2
5	EC2501	Elements of Electronics Engineering	3	1	-	3
6	CT2504	Python Programming *	3	-	2	3
7	EG2504	Professional Communication Lab	-	-	4	2
8	PH2507	Applied Physics Lab	-	-	2	1
		Total	**20**	**2**	**8**	**20**

* **Integrated Course with Theory and Laboratory**

L : Lecture **T : Tutorial** **P : Practical**

II Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	BA2502	Managerial Economics and Financial Analysis	3	-	-	2
2	MA2508	Discrete Mathematical Structures	3	1	-	3
3	CT2505	Data Structures	3	1	-	3
4	CT2506	Digital Logic Design	3	1	-	3
5	CT2507	Object Oriented Programming through Java	4	-	-	3
6	CT2508	Data Structures Lab	-	-	4	2
7	CT2509	Object Oriented Programming Lab	-	-	4	2
8	CS2503	UNIX Programming Lab	-	-	4	2
		Total	**16**	**3**	**12**	**20**
9	SG2501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-

II Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	MA2510	Probability and Statistics	3	1	-	3
2	CT2510	Operating Systems	3	1	-	3
3	CT2511	Formal Languages and Automata Theory	3	1	-	3
4	CT2512	Computer Organization and Architecture	3	1	-	3
5	CT2513	Database Management Systems	3	1	-	3
6		**Open Elective-I** (see list of Open Electives)	4	-	-	3
7	CS2504	Operating Systems Lab	-	-	4	2
8	CT2516	Database Management Systems Lab	-	-	4	2
		Total	**19**	**5**	**8**	**22**
9	NS2501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-
10		**Optional Elective - I**	-	-	-	3
	CE2575	i) Environmental Impact Assessment				
	EC2508	ii) Signals and Systems				
	MA2514	iii) Fuzzy Logic				
11	CS2505	**Optional Elective - II (MOOCs)**	-	-	-	2
		Students shall opt from the list of MOOCs given by the Department)				

L : Lecture **T : Tutorial** **P : Practical**

III Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CT2517	Software Engineering	3	1	-	3
2	CT2518	Compiler Design	3	1	-	3
3	CT2519	Computer Networks	3	1	-	3
4	CT2520	Web Technologies	4	-	-	3
5		**Professional Elective - I**	4	-	-	3
6		**Open Elective-II** (see list of Open Electives)	4	-	-	3
7	CS2509	Computer Networks and Compiler Design Lab	-	-	4	2
8	CT2525	Web Technologies Lab	-	-	4	2
		Total	**21**	**3**	**8**	**22**
9		**Optional Elective - III**	-	-	-	3
	CT2526	i) Human Computer Interaction				
	EC2511	ii) Digital Signal Processing				
	EE2512	iii) Control Systems				
10	CS2510	**Optional Elective - IV (MOOCs)**	-	-	-	2
		Students shall opt from the list of MOOCs given by the Department)				

III Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CT2527	Design and Analysis of Algorithms	3	1	-	3
2	CT2528	Data Warehousing and Data Maining	4	-	-	3
3	CS2511	UML and Design Patterns *	3	-	2	3
5		**Professional Elective - II** (OR) **Any other Elective Depending on Industry Needs**	4	-	-	3
6		**Open Elective-III**(see list of Open Electives)	4	-	-	3
7	CS2514	Data Mining Lab	-	-	4	2
8	CS2515	Mini Project	-	-	4	2
		Total	**18**	**1**	**10**	**19**
9		**Optional Elective - V**	-	-	-	3
	CS2516	i) Graph Theory				
	EC2512	ii) Embedded System Design				
	EE2554	iii) Digital Control Systems				
10	CS2517	**Optional Elective - VI (MOOCs)**	-	-	-	2
		Students shall opt from the list of MOOCs given by the Department)				

*** Integrated Course with Theory and Laboratory**

L : Lecture T : Tutorial P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week L	T	P	No.of Credits
1	CT2533	Cyptography and Network Secuirty	4	-	-	3
2	CT2534	Big Data Analytics	4	-	-	3
3		**Professional Elective - III**	4	-	-	3
4		**Professional Elective - IV**	4	-	-	3
5		**Open Elective-IV**(see list of Open Electives)	4	-	-	3
6	CT2538	Big Data Analytics Lab	-	-	4	2
7	CS2523	Cryptography and Network Security Lab	-	-	4	2
8	CS2524	Internship / Industrial Training / Practical Training	-	-	-	2
		Total	**20**	**-**	**8**	**21**
9		**Optional Elective - VII**	-	-	-	3
	CS2525	i) Network Programming				
	CT2515	i) Systems Software				
	ME2544	iii) Robotics				
10	CS2526	**Optional Elective - VIII (MOOCs)**	-	-	-	2
		Students shall opt from the list of MOOCs given by the Department)				

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week L	T	P	No.of Credits
1		**Professional Elective - V**	4	-	-	3
2		**Professional Elective - VI**	4	-	-	3
3	CS2531	**Project**	-	-	20	10
		Total	**8**	**-**	**20**	**16**

L : Lecture **T : Tutorial** **P : Practical**

Open Elective - I

Sl. No.		Title of the Subject	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE2515	Elements of Civil Engineering (Other than CE)	CE	4	-	-	3
2	CE2516	Building Services	CE	4	-	-	3
3	EE2515	Electrical Materials	EEE	4	-	-	3
4	EE2516	Control Systems Engineering (Other than EEE & ECE)	EEE	4	-	-	3
5	ME2520	Elements of Manufacturing Processes (Other than ME)	ME	4	-	-	3
6	ME2521	Automotive Engineering (Other than ME)	ME	4	-	-	3
7	EC2531	Introduction to MPMC (Other than ECE/EEE/CSE/IT)	ECE	4	-	-	3
8	EC2532	Fundamentals of Communications (Other than ECE)	ECE	4	-	-	3
9	CT2514	Computer Graphics (Other than IT)	CSE	4	-	-	3
10	CT2507	Object Oriented Programming through Java (other than CSE & IT)	CSE	4	-	-	3
11	CT2515	Systems Software	IT	4	-	-	3
12	IT2502	Web Programming(Other than CSE & IT)	IT	4	-	-	3
13	MA2516	Mathematical Cryptography(Other than CSE)	BS&H	4	-	-	3
14	PH2508	Semiconductor Physics (Other than ECE)	BS&H	4	-	-	3

Open Elective - II

Sl. No.		Title of the Subject	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE2530	Geoinformatics (other than CE)	CE	4	-	-	3
2	CE2531	Environmental Sanitation	CE	4	-	-	3
3	EE2523	Modeling & Simulation of Engineering Systems	EEE	4	-	-	3
4	EE2524	Power Systems Engineering (Other than EEE)	EEE	4	-	-	3
5	ME2532	Elements of Mechanical Transmission (Other than ME)	ME	4	-	-	3
6	ME2533	Material Handling Equipment	ME	4	-	-	3
7	EC2543	Automotive Electronics	ECE	4	-	-	3
8	EC2544	Introduction to MEMS (other than ECE)	ECE	4	-	-	3
9	CS2508	Data Science	CSE	4	-	-	3
10	CT2524	Virtual and Augmented Reality (other than IT)	CSE	4	-	-	3
11	IT2505	Open Source Software	IT	4	-	-	3
12	IT2506	Cyber Laws	IT	4	-	-	3
13	MA2517	Quality, Reliability and Operations Research	BS&H	4	-	-	3

L : Lecture **T : Tutorial** **P : Practical**

Open Elective - III

Sl. No.		Title of the Subject	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE2543	Hydrology (Other than CE)	CE	4	-	-	3
2	CE2544	Planning for Sustainable Development	CE	4	-	-	3
3	EE2531	Electrical and Hybrid Vehicles	EEE	4	-	-	3
4	EE2532	Power Plant Instrumentation	EEE	4	-	-	3
5	ME2541	Material Science (Other than ME)	ME	4	-	-	3
6	ME2542	Renewable Energy Sources (Other than ME)	ME	4	-	-	3
7	EC2523	Assistive Technologies (Other than ECE)	ECE	4	-	-	3
8	EC2507	Bio-Medical Engineering (Other than EEE & ECE)	ECE	4	-	-	3
9	CS2512	Node and Angular JS	CSE	4	-	-	3
10	CS2513	Cyber Security	CSE	4	-	-	3
11	CT2529	Scripting Languages (Other than CSE)	IT	4	-	-	3
12	CT2531	Software Project Management (Other than CSE)	IT	4	-	-	3
13	MA2518	Elements of Stochastic Processes	BS&H	4	-	-	3
14	EG2505	Academic Communication	ENGLISH	4	-	-	3

Open Elective - IV

Sl. No.		Title of the Subject	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE2562	Disaster Management (Other than CE)	CE	4	-	-	3
2	CE2563	Repair and Retrofitting Techniques	CE	4	-	-	3
3	EE2542	Modern Optimization Techniques	EEE	4	-	-	3
4	EE2543	Electrical Power Utilization (Other than EEE)	EEE	4	-	-	3
5	ME2553	Green Engineering	ME	4	-	-	3
6	ME2554	Non Destructive Evaluation (Other than ME)	ME	4	-	-	3
7	EC2563	Cyber Physical Systems	ECE	4	-	-	3
8	EC2508	Signals and Systems (Other than EEE & ECE)	ECE	4	-	-	3
9	CS2521	Digital Forensics	CSE	4	-	-	3
10	CS2522	Business Intelligence & Decision Support Systems	CSE	4	-	-	3
11	IT2521	Adhoc and Sensor Networks	IT	4	-	-	3
12	CT2537	Information Retrieval Systems (Other than CSE)	IT	4	-	-	3
13	MA2514	Fuzzy Logic (Other than EEE, ME & CSE)	BS&H	4	-	-	3

L : Lecture **T : Tutorial** **P : Practical**

Professional Electives

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week L	T	P	No.of Credits
		Professional Elective - I	4	-	-	3
	CS2506	i) C#.NET				
	CT2522	ii) Advanced Data Structures				
	CT2523	iii) Software Testing Methodologies				
	CS2507	iv) Principles of Programming Languages				
		Professional Elective - II	4	-	-	3
	CT2521	i) Artificial Intelligence				
	CT2529	ii) Scripting Languages				
	EC2520	iii) Microprocessors and Interfacing				
	CT2531	iv) Software Project Management				
		Professional Elective - III	4	-	-	3
	CS2518	i) Machine Learning				
	CT2535	ii) Internet of Things				
	CS2519	iii) NoSQL Databases				
	CS2520	iv) Software Requirements Engineering and Estimation				
		Professional Elective - IV	4	-	-	3
	CT2536	i) Mobile Computing				
	CT2530	ii) Image Processing				
	CT2537	iii) Information Retrieval Systems				
	MA2515	iv) Optimization Techniques				
		Professional Elective - V	4	-	-	3
	CS2527	i) Web Mining				
	CT2540	ii) Cloud Computing				
	CT2532	iii) Agile Software Development Process				
	CT2541	iv) Blockchain Technologies				
		Professional Elective - VI	4	-	-	3
	CS2528	i) Distributed Systems				
	CT2539	ii) Social Networks				
	CS2529	iii) Web Services				
	CS2530	iv) Deep Learning				

L : Lecture **T : Tutorial** **P : Practical**

IX. SYLLABUS

FUNCTIONAL ENGLISH
(Common to All Branches)
I Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives:

To equip the students for their present and future academic pursuits involving the following:

- listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately;
- Speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture;
- reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes; and
- writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately; and
- To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.

Learning Outcomes

Upon successful completion of Functional English, the students will be able to

- speak with a reasonable degree of fluency using communication strategies as well as conventions of politeness and courtesy;
- listen to short audio and video clips in both standard Indian accent and native English accent and gain both understanding of messages and sensitivity to native- speaker accents;
- read fluently comprehending texts of different kinds;
- write coherent paragraphs and technical reports; and
- guard against mistakes Indians typically make in their speech and writing in English

Course Content

LEVEL - I: Intermediate (for the first mid-semester)

1. (a) From the textbook "Innovate with English": Unit II

Listening	: Conversations using Communicative functions.
Reading Comprehension	: Text: 'Concerning the Unknown Engineer'
Remedial Grammar	: Simple Present, Present Continuous, Use of *have to* structure and Indianism.
Writing	: Paragraph Writing

(b) From the textbook "Innovate with English": Unit III

Listening	: Conversations using Communicative functions (Narrating Events)
Reading Comprehension	: Text: 'Man and his endangered home'
Remedial Grammar	: Simple past tense, Present Perfect, articles.
Writing	: Organization: coherence

2. From the textbook "Vocabulary Builder for Students of Engineering and Technology"

The following portions only:

GRE Words (Unit 1.1)	One-Word Substitutes (Unit 4.1)
Collocations (Unit 2.1)	Idioms (Unit 5.1)
Commonly Confused Words (Unit 3.1)	Phrasal Verbs (Unit 6.1)

3. From Great Stories in Easy English

"The Adventures of Huckleberry Finn" by Mark Twain

LEVEL - II: Advanced (for the second mid-semester)

1. From the textbook "Innovate with English": Unit IV

Listening	: Interacting with faculty members
Reading Comprehension	: Text: 'Clutter'
Remedial Grammar	: Futurity
Writing	: Clutter-free writing

2. From Department-produced materials

Technical report writing

3. From the textbook "Vocabulary Builder for Students of Engineering and Technology"

The following portions only:

GRE Words (Unit 1.2)	One-Word Substitutes (Unit 4.2)
Collocations (Unit 2.2)	Idioms (Unit 5.2)
Commonly Confused Words (Unit 3.2)	Phrasal Verbs (Unit 6.2)

4. From Great Stories in Easy English

"More Tales from Shakespeare" by Charles and Mary Lamb

Text books

a) Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
   - Units TWO, THREE and FOUR only

b) Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.

c) The following simplified classics, one for each mid-semester, from the series, *Great Stories in Easy English*, published by S. Chand & Company Limited:
   - *The Adventures of Huckleberry Finn* by Mark Twain
   - *More Tales from Shakespeare*

d) Audio and video clips carefully selected by the Department in order to sensitize the students to native-speaker accents

e) Department-produced material on technical report writing

Testing Pattern

First Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading an unseen passage and answering two sets of questions on it:

a) Ten comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Five of the ten questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 10 x ½ = 5**

b) Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 5 = 5**

II. Ten contextualized questions of the following from *Vocabulary Builder*: GRE Words: 1.1; Collocations: 2.1; Commonly confused words: 3.1; One-word substitutes: 4.1; Idioms: 5.1; and Phrasal verbs: 6.1 **Marks: 10 x 1 = 10**

III.

a) Correction of grammatical errors: ten sentences with grammatical errors of the following types (dealt with in Units 2 and 3 of *Innovate with English*) will be given: simple present, present continuous, use of *have to* structure and Indianism **Marks: 10 x ½ = 5**

b) Ten objective-type questions based on one retold classic: *The Adventures of Huckleberry Finn*. **Marks: 10 x ½ = 5**

IV.

a) Completing a conversation (in which informational and interactional functions are performed) with appropriate expressions. **Marks: 10 x ½ = 5**

b) Reading two poorly-written paragraphs and performing the following tasks:

i. Identifying the topic sentence of paragraph (a) and the sentences that do not support the topic sentence, and writing in the answer book the topic sentence and the irrelevant sentences. **Marks: 5 x ½ = 2½**

ii. Re-writing paragraph (b), which is poorly organized, into a coherent paragraph choosing appropriate sequence signals or connectives.
Marks: 5 x ½ = 2½

Second Mid-Term Examination

The paper consists of four questions All questions are compulsory; there is no choice.

I.a) Ten contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.2; Collocations: 2.2; Commonly confused words: 3.2; One- word substitutes: 4.2; Idioms: 5.2; and Phrasal verbs: 6.2. **Marks: 10 x ½ = 5**

b) Analyzing a service encounter – an interaction, either a direct personal one, or over the telephone (e.g. *making enquires at the reception counter in a hotel, an interaction with a salesman at a mall, asking for information on the telephone)* – and

i. identifying the reasons for the failure or breakdown of communication in the conversation. **Marks: 5 x ½ = 2½**

ii. rewriting the conversation making the communication successful. In the rewritten conversation, the partners in the conversation must sound polite and positive, using the communication strategies listed in the question.**Marks: 5 x ½ = 2½**

II. Reading an unseen passage and answering two sets of questions on it:

a) Ten comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Five of the ten questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 10 x ½ = 5**

b) Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 5 = 5**

III.

a) Writing a technical report on the given situation. The report must:

follow the conventions of technical report writing

use language and style appropriate to technical report writing

Marks: 5 x 1 = 5

b) Writing a paragraph of 100 - 150 words on the given topic (e.g. *Should there be a dress code in colleges?*). The paragraph must have:

adequate and relevant ideas on the topic with the ideas properly organized using strategies such as coherence and cohesion;

a topic sentence; and

proper choice of vocabulary and grammatical accuracy.**Marks: 5 x 1 = 5**

IV.

a) Correction of grammatical errors: ten sentences with grammatical errors of the following types (dealt with in Unit 4 of *Innovate with English*) will be given: futurity and Indianism. **Marks: 10 x ½ = 5**

b) Ten objective-type questions based on one retold classic: *More Tales from Shakespeare.* **Marks: 10 x ½ = 5**

Semester End Examination

Answer any five questions. Question one is compulsory.

I. Reading an unseen (unfamiliar) passage, preferably one taken from a newspaper or a magazine, on a topical event or situation and answering three sets of questions on it:

a. Ten comprehension questions:
  - Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set; 'information' questions involving a mere reproduction of the content should be avoided.
  - Three of the ten questions should be multiple-choice questions.
  - In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 10 x ½ = 5**

b. Finding four one-word substitutes in the passage for the expressions given. **Marks: 4 x ½ = 2**

c. Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 5 = 5**

II. Reading a dialogue (in which informational and interactional functions are performed) and answering two questions on it:

a. Completing the dialogue with appropriate expressions**Marks: 10 x ½ = 5**

b. Extending the scope of the dialogue using at least five of the given communication strategies/functions. **Marks: 1 x 7 = 7**

III. Analysing a service encounter – an interaction, either a direct personal one, or over the telephone, e.g. *making enquiries at the reception counter in a hotel, an interaction with a salesman at a mall, asking for information on the telephone* – and

a. identifying the reasons for the failure or breakdown of communication in the onversation **Marks: 1 x 5 = 5**

b. rewriting the conversation making the communication successful. In the rewritten conversation, the partners in the conversation must sound polite and positive, using the communication strategies listed in the question. **Marks: 1 x 7 = 7**

IV. Reading two badly-written paragraphs and performing the following tasks:

a. Identifying the topic sentence of paragraph (a) and the sentences that do not support the topic sentence, and writing in the answer book the topic sentence and the irrelevant sentences. **Marks: 1 x 6 = 6**

b. Re-writing paragraph (b), which is poorly organized, into a coherent paragraph choosing appropriate sequence signals or connectives **Marks: 1 x 6 = 6**

V.

a. Writing two paragraphs of 150 words each on the given topics (e.g. *Should there be a dress code in colleges?, Women are better administrators than men*). Each paragraph must have:

- adequate and relevant ideas on the topic with the ideas properly organized using strategies such as coherence and cohesion;
- a topic sentence; and
- proper choice of vocabulary and grammatical accuracy. **Marks: 1 x 6 = 6**

b. Writing a technical report on the given situation. The report must:

- follow the conventions of technical report writing
- use language and style appropriate to technical report writing

Marks: 1 x 6 = 6

VI. Contextualized vocabulary questions with two items on each one of the following from *Vocabulary Builder* (listed as 2 under F. TEXTBOOKS above):

- GRE Words (Units 1.1 and 1.2)
- Collocations (Units 2.1 and 2.2)
- Commonly Confused Words (Units 3.1 and 3.2)
- One-Word Substitutes (Units 4.1 and 4.2)
- Idioms (Units 5.1 and 5.2)
- Phrasal Verbs (Units 6.1 and 6.2)

For example, in the question on idioms, two sentences/contexts with an idiom in each may be given, and the examinee will have to identify the most appropriate meaning of the idiom from among the four options given.**Marks: 12 x 1 = 12**

VII. Correction of grammatical errors:

- Either a conversation with twelve grammatical errors of the types dealt with in Textbook 1 (listed under F. TEXTBOOKS in Section 2), or isolated sentences with twelve grammatical errors will be given.

- The errors will include at least six typical instances of Indianism widely believed to be inappropriate in standard English.
- If isolated sentences with errors are given, they are not to be given in isolation from their contexts; a conversation with errors of the kind specified above will serve the purpose better.
- The examinees are expected to rewrite the sentences in the answer book, correcting them. **Marks: 12 x 1 = 12**

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LINEAR ALGEBRA & INTEGRAL TRANSFORMS
(Common to CSE & IT)
I Year – I Semester

Lecture	: 4	Tutorial	: 1	Internal Marks	: 40
Credits	: 4			External Marks	: 60

Course Objectives

- To understand the concepts of eigenvalues and eigenvectors.
- To gain the knowledge of Laplace and inverse Laplace transforms
- To understand the concepts of Fourier Transforms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use the concepts of eigenvalues and eigenvectors in Engineering problems
- apply Laplace transforms to find the solutions of ordinary differential equations.
- find Fourier transforms and inverse transforms for a given function.

UNIT–I: System of Linear Equations

Rank of a matrix- Echelon form, Normal form. Homogeneous and Non-Homogeneous System of linear equations-consistence and inconsistence, LU-Decomposition method.

UNIT–II: Eigenvalues and Eigenvectors

Eigenvalues and Eigenvectors, Properties of Eigenvalues and Eigenvectors(without Proof), Cayley –Hamilton theorem(without Proof) –finding inverse and power of a matrix.

UNIT–III: Quadratic Forms

Real and complex matrices, Introduction to Quadratic Form, Canonical Form – Index, Signature and nature. Reduction of Quadratic forms to canonical forms by orthogonal transformation.

UNIT–IV: Laplace Transforms (without proofs)

Laplace transforms of standard functions – Properties: Shifting Theorems, change of scale, derivatives, integrals, multiplication and division – Unit step function – Dirac Delta function. Evaluation of improper integrals.

UNIT–V: Inverse Laplace Transforms

Inverse Laplace transforms – by partial fractions – Convolution theorem (without proof).

Application: Solution of ordinary differential equations.

UNIT–VI: Fourier Transforms

Fourier integral theorem (only statement) – Fourier transforms – sine and cosine transforms – properties (without proofs) – inverse Fourier transforms.

Text Books

1. B.S.Grewal, Higher Engineering Mathematics : 42nd edition, Khanna Publishers,2012 , New Delhi.
2. B.V.Ramana, Higher Engineering Mathematics, Tata-Mc Graw Hill company Ltd.

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II : 2nd Edition, Excel Books, 2011, New Delhi.
2. Erwin Kreyszig, Advanced Engineering Mathematics : 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
3. Dr. T.K.V.Iyengar, Dr. B.Krishna Gandhi, S.Ranganatham and Dr.M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I : 11th edition, S. Chand Publishers, 2012, New Delhi.

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CHEMISTRY

I Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge in chemistry and applications of nano materials, liquid crystals and polymers used in engineering.
- To impart knowledge in chemistry of semiconductors, batteries and to impart the knowledge of green chemistry in green synthesis of products.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the synthesis, properties and applications of nano materials.
- analyse the principles in working of LCD, sensors and bio sensors.
- explain the preparation, properties and applications of polymers.
- explain the characteristics of super conducting materials and non-elemental semiconductors.
- analyse the working principles of batteries, fuel cells and solar cells.
- explain the principles of green chemistry and suitable methods for synthesis of green products

Unit–I: Nano Materials

Concept of Nano materials –types of nanomaterials – synthesis of nano materials – Sol-gel method, Thin films by Chemical vapour deposition method, Carbon nano tubes(CNTs) – types, preparation of carbon nano tubes by arc discharge method. Properties and applications of CNTs, Quantum dots – applications.

Unit–II: Liquid Crystals, Electrochemical and Biosensors

Liquid crystals - types, properties, applications, working principle of Liquid Crystal Display(LCD)- Working principle of OLED-Working principle of compact disc and pendrive.

Sensors and Bio-Sensors – principle, description of an electro chemical sensor – applications, working principle of glucometer – Applications of bio-sensors.

Unit–III: Polymer Technology

Fibre reinforced plastics – Definition of matrix and reinforcement – Glass Fibres, Carbon fibres, aramid fibres – preparation methods – hand layup method, matched metal die moulding method – properties – applications. Conducting Polymers – types, properties and applications.Bio-Degradable Polymers – preparation, properties and applications of Dacron and PHBV.

Unit–IV: Non-Elemental Semiconductors & Super Conductivity

Stoichiometric semiconductors, Non- Stoichiometric semiconductors, controlled valency semi conductors, preparation of ultrapure Si and Ge.

Introduction of super conductors – types of super conductors, preparation of 1-2-3 super conducting pellet – classes of super conductors, properties and applications of super conductors.

UNIT–V: Energy Storage Devices

Secondary cells. Construction, electro chemical reactions and applications of secondary cells, Lithium ion battery, Pb-acid storage battery, maintenance free lead acid battery. Construction, electro chemical reactions and applications of Fuel cells – H_2-O_2 fuel cell, Methanol-oxygen fuel cell.

Solar energy – Photo Voltaic Cells, Photosensitizing diode, Solar Reflector(parabolic trough, solar dish, solar tower).

UNIT–VI: Green Chemistry

Need of green chemistry, principles of green chemistry, green synthesis (super critical fluid extraction, microwave induced method), e-waste management, zero waste technology, outline of Green computing.

Text Books

1. Text book of Engineering Chemistry by Jain & Jain. Dhanpat Rai Publishing Company, 16th Edn.,2015.
2. A Text book of Engineering Chemistry by Shashi Chawla. Dhanpat Rai Publications, 3rd Edn.,2013.

Reference Books

1. A Text book of Engineering Chemistry by S.S.Dara. S.Chand & Company Ltd., 12thEdn.,2010.
2. Engineering Chemistry by J.C.Kurisascose and J.Rajaram. volumes 1&2,Tata Mc Graw-Hill Publishing.

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ENVIRONMENTAL STUDIES
(Common to ME, CSE & IT)
I Year – I Semester

Lecture	: 3	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives
- To impart the basic knowledge about the environment and ecology.
- To develop an attitude of concern for biodiversity and its conservation.
- To assess the environmental impacts of developmental activities.
- To create awareness on environmental pollution and waste management.

Learning Outcomes

Upon successful completion of the course, the students will be able to
- understand the role of a citizen in protection of environment.
- analyze functional attributes of an ecosystem.
- enumerate the values of biodiversity.
- identify appropriate processes to control pollution
- identify waste management practices
- understand various stages of Environmental Impact Assessment (EIA)

UNIT–I : Multidisciplinary Nature of Environmental Studies

Definition – Scope – Importance - Need for Public Awareness – Multidisciplinary nature of Environmental Studies – Awareness activities-Role of a citizen in protection of environment

UNIT–II: Ecosystem

Concept of an Ecosystem – Structural features of Ecosystem – Food Chain – Food Web – Ecological Pyramids – Energy Flow – Biogeochemical Cycles – Ecological Succession-Major ecosystems.

UNIT–III: Biodiversity &Its Conservation

Definition – Levels of Biodiversity – Bio-geographical zones of India – Values of biodiversity (Consumptive use, productive use, Social, Ethical, Aesthetic, Option values, Ecosystem service values) – India as a mega diversity nation – Threats to biodiversity – Endangered &Endemic species of India – Conservation of biodiversity (In-situ & Ex-Situ)-Biodiversity Act,2002.

UNIT–IV: Environmental Pollution

Definition – Causes – Effects & Control measures of – Air pollution – Water pollution – Noise pollution – Soil pollution –Radioactive pollution.

UNIT–V: Environmental Management

Environmental Impact Assessment – Environmental Impact Statement – Environmental Management Plan – Environmental Audit – Ecotourism – Green building – Green Development – Mechanism-Environmental legislations-Wild life (protection) Act,1972-Water (prevention and control of pollution) Act, 1974-Forest (conservation) Act,1980-Air (prevention and control of pollution) Act, 1981-Environmental(protection) Act,1986.

UNIT–VI: Waste Management

Liquid waste: Industrial waste water treatment -Municipal water treatment-Drinking water treatment

Solid waste: Municipal solid waste- Biomedical waste- Hazardous waste- E-waste

Text Books

1. Environmental studies:AnubhaKaushik,C.P.Kaushik: New age international publishers (UNIT-1,2,3,5).
2. Environmental Science &Engineering :P.Anandan, R.Kumaravelan, Scitech Publications (India) Pvt. Lted.(UNIT-4,5,6)

Reference Books

1. "Environmental Studies" by Shashichawala:TataMcgraw hill education private limited.
2. "Environmental Studies" by Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
3. "Society and Environmen" by Dr.SureshK.Dhameja:S.K.Kataria and sons
4. "Environmental studies" by Benny Joseph:Tata Mc Graw-Hill publishing company limited.

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BASIC ELECTRICAL ENGINEERING

I Year – I Semester

Lecture	: 3	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To introduce the basics electrical circuits and network theorems.
- To develop an understanding of DC machines and AC machines .

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the basic electrical concepts like voltage, current, power and energy
- analyze an electrical circuit by using various laws.
- apply the knowledge of various network theorems in simplifying electrical networks.
- demonstrate the principles of various D.C. machines.
- select an appropriate DC/AC machine for real time applications.

Course Content

UNIT–I: Electrical Circuits

Basic definitions, types of elements, Ohm's Law, Kirchhoff's laws, mesh and nodal analysis . (All the above topics are only elementary treatment and simple problems).

UNIT–II: Network Theorems

Superposition, Reciprocity theorem, Thevenins and Maximum power transfer theorems. (All the above topics are only elementary treatment and simple problems).

UNIT–III: DC Generators

Construction & Principle of operation of DC Generator – emf equation - types of DC Generators. (All the above topics are only elementary treatment and simple problems).

UNIT–IV: DC Motors

Construction & Principle of operation of dc motors - types of DC Motors - Losses and torque equation. (All the above topics are only elementary treatment and simple problems).

UNIT–V: Transformers

Principles of operation, Constructional Details, Transformer Losses, O.C and S.C Tests, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

UNIT–VI: AC Machines

Three phase induction motor, principle of operation, slip and rotor frequency, torque equation .(All the above topics are only elementary treatment and simple problems).

Text Books

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah TMH.
2. Basic Electrical Engineering By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.
3. Electrical and Electronic Technology by hughes Pearson Education.

Reference Books

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagr ath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.
4. Basic Electrical Engineering by Vincent Del toro, PHI

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PROBLEM SOLVING THROUGH COMPUTER PROGRAMMING
(Common to ECE, CSE & IT)
I Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To emphasize the use of flowcharts and pseudo code in problem solving.
- To gain knowledge in C language.
- To apply C language in problem solving.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline problem solving steps, c-tokens and data types.
- design algorithm and flowchart for solving problem.
- use control statements for writing the programs.
- apply the concepts of arrays and strings in problem solving.
- use pointers and funtions to develop C programs.
- distinguish structures and unions and develop programs using structures.
- demonstrate the operations on files.

Course Content

UNIT–I

Problem Solving Steps – Understanding problem, developing algorithm, flowchart, coding, debugging and testing.

General form of a C program, C Tokens, basic data types, type conversion, variable declarations, console I/O statements, order of evaluation.

Sample problems such as evaluating formulae.

UNIT–II

Control Statements: Selection Statements – if, if-else, nested if, else-if, switch and conditional operator.

Iteration Statements – for, while and do-while.

Jump Statements – return, goto, break, exit and continue.

Problem Solving - Factorial computation, generation of Fibonacci sequence, reversing digits of an integer, generating prime numbers.

UNIT–III

Arrays and Strings– Declaring, initializing, accessing and display of one dimensional and two dimensional arrays.

Problem Solving – Computing mean and variance of a set of numbers, reverse the elements in an array, addition of two matrices.

UNIT–IV

Pointers – Declarations, initialization and operations.

Functions – General form of functions, passing parameters by value and by address, recursive functions, dynamic memory allocation functions, storage classes, pointers and arrays and string handling functions.

Problem solving - Print the sum of all elements of the array using pointers, swapping of two numbers, calculate the GCD of two non-negative integers using recursion.

UNIT–V

Structures -Definition, declaration, initialization, accessing structure members, nested structures, array of structures, structures and functions, unions.

Problem solving- Implement a structure to read and display the Name, Date of Birth and Salary of Employees, Functions to perform read, add and write two complex numbers using Structures.

UNIT–VI

File Handling- Text and binary files, file handling functions, file processing operations – inserting, deleting, searching and updating a record and displaying file contents, random access to files.

Problem solving – Copy the contents of one file to another, count the number of characters, words and lines in a file.

Text Books

1 Programming in C, 2nd Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.

2 C Programming, E Balaguruswamy, 3rd edition, TMH.

Reference Books

1 Programming in C, Reema Thareja, OXFORD.

2 C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.

3 R G Dromey, How to Solve it by Computer, Prentice-Hall of India, 1999.

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FUNCTIONAL ENGLISH LAB
(Common to All Branches)
I Year – I Semester

Practical	: 2	Internal Marks	: 40
Credits	: 1	External Marks	: 60

Course Objectives

Functional English (Lab) seeks to develop in the students

- the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English; and
- a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.

Learning Outcomes

Upon successful completion of Functional English (Lab), the students will be able to

- give short impromptu speeches with confidence and fluency and take part in conversations in different functional contexts using English following appropriate communication strategies.
- check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
- speak English with adequate attention to stress, rhythm, and intonation; and
- speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.

Course Content

UNIT–I
a. Greeting, introducing and taking leave b. Pure vowels

UNIT–II
a. Giving information and asking for information b. Diphthongs

UNIT–III
a. Inviting, accepting and declining invitations b. Consonants

UNIT–IV
a. Commands, instructions and requests b. Accent and rhythm

UNIT–V
a. Suggestions and opinions b. Intonation

Text Books

1. Hari Prasad, M., Salivendra Raju, J., and Suvarna Lakshmi, G. (2013). *Strengthen Your Communication Skills*. Hyderabad: Maruthi Publications.
2. Handouts produced by the Department on "difficult sounds," consonant clusters, the other problems of Telugu learners of English, listening comprehension, and oral reading
3. The following pieces of software:
   - 'Multimedia Language Lab' provided by K-Van Solution, Hyderabad
   - 'Foundation Course in Communication Skills' provided by the Andhra Pradesh State Council of Higher Education (APSCHE), Government of Andhra Pradesh.
4. Audio and video clips such as 'BBC English'

Testing Pattern

I.	**Internal**	**40 marks**
a.	Regular performance in the Language/Communications Lab	15 marks
b.	Completing the tasks in the lab manual	10 marks
c.	Testing of listening : Listening to a short audio clip of a speech/conversation in British accent and answering questions at the 'information' level.	05 marks
d.	Test of reading: Role-playing a dialogue with proper pronunciation and with reasonable attention to tone groups, stress, rhythm and intonation.	10 marks
II.	**External**	**60 marks**
a.	Test of writing	
	Writing a dialogue on the situation set	10 mark
	Answering 'Yes/No' questions on pronunciation	05 mark
	Marking sentence stress and intonation	05 marks
b.	Test of speaking	20 marks
	Role-playing a situational dialogue (e.g. 'At the railway station,' 'At the restaurant') with proper pronunciation and with reasonable attention to tone groups, stress, rhythm, and intonation	
c.	Viva voce (with an external examiner)	20 marks
	Speaking for one minute on a given topic	

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COMPUTER PROGRAMMING LAB
(Common to ECE, CSE & IT)
I Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To familiarize with the discrete components of a computer, MS Office
- To develop C Programs to solve problems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Identify discrete components of computers.
- Prepare applications using MS Office.
- Apply problem solving steps to solve a problem.
- Develop a C program for a given problem.

List of Exercises

Exercise 1:

a. Identifying the discrete components of a computer.
b. Creating a document using MS Word.

Exercise 2:

a. Familiarizing with the usage and applications of MS Excel.
b. Creating a presentation using MS PowerPoint.

Exercise 3: Basics of C

a. Write a C program to calculate the area of triangle using the formula area = $(s (s-a) (s-b)(s-c))^{1/2}$ where s= (a+b+c)/2
b. Write a C program to find the largest of three numbers using ternary operator.

Exercise 4: Selection Statements

Implement a C program for the following:

a. Find the roots of a quadratic equation.
b. Calculate electricity bill for the consumed units – assume suitable constraints.
c. Read two integer operands and one operator form the user, perform the operation and then print the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 5: Iterative statements

Develop a C program for the following:

a. Display first N natural numbers.
b. Check whether given number is Prime (or) not.
c. Find the reverse of a given number.

Exercise 6: Arrays

Design a C program for the following :

a. To Search whether the given element is in the array.
b. To Perform Addition and multiplication of two Matrices.

Exercise 7: Strings

Develop a C program for the following:

a. To Check whether the given String is a Palindrome (Without using String Handling functions).
b. To Illustrate string handling functions-strlen(), strcmp(), strcat(), strcpy(), strrev()

Exercise 8: Functions

Implement a C program for the following:

a. To Sort a given set of numbers in ascending order using functions.
b. To find the factorial of a given integer using recursive function.
c. To generate Fibonacci series using non-recursive function

Exercise 9: Pointers

Implement a C program for the following:

a. Function to exchange (Swap) values of two integers using call by reference.
b. Illustrate the usage of dynamic memory management functions.

Exercise 10: Structures

Develop a C program for the following:

a. To implement a structure to read and display the Name, date of Birth and salary of an Employee.
b. To display the Name, Marks in five subjects and total marks of given number of students. (Using array of structures).
c. Functions to perform the following operations using Structure:
   i) Addition of two complex numbers
   ii) Multiplication of two complex numbers.

Exercise 11: Files

Implement a C program for the following:

a. To copy contents of one file to another.
b. To count the number of characters, words and lines in a file.

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PROFESSIONAL COMMUNICATION
(Common to All Branches)
I Year – II Semester

Lecture	: 3	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity.
- To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.

Learning Outcomes

Upon successful completion of Professional Communication, the students will be able to

- speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation)
- listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents
- read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills
- produce written discourses of different kinds;
- guard against grammatical errors Indians typically make in their speech and writing in English

Course Content

LEVEL - I: Intermediate (for the first mid-semester)

1. From the textbook "Innovate with English": Unit VII

Listening	: Conversations using Communicative functions
Reading Comprehension	: Text: 'Priming the Pump'
Remedial Grammar	: *if*-clause and Indianism
Writing	: Email writing

2. From the textbook "Vocabulary Builder for Students of Engineering and Technology"

The following portions only:

GRE Words (Unit 1.3)	One-Word Substitutes (Unit 4.3)
Collocations (Unit 2.3)	Idioms (Unit 5.3)
Commonly Confused Words (Unit 3.3)	Phrasal Verbs (Unit 6.3)

3. From Great Stories in Easy English

"Pride and Prejudice" by Jane Austen

LEVEL - II: Advanced (for the second mid-semester)

1. From the textbook “Innovate with English”: Unit VIII

Listening	: Conversations using communicative functions
Reading Comprehension	: Text: ‘Bionics’
Remedial Grammar	: Articles and Indianism
Writing	: Email writing

2. From the textbook “Vocabulary Builder for Students of Engineering and Technology”

The following portions only:

GRE Words (Unit 1.4)	One-Word Substitutes (Unit 4.4)
Collocations (Unit 2.4)	Idioms (Unit 5.4)
Commonly Confused Words (Unit 3.4)	Phrasal Verbs (Unit 6.4)

3. From Great Stories in Easy English

“Gulliver’s Travels” by Jonathan Swift

Textbooks

1. Samson, T. (2010). *Innovate with English*. Hyderabad: Foundation
   - Unit SEVEN and EIGHT only
2. Vijayalakshmi, M. et al (2014). *Vocabulary Builder for Students of Engineering and Technology*. Hyderabad: Maruthi Publications.
3. The following simplified classics, one for each mid-semester, from the series, *Great Stories in Easy English*, published by S. Chand & Company Limited:
   - *Pride and Prejudice* by Jane Austen
   - *Gulliver’s Travels* by Jonathan Swift
4. Audio and video clips carefully selected by the Department in order to sensitize the students to native-speaker accents.

Testing Pattern

First Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading an unseen passage and answering two sets of questions on it:

a) Ten comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer’s ideas, etc. are to be set. Five of the ten questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 10 x ½ = 5**

b) Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 100 – 150 words. **Marks: 1 x 5 = 5**

II. Reading a poorly-written e-mail message and doing the following tasks:

a) Analyzing the reasons for the e-mail failing to meet the standards of professional e-mail communication. The analysis must identify and discuss at least five reasons. (Length: 100 – 150 words) **Marks: 1 x 5 = 5**

b) Rewriting the e-mail using the standards of professional e-mail communication. **Marks: 1 x 5 = 5**

III.

a) Ten contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.3; Collocations: 2.3; Commonly confused words: 3.3; One- word substitutes: 4.3; Idioms: 5.3; and Phrasal verbs: 6.3 **Marks: 10 x ½ = 5**

b) Correction of grammatical errors: ten sentences with grammatical errors of the following types (dealt with in Unit 7 of *Innovate with English*) will be given: *if*-clause and Indianism **Marks: 10 x ½ = 5**

IV.

a) Completing a conversation (where informational and interactional functions are performed) with suitable expressions. **Marks: 10 x ½ = 5**

b) Answering ten 'true-or-false' questions on communication strategies and functions given in form of short dialogues. **Marks: 10 x ½ = 5**

Second Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading a poorly-written e-mail message and doing the following

a) Analyzing the reasons for the e-mail failing to meet the standards of professional e-mail communication. The analysis must identify and discuss at least five reasons. (Length: 100 – 150 words) **Marks: 1 x 5 = 5**

b) Rewriting the e-mail using the standards of professional e-mail communication **Marks: 1 x 5 = 5**

II. Reading an unseen passage and answering two sets of questions on it.

a) Ten comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, etc. are to be set. Five of the ten questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks 10 x ½ = 5**

b) Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 100 – 150 words. **Marks: 1 x 5 = 5**

III.

a) Ten contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.4; Collocations: 2.4; Commonly confused words: 3.4; One- word substitutes: 4.4; Idioms: 5.4; and Phrasal verbs: 6.4 **Marks: 10 x ½ = 5**

b) Correction of grammatical errors: ten sentences with grammatical errors of the following types (dealt with in Unit 8 of *Innovate with English*) will be given: articles and Indianism. **Marks: 10 x ½ = 5**

IV. Reading an expository text and doing two tasks:

a) Making notes (identifying the main points of the text and writing them down in note form)

b) Summarizing the text using the notes already made **Marks: 1 x 5 = 5**

Semester End Examination

Answer any five questions: **Question I is compulsory.**

I. Reading a poorly-writen e-mail message and doing the following task:**(**Compulsory)

a. Analyzing the reasons for th email failing to meet the standards of professional email communication. The analysis must identify and discuss at least five reasons. (Length: 100-150 words) **Marks: 1 x 5 = 5**

b. rewriting the email using the standards of professional email communication. **Marks: 1 x 7 = 7**

II. Reading the text of a presentation made in a professional context and answering the following questions:

a. Analysing the passage from the point of view of language and style and identifying the reasons for the presentation falling short of the standards of professional presentations (Length of the answer: 100 – 150 words) **Marks: 1 x 5 = 5**

b. Rewriting the text of the presentation in the light of the analysis made in (a) above and following the conventions of professional presentations as far as language and style are concerned. **Marks: 1 x 7 = 7**

III. Reading an unseen (unfamiliar) passage on an issue related to engineering and technology or on a professional issue or situation and answering two sets of questions on it:

a. Ten comprehension questions:

- Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, pinpointing the writer's attitude/bias, etc. are to be set; 'information' questions involving a *mere* reproduction of the content should be avoided.
- At least three of the ten questions should be multiple-choice questions.
- In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 10 x ½ = 5**

a. Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 200 – 250 words. **Marks: 1 x 7 = 7**

IV. Filling in blanks in sentences using GRE words, collocations, one-word substitutes, commonly-confused words, idioms, and phrasal verbs. The contexts will be clearly given for each expression, and the questions will be multiple-choice ones.

- GRE Words (Units 1.3 and 1.4)
- Collocations (Units 2.3 and 2.4)
- Commonly Confused Words (Units 3.3 and 3.4)
- One-Word Substitutes (Units 4.3 and 4.4)
- Idioms (5.3 and 5.4)
- Phrasal Verbs (Units 6.3 and 6.4) **Marks: 12 x 1 = 12**

V. Reading a dialogue (in which informational and interactional functions are performed) and answering two questions on it:

a. Completing the dialogue with appropriate expressions **Marks: 10 x ½ = 5**

b. Extending the scope of the dialogue using at least five of the given communication strategies/functions. **Marks: 1 x 7 = 7**

VI. Correction of grammatical errors:

- Either a conversation with twelve grammatical errors (in the areas of articles, modal verbs, prepositions, phrasal verbs, and Indianism), or isolated sentences with twelve grammatical errors will be given.
- If isolated sentences with errors are given, they are not to be given in isolation from their contexts; a conversation with errors of the kind specified above will serve the purpose better.

The examinees are expected to rewrite the sentences in the answer book, correcting hem. **Marks: 12 x 1 = 12**

VII. Reading an expository text and doing two tasks:

a. Making notes (identifying the main points of the text and writing them down in note form) **Marks: 4 x 1 = 4**

b. Summarizing the text using the notes already made **Marks: 1 x 8 = 8**

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NUMERICAL METHODS AND DIFFERENTIAL EQUATIONS
(Common to CSE & IT)
I Year – II Semester

Lecture	: 4	Tutorial	: 1	Internal Marks	: 40
Credits	: 4			External Marks	: 60

Course Objectives

- To understand the various numerical techniques.
- To aware of different techniques to solve first and second order differential equations.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply numerical techniques for solutions of Algebraic, transcendental and ordinary differential equations.
- find interpolating polynomial for the given data.
- apply the learnt techniques to solve first and second order differential equations in various engineering problems.
- find the maximum and/or minimum points on a given surface.

UNIT–I: Algebraic and Transcendental Equations

Solution of Algebraic and Transcendental Equations- Introduction –Bisection Method – Method of False Position – Newton-Raphson Method.

UNIT–II: Interpolation

Interpolation- Introduction – Finite differences- Forward Differences – Backward differences –Central differences – Symbolic relations – Newton formulae for interpolation – Lagrange's interpolation.

UNIT–III: Numerical differentiation and integration

Approximation of derivative using Newton's forward and backward formulas. Integration using Trapezoidal and Simpson's rules.

UNIT–IV: First order ordinary Differential Equations

Exact and non-exact differential equations, Applications- Newton's Law of cooling, Orthogonal trajectories.

UNIT–V: Higher Order Linear ordinary Differential Equations with constant coefficients

Solving Homogeneous differential equations, solving Non-Homogeneous differential equations when RHS terms are of the form $e^{ax}, \sin ax, \cos ax, polynomial\ in\ x, e^{ax}\,v(x), x\,v(x)$.

UNIT–VI: Partial Differentiation

Total derivative, chain rule, Jacobian, Application- finding maxima and minima(two & three variables).

Text Books

1. B.S.Grewal, Higher Engineering Mathematics: 42nd edition, Khanna Publishers,2012 , New Delhi.
2. B.V.Ramana, Higher Engineering Mathematics: Tata McGraw Hill, New Delhi.

Reference Books

1. U.M.Swamy, A Text Book of Engineering Mathematics – I & II : 2nd Edition, Excel Books, 2011, New Delhi.
2. Dr. T.K.V.Iyengar, Dr. B.Krishna Gandhi, S.Ranganatham and Dr.M.V.S.S.N.Prasad, Engineering Mathematics, Volume-I: 11th edition, S. Chand Publishers, 2012, New Delhi.
3. Erwin Kreyszig, Advanced Engineering Mathematics: 8th edition, Maitrey Printech Pvt. Ltd, 2009, Noida.
4. S. Armugam, A. Thangapandi Isac, A. Soma Sundaram, Numerical Methods, Scitech Publications.

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APPLIED PHYSICS

I Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To learn conditions for propagation of laser light in guided medium
- To understand principles of solid state materials for use in the engineering applications

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain construction and working of laser
- relate the principles of propagation of light in optical fibers for applications in communications.
- apply the wave nature of electrons to understand the basic concepts of quantum computing.
- identify conductivity mechanism in semiconductors
- derive orbital and spin contribution for magnetism
- determine types of polarization and classius-mossoti relation

Course Content

UNIT– I: Laser

Basic characteristics - Basic requirements - Spontaneous and stimulated emission - Einstein's coefficient - Ruby laser - Helium-Neon Laser – Semi Conductor Laser - application of laser.

UNIT–II: Optical Fiber

Basic principle of optical fiber - Construction of optical fiber - Acceptance angle, Acceptance cone - Numerical Aperture - Types of optical fiber - Light wave communication by using optical fiber

UNIT–III: Principles of Quantum Mechanics and its Applications

De Broglie's hypothesis - De Broglie's wave length - Schrodinger time independent wave equation - Physical significance of wave function - Particle in one dimensional infinite potential box - Bloch sphere - Classical bits and Quantum bits - Application of Qu bits for Quantum computing

UNIT–IV: Semi Conductor

Carrier density in intrinsic and extrinsic semiconductor- Drift and Diffusion currents-Einstein's coefficients-LEDs

UNIT–V: Magnetic Materials

Permeability, magnetization - Origin of magnetism - Classification of magnetic materials - Domain theory (qualitative) – Hysteresis - Soft and hard magnetic materials - Applications

UNIT–VI: Dielectric Materials

Polarization-Internal field-Claussius-Mossoti relation- -Dielectric loss -Break down-Ferroelectrics.

Text Books

1. Charles Kittel, Introduction to Solid-state physics, (8^{th} Edition) , John Wiley & Sons, Inc
2. Dr. M.N. Avadhanulu , Dr. P.G.Kshirsagar, A Text Book of Engineering Physics (9^{th} Edition), S.Chand Publications.

Reference Books

1. A.J.Dekker,Solid state physics.
2. B.B.Laud , Lasers and Non-Linear optics, Newage international publishers.
3. P.K. Palanisamy, Applied Physics, Scitech Publications.

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ENGINEER AND SOCIETY
(Common to ME, CSE & IT)
I Year – II Semester

Lecture	: 3		Internal Marks	:	40
Credits	: 2		External Marks	:	60

Course Objectives

- To understand the Ethics and Human Values.
- To equip the students to have a basic awareness on environmental and socio-economic factors.
- To familiarize with the rights and responsibilities of an engineer.
- To elucidate the rules and regulations of patents and trade laws.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- comprehend different moral perspectives and one's own ethical standards.
- understand the concept of safety and risk.
- explain different initiatives to protect nature.
- identify the role of Information Technology.
- understand different types of infringement of Intellectual Property Rights.
- analyze the importance of Entrepreneurship.

UNIT–I: Human Values

What is engineering – who is an engineer - Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue -Value time – Co-operation – Commitment – Empathy–Self-confidence –Character.

UNIT–II: Engineer's Responsibilities and Rights

Safety and risk –Types of risks – Voluntary vs. Involuntary risk –Short Term vs. Long Term Consequences – Expected Probability – Reversible Effects –Threshold Levels for Risk – Delayed vs. Immediate Risk – Collegiality – Techniques for achieving Collegiality- Two senses of Loyalty –Rights – Professional Responsibilities – Confidential and Proprietary information.

UNIT–III: Global climatic issues and mitigation strategies

Greenhouse effect – global warming – acid rain – ozone layer depletion – International efforts-key initiatives of Montreal protocol, Rio declaration, Kyoto protocol, Johannesburg summit.

UNIT–IV: Future challenges to society

Sustainable development – Measures for sustainable development – Water conservation practices – Rain water harvesting methods- Watershed management – Resettlements and Rehabilitation of people- waste land reclamation – Role of information technology- Role of an engineer in mitigating societal problems.

UNIT–V: Patent law, Trade Marks and Copyrights

Introduction, Types of IPR – Patent requirements - Application process – Ownership – Transfer – Infringement – Litigation.

Trade Mark and Copyrights: Introduction – Registration Process – Transfer – Infringement.

UNIT–VI: Entrepreneurship

Meaning, definition& concept of Entrepreneurship, characteristics &skills of entrepreneur, Role of an entrepreneur in economic development.

Text Books

1. Professional ethics and human values by Ddharanikota Suyodana, Maruti publications(unit 1,2).
2. Environmental studies" by Deeksha Dave, P. Udaya Bhaskar,Cengage Learning.(unit 3,4).
3. "Intellectual Property" by Deborah E.Bouchoux, Cengage Learning, New Delhi.(unit 5).
4. "Entrepreneurship", by Narayana Reddy, Cengage Learning.(unit 6)

Reference Books

1. Professional Ethics and Human Values, by A. Alavudeen, R. KalilRahman and M.Jayakumaran- University Science press.
2. Environmental Studies by R. Rajagopalan 2nd Edition 2011, Oxford University Press.
3. Intellectual Property Rights, R.Radha Krishnan, S.Balasubramanian Excel Books, New Delhi.
4. Intellectual Property Rights, Prabhuddha Ganguli. Tata McGrawHill, New Delhi.
5. Fundamentals of Entrepreneurship by P H.Nandan, PHI Learning, New Delhi.

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ELEMENTS OF ELECTRONICS ENGINEERING
(Common to CSE & IT)
I Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize the construction, characteristics and applications of various semiconductor devices.
- To introduce various electronic circuits and their operation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish the behavior of PN junction diode under forward bias and reverse bias conditions.
- select appropriate semiconductor devices for different electronic circuits.
- analyze the rectifier circuits with and without filters.
- characterize the performance of BJT, FET, and MOSFETS

Course Content

UNIT–I: Introduction

Passive circuit components: Resistors, capacitors, inductors, Material classification, Mobility and conductivity, Intrinsic and extrinsic semiconductor, mass-action law, Hall effect, drift and Diffusion currents.

UNIT–II: Semiconductor Diode Characteristics

Open circuited PN junction, Current components in a PN diode, Diode forward and reverse currents, The Volt-Ampere characteristics, Temperature dependence of V-I characteristics, Resistance, Transition capacitance, Diffusion capacitance.

UNIT–III: Special Semiconductor Devices

Breakdown diodes, Tunnel diode, Varactor diode, Photo diode, LED, UJT and SCR (only V-I characteristics).

UNIT–IV: Rectifiers and Filters

Diode as a rectifier, half wave rectifier, Full wave bridge rectifiers and comparison, rectifier with inductor filter, capacitor filter, L section filter, ð-section filter, comparison, Zener diode voltage regulator.(No analysis part for filters)

UNIT–V: Bipolar Junction Transistor

Construction of a transistor, transistor current components, Transistor configurations – CB, CE and CC, Early effect, comparison of CB, CE and CC, Transistor operating regions, Operating point.

UNIT–VI: Field Effect Transistor

Classification of FETs, Construction of JFET, Characteristics of FET, FET as a voltage variable resistor, Transfers Characteristics, comparison with BJT, Depletion type MOSFET, Enhancement type MOSFET.

Text Books

1. Jacob Millman and Christos C Halkias, Electronic Devices and Circuits, 2nd Edn., TMH, 2002.
2. Robert L Boylested and Louis Nashelsky, Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003.

Reference Books

1. K. Rajarajeswari, B. Visvesvararao, K.Bhaskararamamurthy and P.Chalamraju pantulu Electronic Devices and Circuits, 2nd Edition, Pearson Education.
2. Theodore F Bogart Jr., Jeffrey S Beasley and Guiliermo Rico, Elecronic Devices and Circuits, 6th Edition, Pearson Education 2004.
3. David A Bell, Electronic Devices and Circuits, 4th Edition, PHI, 2003. 4. Floyd, Thomas, Electronic Devices, Pearson Education, 5th Edition.

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PYTHON PROGRAMMING
(Common to CSE & IT)

I Year – II Semester

Lecture : 3	Practical : 2	Internal Marks	: 40
Credits : 3		External Marks	: 60

Course Objectives

- To introduce Scripting Language.
- To explore various problems solving approaches of computer science.
- To develop a basic understanding of Python programming.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Demonstrate the basic elements of Python
- Implement programs using Python Control Structures.
- Design functions in Python to solve the problems.
- Apply strings, lists and tuples in developing Python programs.
- Implement programs with the help of Dictionaries to solve the problems.
- Develop python programs by using files.

Course Content

UNIT–I: Basics of Python Programming

Features and History of Python, Literal Constants, Data Types, Variables, Operators, input operation.

Programs: Write a python program to

1. print “Hello World!” on the screen.
2. find sum of two numbers.
3. compute distance between two points taking input from the user. (use Pythagorean Theorem)

UNIT–II: Decision Control and Looping Statements

Conditional and un-conditional branching, Iterative statements, Nesting of decision control statements and loops.

Programs: Write a python program to

1. test whether a given number is even or odd.
2. print out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10, using a for loop.
3. print a countdown from the given number to zero. using a while loop.
4. find the sum of all the primes below hundred.
5. find the factorial of a given number.

UNIT–III: Functions and Strings

Functions-function definition, call, return statement, Types of arguments Recursive functions, modules.

Strings -Basic string operations, String formatting operator, Built-in functions.

Programs:

1. Write a function cumulative_product to compute cumulative product of a list of numbers.
2. Write function to compute gcd, lcm of two numbers. Each function shouldn’t exceed one line.

3. Find the sum of the even-valued terms in the Fibonacci sequence whose values do not exceed ten thousand.
4. Write a program that accepts a string from a user and re-displays the same after removing vowels from it.
5. Write a program to calculate the length of a string.
6. Write a function to reverse a given string.

UNIT–IV: Tuples, Lists

Tuples – creating, accessing values ,updating, deleting elements in a tuple, Basic Tuple operations.

Lists – accessing, updating values in Lists, Basic List operations, mutability of lists.

Programs: Creating Python Lists and deleting some elements, creating and accessing Python tuple elements.

1. write a program to swap two values using Tuple assignments.
2. Write a program to sort a Tuple of values.
3. Write program that scans an email address and forms a tuple of user name and domain name.
4. Write a program to print sum and average of the elements present in the list.
5. Write a program that forms a list of first character of every word present in another list.

UNIT–V: Dictionaries

Dictionaries – Creating a Dictionary, adding an item, deleting items, sorting items, looping over a dictionary, Basic Dictionary operations, Built-in functions.

Programs:

1. Write a program to count the number of characters in the string and store them in a dictionary.
2. Write a program to sort keys of a dictionary.
3. Write a program that prints maximum and minimum value in a dictionary.

UNIT–VI: File Handling

File types, File path, File operations-open, close, read, write, Types of arguments.

Programs:

1. Write a program to print each line of a file in reverse order.
2. Write a program to compute the number of characters, words and lines in a file.
3. Write a program to copy contents of one file into another file.

Text Books

1. Reema Thareja, “Python Programming – Using Problem Solving Approach “, Oxford University Press, 2014 Edition.

Reference Books

1. Wesley J. Chun, “Core Python Programming”, Second Edition, Prentice Hall.
2. Martin C. Brown, “Python: The Complete Reference”, 2001 Edition, Osborne/ Tata McGraw Hill Publishing Company Limited.
3. Kenneth A. Lambert, ‘Fundamentals of Python – first programs”, 2012 Edition, CENGAGE publication.

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PROFESSIONAL COMMUNICATION LAB
(Common to All Branches)
I Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.

Learning Outcomes

Upon successful completion of Professional Communication Lab, the students will be able to

- enhance the effectiveness of their communication through body language;
- take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
- take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency
- speak professionally in telephone conversations;
- make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;
- take part in group discussions and debates successfully;
- answer questions at an elementary level in job interviews; and
- use team-building skills with impact in different situations.

Course Content

UNIT–VI : Body Language

UNIT–VII : Dialogues

UNIT–VIII : Presentation Skills

UNIT–IX : Group Discussion

UNIT–X : Interviews and Telephonic Interviews

UNIT–XI : Debates

Text Books

1. Hari Prasad M., Salivendra Raju J., and Suvarna Lakshmi G., (2013). *Strengthen Your Communication Skills*. Hyderabad: Maruthi Publications.

2. The following pieces of software:
   - 'Multimedia Language Lab' provided by K-Van Solution, Hyderabad
   - 'Foundation Course in Communication Skills' provided by the Andhra Pradesh State Council of Higher Education (APSCHE), Government of AndhraPradesh.

Testing Pattern

1. Internal	**40 marks**
a. Regular performance in the Communications Lab	15 marks
b. Completing the tasks in the lab manual	10 marks
c. Making a PowerPoint presentation (Pair/Group)	15 marks
(Note: A hard copy of the presentation is to be submitted)	
2. External	**60 marks**
a. Test of writing	
A telephone conversation	08 marks
The minimum number of exchanges to be specified	
• Writing a resume	10 marks

The length (1page / 2 pages) is to be specified. The features to be included in the resume are also to be specified; the examinees will, however, have the option of including more features within the length specified.

- Answering 3 job-interview questions — 12 marks

Questions at an elementary level. In other words, questions that require candidates to talk about themselves, their ambitions, their personality, their hobbies and interests, and their key skills.

Sample questions:

Can you tell us something about yourself?
What kinds of things do you worry about?
What are your key skills?
What skills do you need to improve?
What do you see as your strengths?
What do you like doing in your spare time?
How would you describe the way you work?
Tell us about a time when you showed strong leadership skills.
Tell us about a time when you had to make a difficult decision.
How do you see yourself in five years' time?

b. Test of speaking	
Group discussion	15 marks
Time: 10-15 minutes (approx.) per group	
c. Viva voce with an external examiner	15 marks

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APPLIED PHYSICS LAB

I Year – II Semester

Practical	: 2	Internal Marks	: 40
Credits	: 1	External Marks	: 60

Course Objectives

- To draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
- To understand the behaviour and characteristics of various active and passive components.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify energy gap of a semiconductor
- draw characteristic curves to estimate thermal coefficient of a thermsitor
- observe self timer and tuning nature of passive components like RC,LCR
- verify magnetic field along the axis of a circular coil.
- determine frequency of AC and unknown tuning fork
- calculate light gathering power of optical fiber
- estimate wavelength of unknown source

List of Experiments

S.No	Name of the experiment- Aim
1	Determination of Energy Band gap of a semiconductor
2	Determination of thermal coefficient of a thermistor
3	Draw V-I characteristics of a Zenar diode and calculate breakdown voltage
4	Determination of time constant of RC circuit
5	Determination of resonance frequency of LCR Series and parallel circuit
6	Determination of magnetic field along the axis of a circular coil by using Stewart and Gee's Apparatus
7	Study of normal modes in string using forced vibrations in rods-Melde's experiment
8	Determine Numerical aperture of an optical fiber
9	Determination of Frequency of A.C supply
10	Determination of wave length of source using diffraction grating

Reference Books

1. Vijay Kumar & T. Radha Krishna, Practical Physics for engineering students.
2. Dr. Y.Aparna and Dr. K.Venkateswara Rao, Lab manual of Engineering Physics, VGS Books links, Vijayawada.
3. R.Jayaraman,V.Umadevi,S.Maruthamuthu,B.Saravana Kumar, Engineering Physics laboratory manual(1st edition) Pearson publishers.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

II Year – I Semester

Lecture	: 3	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To familiarize with the importance of Managerial Economics and know its significant role in achieving business objectives.
- To interpret and analyze the financial performance of a business unit.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- evaluate the economic concepts and apply them in various changing situations in industry.
- predict the demand for a product of a company and analyze various factors influencing demand elasticity.
- apply various aspects of production and cost analysis in business decision making.
- gain knowledge on various forms of business organisations and their establishment.
- propose various pricing strategies for different products or services.
- apply the accounting rules in determining the financial results and prepare financial statements.
- evaluate various investment opportunities in business.

Course Content

UNIT - I: Introduction to Managerial Economics

Definition, nature and scope of managerial economics, Demand analysis- Demand determinants, law of demand and its exceptions, elasticity of demand, methods of demand forecasting.

UNIT - II: Theory of Production and Cost Analysis

Production function, isoquants and isocosts, MRTS, least cost combination of inputs, Cobb-Douglas production function, laws of returns, Cost analysis- Cost concepts & break even analysis with simple problems.

UNIT - III: Introduction to Markets & Pricing Strategies

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition. Pricing strategies: cost based, demand based, competitive based and strategy based .

UNIT- IV: Introduction to Business Organisations

Factors affecting the choice of business organisations, Forms of business organisations -Sole proprietorship, partnership, joint stock company.

UNIT - V: Introduction to Accountancy

Introduction to accountancy, types of accounts, journal, ledger and trial balance, final accounts with simple adjustments.

UNIT - VI: Capital Budgeting

Significance of capital budgeting, Methods of capital budgeting - Traditional methods and discounted cash flow methods with simple problems.

Text Books

1. A R Aryasri, "Managerial Economics and Financial Analysis", 2nd edition, TATA McGraw Hill.
2. H. Craig Peterson, Sudhir K. Jain and W. Cris Lewis, "Managerial Economics", 4th edition, Pearson Education.

Reference Books

1. R. L. Varshney, "Managerial Economics", Sultan Chand.
2. Ambrish Gupta, "Financial Accounting for Management-An Analytical Perspective", 5th edition, Pearson Education.
3. Yogesh Maheshwari, "Managerial Economics", PHI Learning Pvt. Ltd.

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DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE & IT)
I Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize the structure of statements (and arguments) involving predicates and quantifiers.
- To introduce the applications of graph theory to various practical problems.
- To impart recurrence relations for solving a recursive problem.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply the concept of Mathematical logic in software development process.
- use the concept of Pigeonhole principle to derive the $\Omega(n \log n)$ lower bound.
- apply the concepts of graph theory in robotics, computer vision and computer graphics.
- use the concepts of graph theory to provide solutions for routing applications in computer networks.
- apply the recurrence relation for analyzing recursive algorithms.

Course Content

UNIT - I: Mathematical Logic

Propositional Calculus: Statements and notations, connectives, truth tables, tautologies, equivalence of formulas, tautological implications, theory of inference for statement calculus, consistency of premises.

UNIT - II: Relations and Functions

Relations: Properties of binary relations, equivalence, compatibility and partial order relations, Hasse diagram.

Functions: Inverse, composite and recursive functions, Pigeonhole principle and its application.

UNIT - III: Algebraic Structures

Algebraic systems and examples, general properties, semigroup, monoid, groups, subgroups, cyclic groups.

UNIT - IV: Graph Theory - I

Concepts of graphs, sub graphs, multi graphs, matrix representation of graphs: adjacency matrices, incidence matrices, isomorphic graphs. (theorems without proofs).

UNIT - V: Graph Theory - II

Paths and circuits, Eulerian graph, planar graphs, Hamiltonian graph, chromatic number of a graph. (theorems without proofs).

UNIT - VI: Combinatorics and Recurrence Relations

Basics of counting principles-sum rule and product rule, solving recurrence relations by substitution and by the method of characteristic roots.

Text Books

1. J.P.Trembley, R Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill.
2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd edition, PHI.
3. Kenneth H. Rosen, Kamala Krithivasan, "Discrete Mathematics and its Application: With Combinatorics and Graph Theory", 7th editon, Tata McGraw Hill.

Reference Books

1. S.Santha, "Discrete Mathematics with Combinatorics and Graph Theory", Cengage Publications.
2. J K Sharma, "Discrete Mathematics", 2nd edition, Macmillan Publications.

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DATA STRUCTURES
(Common to CSE & IT)
II Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To impart knowledge of linear and non-linear data structures.
- To familiarize with different sorting and searching techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- demonstrate the working process of sorting (bubble, insertion, selection and heap) and searching (linear and binary) methods using a programming language.
- design algorithms to create, search, insert, delete and traversal operations on linear and non-linear data structures.
- evaluate the arithmetic expressions using stacks.
- choose appropriate collision resolution techniques to resolve collisions.
- compare array and linked list representation of data structures.

Course Content

UNIT - I: Sorting and Searching

Introduction- Concept of data structures, overview of data structures.

Searching: Linear search, Binary search.

Sorting (Internal): Basic concepts, sorting by: insertion (insertion sort), selection (selection sort), exchange (bubble sort).

UNIT - II: Linked Lists

Linked Lists- Basic concepts and operations of single linked list, circular linked list and double linked list.

UNIT - III: Stacks and Queues

Stack: Introduction, representation using arrays and linked list, operations on stack, evaluation of arithmetic expression.

Queue: Introduction, representation using arrays and linked list, operations on queue, circular queue.

UNIT - IV: Trees

Binary Trees: Basic tree concepts, properties, representation of binary trees using arrays and linked list, binary tree traversals.

Binary Search Trees: Basic concepts, BST operations: search, insertion, deletion and traversals, creation of binary search tree from in-order and pre (post) order traversals.

UNIT - V: Heap Trees and Graphs

Heap Trees: Basic concepts, operations, application-heap sort.

Graphs- Basic concepts, representations of graphs, graph traversals-breadth first search and depth first search techniques.

UNIT - VI: Hashing

Hashing: Basic concepts, hashing functions (division method, multiplication method), collision resolution techniques- open hashing and closed hashing.

Text Books

1. Horowitz, Sahani, Anderson Freed, “Fundamentals of Data Structure in C”, 2nd edition, University Press.
2. Richard F, Gilberg, Forouzan, “Data Structures”, 2nd edition, Cengage.

Reference Books

1. G. A. V. Pai, “Data Structures and Algorithms”, TMH.
2. Debasis Samanta, “Classic Data Structures”, 2nd edition, PHI.

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DIGITAL LOGIC DESIGN
(Common to CSE & IT)
II Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize with the concepts of designing digital circuits.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- translate number given in one number system to another number system.
- apply complements to perform addition and subtraction of signed numbers.
- reduce Boolean function using Boolean laws, theorems and K-Maps.
- design combinational logic circuits such as adders, subtractors, decoders, encoders, Multipluxers and De-Multipluxers.
- prepare characteristic equation and excitation tables of SR, JK, T and D flip-flops.
- design counters and registers using flip-flops.

Course Content

UNIT - I: Number Systems

Binary, octal, decimal, hexadecimal number systems, conversion of numbers from one radix to another radix, r's, (r-1)'s complements, signed binary numbers, addition and subtraction of unsigned and signed numbers, weighted and un-weighted codes.

UNIT - II: Logic Gates and Boolean Algebra

NOT, AND, OR, universal gates, X-OR and X-NOR gates, Boolean laws and theorems, complement and dual of a logic function, canonical and standard forms, two level realization of logic functions using universal gates, minimizations of logic functions (POS and SOP) using Boolean theorems, K-map (upto four variables), don't care conditions.

UNIT - III: Combinational Logic Circuits - 1

Design of half adder, full adder, half subtractor, full subtractor, ripple adders and subtractors, ripple adder / subtractor.

UNIT - IV: Combinational Logic Circuits - 2

Design of decoders, encoders, priority encoder, multiplexers, demultiplexers, higher order decoders, demultiplexers and multiplexers, realization of Boolean functions using decoders, multiplexers.

UNIT - V: Sequential Logic Circuits

Classification of sequential circuits, latch and flip-flop, RS- latch using NAND and NOR Gates, truth tables, RS, JK, T and D flip-flops, truth and excitation tables, conversion of flip- flops, flip-flops with asynchronous inputs (preset and clear).

UNIT - VI: Registers and Counters

Design of registers, shift registers, bidirectional shift registers, universal shift register, design of ripple counters, synchronous counters and variable modulus counters, ring counter, Johnson counter.

Text Books

1. M. Morris Mano, Michael D Ciletti, "Digital Design", 5th edition, PEA.

Reference Books

1. Kohavi, Jha, "Switching and Finite Automata Theory", 3rd edition, Cambridge.
2. Leach, Malvino, Saha, "Digital Principles and Applications", 7th edition, TMH.
3. Roth, "Fundamentals of Logic Design", 5th edition, Cengage.

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE & IT)
II Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of object oriented programming.
- To impart the knowledge of AWT components in creation of GUI.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply Object Oriented approach to design software.
- create user defined interfaces and packages for a given problem.
- develop code to handle exceptions.
- implement multi tasking with multi threading.
- develop Applets for web applications.
- design and develop GUI programs using AWT components.

Course Content

UNIT - I: Fundamentals of OOP and Java

Need of OOP, principles of OOP languages, procedural languages vs. OOP, Java virtual machine, Java features.

Java Programming constructs: variables, primitive data types, identifiers, keywords, literals, operators, arrays, type conversion and casting.

UNIT - II: Class Fundamentals and Inheritance

Class fundamentals, declaring objects, methods, constructors, this keyword, overloading methods and constructors, access control.

Inheritance**-** Basics, types, using super keyword, method overriding, dynamic method dispatch, abstract classes, using final with inheritance, Object class.

UNIT - III: Interfaces and Packages

Interfaces: Defining an interface, implementing interfaces, nested interfaces, variables in interfaces and extending interfaces.

Packages: Defining, creating and accessing a package.

UNIT- IV: Exception Handling and Multithreading

Exception Handling- exception-handling fundamentals, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, user-defined exceptions.

Multithreading-Introduction to multitasking, thread life cycle, creating threads, synchronizing threads, thread groups.

UNIT - V: Applets and Event Handling

Applets- Concepts of applets, differences between applets and applications, life cycle of an applet, creating applets.

Event Handling- Events, event sources, event classes, event listeners, delegation event model, handling mouse and keyboard events, adapter classes.

UNIT - VI: AWT

The AWT class hierarchy, user interface components-label, button, checkbox, checkbox group, choice, list, text field, scrollbar, layout managers –flow, border, grid, card, gridbag.

Text Books

1. Herbert Schildt, "Java - The Complete Reference", 7th edition, TMH.
2. Sachin Malhotra, Saurabh choudhary, "Programming in Java", 2nd edition, Oxford.

Reference Books

1. Joyce Farrel, Ankit R.Bhavsar, "Java for Beginners", 4th edition, Cengage Learning.
2. Y.Daniel Liang, "Introduction to Java Programming", 7th edition, Pearson.
3. P.Radha Krishna, "Object Oriented Programming through Java", Universities Press.

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DATA STRUCTURES LAB
(Common to CSE & IT)
II Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To implement different searching and sorting algorithms.
- To implement linear and non-linear data structures.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- demonstrate linear and binary search techniques to find an element in a given list of numbers.
- select an appropriate sorting technique to sort the given list of numbers.
- develop suitable code to simulate the operations on linked lists.
- determine the suitable ways to implement Stacks and Queues.
- choose appropriate data structure for evaluation of arithmetic expressions.
- demonstrate the operations on Binary Search Trees and Graphs.
- determine the use of hashing in implementing dictionaries.

Course Content

Write a C program for the following

Exercise - I

1. Develop recursive and non-recursive functions to perform search for a key value in a given list using

   i. Linear Search   ii. Binary Search

Exercise - II

2. Implement the following sorting techniques to sort a given list of integers in ascending order

   i. Bubble sort   ii. Insertion sort   iii. Selection sort

Exercise - III

3. Use functions to

   i. Create a singly linked list.

   ii. Insert an element into a singly linked list.

   iii. Delete an element from a singly linked list.

Exercise - IV

4. Use functions to

   (i) Create a doubly linked list.

   (ii) Insert an element into a doubly linked list.

   (iii) Delete an element from a doubly linked list.

Exercise - V

5. Implement stack (its operations) using arrays.

6. Implement queue (its operations) using linked lists.

Exercise - VI

7. To convert infix expression into postfix expression.

8. To evaluate postfix expression.

Exercise - VII

9. Create a binary search tree of integers and perform the following operations
   i. insert ii. traversals (pre-order, in-order, post-order)

Exercise - VIII

10. Implement the DFS and BFS traversals on graphs.

Exercise - IX

11. Create a hash table to perform the following operation.

    i. Insertion ii. Display iii. Search

Text Books

1. Horowitz, Sahni, Anderson Freed, "Fundamentals of Data Structure in C", 2nd edition, University Press.

2. Richard F, Gilberg, Forouzan, "Data Structures", 2nd edition, Cengage.

Reference Books

1. G. A. V. Pai, "Data Structures and Algorithms", TMH.

2. Debasis Samanta, "Classic Data Structures", PHI, 2nd edition, 2011.

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OBJECT ORIENTED PROGRAMMING LAB
(Common to CSE & IT)
II Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To demonstrate object oriented programming concepts.
- To introduce the creation of GUI using AWT components.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use inheritance to extend the functionality of classes.
- prepare code that exhibits polymorphism.
- examine multi tasking with multi threading.
- create packages for reusability.
- create an effective GUI using AWT components.
- implement event handling.

List of Exercises

Write JAVA code to

Exercise-I

1. Display default initial values of all primitive data types in java.
2. Sort the given list of numbers in ascending order

Exercise-II

3. Test whether the given number is Armstrong number or not.
4. Perform transpose of a given matrix.

Exercise-III

5. Access the instance variables by using ‘this’ keyword.
6. Access class members by using the keyword ‘super’.
7. Overload a method called area(), where the method computes the area of a square if the number of parameters are 1 otherwise if the numbers of parameters are 2 it needs to compute the area of a rectangle.

Exercise IV

8. Create an abstract class named shape, that contains an empty method named numberofsides(). Define three classes named Trapezoid, Triangle and

Hexagon, such that each one of the classes contains only the method numberofsides(), that contains the number of sides in the given geometrical figure.

9. Illustrate multiple inheritance.

Exercise V

10. Create and access a user defined package where the package contains a class named CircleDemo, which inturn contains a method called circleArea() which takes radius of the circle as the parameter and returns the area of the circle.
11. Create three threads (by using **Thread** class and **Runnable** interface) where the first thread displays “Good Morning” every one second, the second thread displays “Hello” every two seconds and the third thread displays “Welcome” every three seconds.

Exercise-VI

12. Handle keyboard events, which echoes keystrokes to the applet window and shows the status of each key event in the status bar.
13. Display the position of x and y co-ordinates of the cursor movement using mouse.

Exercise-VII

14. Create a list of items and display the selected item of the list in a text field. Arrange these components by using flow layout control.
15. Arrange components by using border layout control

Text Books

1. Herbert schildt, “Java: The Complete Reference”, 7th edition, TMH.
2. T. Budd, “Understanding OOP with Java”, Pearson Education.

Reference Books

1. J.Nino and F.A. Hosch, John wiley and sons, “An Introduction to Programming and OO Design using Java”.
2. Y. Daniel Liang, “Introduction to Java Programming”, 6th edition, Pearson Education.
3. Cay.S.Horstmann and Gary Cornell, “Core Java2, Fundamentals”, Vol 1, 7th edition, Pearson Education.
4. P. Radha Krishna, “Object Oriented Programming through Java”, University Press.

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UNIX PROGRAMMING LAB

II Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To familiarize with various UNIX utilities
- To impart knowledge on developing shell scripts.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop shell scripts in order to perform shell programming.
- demonstrate the UNIX file system.

List of Experiments

1. Practice session on UNIX commands and vi editor
2. Write a shell script to print the factorial of first n natural numbers.
3. Write a shell script to generate a multiplication table of the given number.
4. Write a shell script to list the files in the current directory to which the user has read, write and execute permissions.
5. Write a shell script to compare two strings by reading strings from the command line.
6. Write shell script to read username & to find whether the user currently logged in or not.
7. Write shell scripts to find the length of a given string and to extract a substring from a given string.
8. Write a shell script that counts the number of lines and words present in a given file.
9. Write a shell script that displays the list of all files in the given directory.
10. Write a shell scripts that copies multiple files to a directory.
11. Write a shell script (small calculator) that adds, subtracts, multiplies and divides the given two integers. There are two division options: one returns the quotient and the other returns reminder. The script requires 3 arguments: The operation to be used and two integer numbers. The options are add (-a), subtract (-s), multiply (-m), quotient (-c) and reminder (-r).

12. Write a C program that illustrates uses of the opendir, readdir, and closedir APIs.
13. Write a program that takes one or more file/directory names as command line input and reports the following information on the file:
    - File type.
    - Number of links.
    - Time of last access.
    - Read, Write and Execute permissions.
14. Write a C program that illustrates the creation of child process using fork system call.

Text Books

1. Sumithabha Das, "UNIX and shell programming ", 4th edition, TATA McGraw Hill.
2. Yashavant Kanetkar, "UNIX shell programming", BPB Publications.
3. W.Richard Stevens, "Advanced programming in the UNIX Environment", 2nd edition, Pearson Education.

Reference Books

1. Kernighan and pike, "Unix Programming environment", Pearson Education.
2. N B Venkateswarlu, "Advanced UNIX Programming", BS Publications Second Edition.

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PROBABILITY AND STATISTICS
(Common to CSE & IT)
II Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To impart the concepts of probability and statistics.
- To disseminate the knowledge on sampling theory and principles of hypothesis testing.
- To introduce the correlation coefficient and lines of regression.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use the concepts of probability in different real time problems.
- apply probability distribution in appropriate scenario.
- find confidence intervals for estimating population parameters.
- apply a range of statistical tests appropriately.
- measure correlation between variables and obtain lines of regression.

Course Content

UNIT - I: Probability and Expectations of Random Variable

Introduction to probability, additive, conditional and multiplicative laws of probability and their applications, Baye's theorem (without proof) and its applications.

Introduction to random variables, discrete and continuous probability distribution functions, expectation, variance – properties and applications.

UNIT - II: Theoretical Probability Distributions

Introduction to Bernoulli variable, applications of Binomial distribution, Poisson distribution, mean and variance(without derivation) and normal distributions and their properties; applications of uniform and exponential distributions.

UNIT - III: Sampling Distributions

Basic terminology in sampling, sampling techniques (with and without replacement), sampling distribution and its applications

Concepts of point and interval estimation, criteria of good estimator, construction of confidence interval (mean and proportions).

UNIT - IV: Statistical Inference – I (Large Samples)

Null hypothesis - alternative hypothesis- level of significance - degrees of freedom. Type-I and Type-II errors- one tailed and two tailed tests- testing of hypothesis concerning means and proportions (applications).

UNIT - V: Statistical Inference - II (Small Samples)

T- test, F-test, χ^2-test (independence of attributes and goodness of fit) and their applications.

UNIT - VI: Correlation and Regression

Types of correlation, determination of correlation coefficient (for ungrouped data), rank correlation coefficient, linear regression and its properties.

Text Books

1. Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, "Probability and Statistics", 5th edition, S. Chand and Company Ltd., New Delhi.
2. Miller, John E. Freund, "Probability and Statistics for Engineers", 8th edition, PHI, Delhi.

Reference Books

1. S. C. Gupta, V.K. Kapoor, "Fundamentals of Mathematical Statistics", S.Chand and Company Ltd., New Delhi.
2. B. V. Ramana, "Engineering Mathematics", 4th edition, Maitrey Printers Pvt. Ltd., 2009, India.

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OPERATING SYSTEMS

II Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 40
Credits : 3		External Marks	: 60

Course Objectives

- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the role, functions and structures of operating systems.
- evaluate the performance of CPU scheduling algorithms by calculating average waiting time and turnaround time.
- compare and contrast memory management schemes for efficient utilization of memory.
- apply deadlock prevention, avoidance and recovery techniques to keep the system in safe state.
- determine seek time of disk scheduling algorithms.
- develop software or hardware based solutions for critical section problems.
- analyze files and directory structures and implementations.

Course Content

UNIT - I: Introduction

Operating system operations, operating-system services, system calls, types of system calls, operating-system structure.

UNIT - II: Process Management

Process, process state, Process Control Block (PCB), process scheduling-scheduling queues, schedulers, context switch, scheduling criteria, scheduling algorithms, operations on processes, inter process communication.

UNIT - III: Memory Management Strategies

Swapping, contiguous memory allocation, paging, segmentation.

Virtual Memory Management: Demand paging, page replacement algorithms, allocation of frames, thrashing.

UNIT - IV: Deadlocks and Mass-storage structure

Deadlocks- System model, deadlock characterization, methods for handling deadlocks, deadlock- prevention, avoidance, detection, recovery.

Mass-storage structure- Overview, disk scheduling, disk management.

UNIT - V: Synchronization

The critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, monitors.

UNIT - VI: File System Interface

Concepts of a file, access methods, directory structure, file system mounting, file sharing and protection.

Text Books

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", 7th edition, John Wiley.
2. Stallings, "Operating Systems - Internal and Design Principles", 6th edition, Pearson Education.

Reference Books

1. D. M. Dhamdhere, "Operating systems-A Concept based Approach", 2nd edition, TMH.
2. Andrew S Tanenbaum, "Modern Operating Systems", 3rd edition, PHI.

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FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to CSE & IT)
II Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To introduce the classification of machines by their power to recognize languages and to solve problems in computing.
- To familiarize how to employ deterministic and non-deterministic machines.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- compare the automata based on their recognizing power.
- design finite automata for regular languages.
- reduce DFA by applying minimization algorithm.
- write regular expressions for regular languages or for DFA by applying Arden's theorem.
- generate grammar for CFL.
- use algorithm to simplify grammar.
- design PDA for context free languages.
- design Turing Machine for the phrase-structured languages.

Course Content

UNIT - I: Fundamentals

Strings, alphabet, language, operations, finite state machine, finite automaton model, acceptance of strings and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and language recognizers.

UNIT - II: Finite Automata

NFA with epsilon transitions - significance, acceptance of languages, equivalence between NFA with and without $\in$-transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, finite automata with output- Moore and Mealy machines, applications of FA.

UNIT - III: Regular Languages

Regular sets, regular expressions, identity rules, construction of finite automata for a given regular expressions and its inter conversion, pumping lemma of regular sets, closure properties of regular sets (proofs not required), applications of regular languages.

UNIT - IV: Grammar Formalism

Chomsky hierarchy of languages, regular grammars - right linear and left linear grammars, equivalence between regular linear grammar and FA, derivation trees, sentential forms, rightmost and leftmost derivation of strings.

UNIT - V: Context Free Grammars

Ambiguity in context free grammars, minimization of context free grammars, Chomsky normal form, Greibach normal form, pumping Lemma for context free languages, closure properties of CFL (proofs not required), applications of CFLs. Push Down Automata: model and design of PDA.

UNIT - VI: Turing Machine

Model, design of TM, types of Turing machines (Proofs not required), recursively enumerable languages and recursive languages.

Computability Theory: Decidability of problems, undecidability of posts correspondence problem.

Text Books

1. John E.Hopcroft, Rajeev Motwani and Jeffrey D.Ullman J.D., “Introduction to Automata Theory Languages and Computation”, 3rd edition, Pearson Education.
2. Lewis H.R., Papdimitriou, “Elements of Theory of Computation”, 2nd edition, PHI.

Reference Books

1. Daniel I.A. Cohen, John Wiley, “Introduction to languages and the Theory of Computation”.
2. Sipser, Thomson, “Introduction to Theory of Computation”, 2nd edition.
3. Mishra and Chandrashekaran, “Theory of computer science - Automata, Languages, and Computation”, 2nd edition, PHI.4. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and

Computation; Pearson Education, 2009.

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COMPUTER ORGANIZATION AND ARCHITECTURE
(Common to CSE & IT)
II Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize with organizational aspects of memory, processor and I/O.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify different types of instructions.
- differentiate micro-programmed and hard-wired control units.
- analyze the performance of the hierarchical organization of memory.
- demonstrate various operations on fixed and floating point numbers.
- summarize different data transfer techniques.
- demonstrate the use of parallel processing.

Course Content

UNIT - I: Register transfer language and Micro operations

Introduction- Functional units, computer registers, register transfer language, register transfer, bus and memory transfers, arithmetic, logic and shift microoperations, arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, instruction cycle. register reference instructions, Memory – reference instructions, input – output and interrupt.

UNIT - II: CPU and Micro Programmed Control

Central Processing unit: Introduction, instruction formats, addressing modes.

Control memory, address sequencing, design of control unit - hard wired control, micro programmed control.

UNIT - III: Memory Organization

Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory.

UNIT - IV: Computer Arithmetic

Data representation- fixed point, floating point, addition and subtraction, multiplication and division algorithms.

UNIT - V: Input-Output Organization

Peripheral Devices, input-output interface, asynchronous data transfer, modes of transfer- programmed I/O, priority interrupt, direct memory access, Input –Output Processor (IOP).

UNIT - VI: Parallel Processing

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

Multi Processors: Characteristics of multiprocessors, interconnection structures, inter processor arbitration, cache coherence.

Text Books

1. M. Moris Mano, "Computer Systems Architecture", 3rd edition, Pearson/PHI.

Reference Books

1. Carl Hamacher, Zvonks Vranesic, Safea Zaky, "Computer Organization", 5th edition, McGraw Hill.
2. William Stallings, "Computer Organization and Architecture", 6th edition, Pearson/PHI.
3. John L. Hennessy and David A. Patterson, "Computer Architecture a Quantitative Approach", 4th edition, Elsevier.

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DATABASE MANAGEMENT SYSTEMS
(Common to CSE & IT)
II Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize with the concepts of database systems and different issues involved in the database design.
- To introduce SQL for storage, retrieval and manipulation of data in a relational database.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- recognize the importance of database system over file processing system.
- analyze an information storage problem and derive an information model in the form of an entity relationship diagram.
- write simple and complex queries using Structured Query Language (SQL) for storage, retrieval and manipulation of data in a relational database.
- employ principles of normalisation for designing a good relational database schema.
- describe the issues and techniques relating to concurrency and database recovery in a multi-user database environment.

Course Content

UNIT - I: Introduction to Database

Introduction, advantages of using DBMS, data models, levels of abstraction, entity-relationship model: attributes and keys, relationship types, weak entity set, strong entity set, specialization and generalization, database design for banking enterprise, reduction to relational schemas.

UNIT - II: Relational Model and SQL

Relational Model: Basic concepts, schema and instances, keys, relational algebra, SQL: DDL, DML, integrity constraints, defining different constraints on a table, set operations, aggregate functions, group by and having clauses, nested queries.

UNIT - III: Database Design

Functional dependencies: Partial, full, transitive and trivial dependencies, Axioms, Decomposition: Lossless Join and dependency preserving decomposition, attribute closure, Normal forms: 1NF, 2NF, 3NF and BCNF.

UNIT - IV: Transaction Management

Transaction concept, ACID properties, transaction state diagram, schedules-serial, concurrent and serializable schedules, serializability- conflict and view serializability, recoverability.

UNIT - V: Concurrency Control

Concurrency Control- Concurrent execution of transactions, anomalies due to concurrent execution, lock-based protocols-2PL, Strict 2PL and Rigorous 2PL, timestamp-based protocols, Thomas write rule, deadlock handling-deadlock prevention, deadlock detection and recovery.

UNIT - VI: Crash Recovery

Crash Recovery - Failure classification, different types of recovery techniques: deferred update, immediate update, shadow paging, checkpoints.

Text Books

1. Korth and Sudarshan, “Database system concepts”, 3rd edition, MH.
2. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, 3rd edition, MH

Reference Books

1. Elmasri Navate, “Fundamentals of Database Systems”, 5th edition, Pearson Education
2. C.J.Date, “Introduction to Database Systems”, 8th edition, Pearson Education
3. Peter Rob and C Coronel, “Database Systems Design, Implementation, and Management”, 7th edition.

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Open Elective - I

ELEMENTS OF CIVIL ENGINEERING

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources,Water Supply, Sanitary ,Electrical Works in Building and Highway engineering.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- familiarizewith basics of civil engineering and concepts of surveying.
- identify the various properties of building materials and various types of building.
- get acquainted with fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.
- enumerate the fundamental concepts highway engineering.

Course Content

UNIT - I: Introduction.

Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society.Impact of infrastructural development on economy of country.

UNIT - II: Surveying

Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Levelling: Objectives and applications-terminology-Instruments,component parts of dumpy level,Types of levelling ,levelling staff

UNIT - III: Building Materials and Construction

Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen.

Construction: Classification of buildings, Building components and their functions.

UNIT - IV: Water Resources

Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams.

UNIT - V: Water Supply, Sanitary and Electrical Works in Building

Introduction, water supply system, water supply layout of a building, housedrainage, traps, electrical works in building.

UNIT - VI: Transportation Engineering

classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Elements of Civil Engineering, Dr. R.K. Jain and Dr. P.P. Lodha, Publisher: McGraw Hill Education, India Pvt. Ltd.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, ArunkumarJain, 16th Edition Publisher: Laxmi Publication Delhi.

Reference Books

1. Surveying Theory and Practice, James M Anderson andEdward, 7th Edition, M Mikhail Publisher: McGraw Hill Education, India Pvt. Ltd.
2. Surveying and Leveling, R. Subramanian Publisher, Oxford University.
3. Building drawing, M.G.Shah, C.M.Kale and S.Y.Patki Publisher: TataMcGraw Hill.

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Open Elective - I

BUILDING SERVICES

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart knowledge on water supply, treatments and water distribution for all type of buildings
- To acquire principles and best practices for Solid waste management in residential units.
- To create awareness about the importance of electrical and mechanical services in buildings and fire safety

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe water supply, treatments, distribution and plumbing systems for all type of buildings.
- study waste water treatments, Sewer lines for all types of buildings.
- appraise the refuse collections, disposal, composting, landfill, bio gas for a town and city.
- acquaint with distribution of electricity to all units of the project.
- adopt fire protection units at service points.

Course Content

UNIT - I: Water Quality, Treatments and Distribution

Sources of water supply – Water Quality - Water requirements for all type of residential, commercial, Industrial buildings and for town – Water treatment methods – Screening, aeration, Sedimentation, Filtration, Disinfection, Softening, conveyance of water – Distribution of water – Choice of pipe materials - Types of fixtures and fittings – System of plumbing in all type of buildings.

UNIT - II: Waste Water, Treatments and Disposal

Waste water – Sewage disposal, primary treatment.Secondary treatment, Biological treatment and Modern types of Sewage Treatment Plants - Sewer line fixtures and traps, Manholes, Septic tank.

UNIT - III: Room Acoustics

Key terms & Concepts, Introduction, Acoustic principles, Sound power and pressure levels, Sound pressure level, absorption of sound, Reverberation time, Transmission of sound. Sound pressure level in a plant room, outdoor sound pressure level, Sound pressure level in intermediate space, noise rating, Data requirement, output data.

UNIT - IV: Electrical Services

Electrical systems – Basic of electricity – single/Three phase supply – protective devices in electrical installation – Earthing for safety – Types of earthing – ISI Specifications. Electrical installations in buildings – Types of wires, Wiring systems and their choice – planning electrical wiring for building – Main and distribution boards –Principles of illumination

UNIT - V: Heat Ventilation and Air Conditioning (HVAC)

Behaviour of heat propagation, thermal insulating materials and their co-efficient of thermal conductivity.

General Methods of Thermal Insulation: Thermal insulation of roofs, exposed walls.

Ventilation: Definition and necessity,system of ventilation. Principles of air conditioning, Air cooling, Different systems of ducting and distribution, Essentials of air-conditioning system.

UNIT - VI: Fire Fighting Services

Fire, causes of fire and spread of fire, Classification of fire, fire safety and fire fighting method, fire detectors, heat detector, smoke detectors, fire dampers, fire extinguishers.

Text Books

1. Water supply and sanitary engineering, S.C.Rangwala, Charotar publishing house.
2. Environmental Engineering, A. Kamala & DL Kantha Rao, Tata McGraw – Hill Publishing company Limited

Reference Books

1. Water supply and sanitary engineering, Charangith shah, Galgotia publishers.
2. Fire Safety in Building, V.K.Jain, Newage publishers (2010)
3. Heat pumps and Electric Heating, E.R.Ambrose, John and Wiley and Sons Inc.
4. Handbook for Building Engineers in Metric systems, NBC,New Delhi.
5. National Building Code (2016).

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Open Elective - I

ELECTRICAL MATERIALS

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts of dielectric and ferro magnetic materials.
- To impart knowledge on semiconductor materials.
- To familiarize with the required materials used for electrical applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe various insulating, conducting and magnetic materials used in electrical applications.
- analyze the properties of liquid, gaseous and solid insulating materials.
- describe various semiconductor materials.
- select appropriate material for electrical and special purpose applications

Course Content

UNIT - I: Dielectic Materials

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics.

UNIT - II: Ferromagnetic Materials

Properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT - III: Magnetic Materials

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. factors effecting permeability and hysteresis.

UNIT - IV: Semiconductor Materials

Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT - V: Materials for Electrical Applications

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation.

UNIT - VI: Special Purpose Materials

Refractory Materials, Structural Materilas, Radiaoactive Materials, Galvonization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

Text Books

1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009.
2. T K BasaK: A course in Electrical Engineering Materials:, New Age Science Publications 2009 .

Reference Books

1. TTTI Madras: Electrical Engineering Materials
2. Adrianus J.Dekker: Electrical Engineering Materials , THM Publication

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Open Elective - I

CONTROL SYSTEMS ENGINEERING

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the basic concepts of control systems by developing mathematical models for physical systems.
- To familiarize with the time domain behavior of linear control systems.
- To impart knowledge on analytical and graphical methods to quantify stability of linear control systems.
- To introduce concepts on the state variable theory.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop mathematical models for physical systems.
- employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- quantify time and frequency domain specifications to determine stability margins.
- apply state variable theory to determine the dynamic behavior of linear control systems.

Course Content

UNIT - I: Introduction

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer function.

UNIT - II: Control Systems Components

Transfer Function of DC Servo motor - AC Servo motor-, Block diagram representation of systems considering -Block diagram algebra – Representation by Signal flow graph - Reduction is using Mason's gain formula- simple problems

UNIT - III: Time Response Analysis

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants- simple problems.

UNIT - IV: Stability Analysis in S-Domain

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.

Root Locus Technique: The root locus concept - construction of root loci – simple problems

UNIT - V: Frequency Response Analysis

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications- Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots- simple problems.

UNIT - VI: State Space Analysis of Continuous Systems

Concept of state, state variables and state model, derivation of state models from physical systems, solving the Time invariant state Equations- State Transition Matrix and its Properties – simple problems.

Text Books

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2nd edition.
2. Automatic control system – B.C.Kuo , john wiley and son's 8th edition, 2003.

Reference Books

1. Modern control engineering – K.Ogata , prentice Hall of India Pvt. Ltd., 5th Edition.
2. Control system – N.K.Sinha, New Age International (p) Limited Publishers, 3rd Edition, 1998.
3. Control system engineering – Norman S-Nice, Willey Studio Edition, 4th Edition. Feed back and control system – Joseph J Distefa

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Open Elective - I

ELEMENTS OF MANUFACTURING PROCESSES

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- select appropriate casting method to impart geometry to the material.
- choose appropriate type of welding process for joining of metals
- list out various welding defects and propose remedial measures
- distinguish between hot working and cold working processes
- identify suitable metal forming technique to impart desired geometry to the product.

Course Content

UNIT - I

Introduction: Classification of manufacturing processes

Sand Casting: steps involved in making casting

Patterns: - Pattern Materials, Types of patterns, Pattern Allowances

Molding: – Molding sand, Types of molding sand and its properties, Methods of molding

UNIT - II

Special casting processes – Centrifugal casting, Investment casting, Die casting, Shell molding, Slush casting.

Casting defects – Cause and Remedies.

UNIT - III

Metal Joining Processes:- Classification of Metal joining processes

Welding:- Welding terminology, Types of weld joints and welds

Fusion Welding:- Principle of Oxy Acetylene welding, Equipment Setup, Types of flames.

Types of Arc Welding Processes: SMAW, TIG, MIG

UNIT - IV

Pressure welding: Principle of Resistance welding, Equipment set up, Different resistance welding methods.

Solid state welding: Friction welding, Induction welding and Explosive welding

Welding Allied Processes: Soldering, Brazing and Braze welding

UNIT - V

Metal Forming: Classification of metal working processes.

Rolling –Types of Rolling mills, Rolling defects and remedies.

Drawing – drawing of rod, wire and tube – Drawing defects.

Extrusion – Classification of Extrusion process, Impact Extrusion

UNIT – VI

Forging – Basic forging operations ,Open die forging, Closed die forging, press forging, Drop forging, Roll forging Defects

Sheet metal forming operations – Blanking and piercing, Bending Deep drawing, Stretch forming, Embossing, Coining.

Text Books

1. M.P.Groover "Fundamentals of Modern Manufacturing, Materials, processing and systems", John wiley & sons, inc,4th Edition
2. H.S.Shan ,"Manufacturing Processes", Cambridge, 2nd Edition.

Reference Books

1. Serope Kalpakjian and Steven R.Schmid, "Manufacturing Engineering & Technology", Pearson Education, Inc., 5th edition..
2. Lindberg/PE , "Process and materials of manufacturing ", PHI.
3. Heine, Roper, Rosenthal, "Principles of Metal Castings ", Tata Mc Graw Hill Publications, 2nd edition.
4. R.S.Paramar,"Welding Engineering and Technology ",khanna Publications,1st edition.

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Open Elective - I

AUTOMOTIVE ENGINEERING

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce various components of an automobile and engine sub systems.
- To familiarize with the various systems such as transmission system, steering system, suspension system, braking system, and safety systems.
- To impart knowledge on various safety systems of an automobile and emission norms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the various components of an automobile
- classify various fuel supply, lubrication, cooling and ignition systems
- explain transmission, suspension, steering and braking systems of an automobile and their differences
- specify different safety norms for the operation of an automobile.

Course Content

UNIT - I

Introduction: classification of automobiles, Components of four wheeler automobile- chassis, body, power unit, power transmission- front wheel drive, rear wheel drive, four-wheel drive

Fuel supply systems: Carburettor-types, defects in carburettor, electronic injection system, multi point fuel injection system, fuel injection system in diesel engine, fuel injection pumps, fuel injector and nozzles.

UNIT - II

Lubricating System: Functions & properties of lubricants, methods of lubrication-splash, pressure, dry sump and wet sump lubrication, oil filters and oil pumps.

Cooling System: Necessity, methods of cooling - air cooling & water cooling, components of water cooling, radiator, thermostat.

UNIT - III

Ignition System: Functions, requirements, types of an ignition system, **b**attery ignition system - components, Magneto ignition system, Electronic ignition system.

Electrical System: charging circuit- generator, current-voltage regulator, stating System-Bendix drive mechanism, lighting system, indicating devices, horn.

UNIT - IV

Transmission system: Types and functions of the clutches- cone clutch, single plate clutch, multi plate clutch, centrifugal and semi centrifugal clutch, Types of gear boxes- Sliding mesh, Constant mesh, Synchromesh, propeller shaft, universal joint and differential. wheels and tyres.

Steering System: steering geometry, condition for correct steering, types of steering Mechanisms-Ackermann and Davis steering mechanism, steering gears, power steering.

UNIT - V

Suspension System: Objectives of suspension system, front suspension system-rigid axle suspension system, independent suspension system, rear axle suspension, torsion bar, shock absorber.

Braking System: Mechanical brakes, hydraulic brakes-master cylinder, wheel cylinder, tandem master cylinder, brake fluid, air brakes and vacuum brakes.

UNIT - VI

Emissions from Automobile: Emission norms - Bharat stage and Euro norms. Engine emissions - exhaust and non-exhaust.

Safety Systems: seat belt, air bags, bumper, antilock brake system(ABS), wind shield, suspension sensor, traction control, central locking, electric windows, speed control.

Text Books

1. Kirpal Singh, "Automobile Engineering Vol-1 & vol-2", Standard Publishers Distributors, 11th edition.
2. William H Crouse & Donald L Anglin, Automotive Mechanics, Tata Mc Graw Hill Publications, 10th edition.

Reference Books

1. R.B Gupta , Automobile Engineering, Satya Prakashan Publications, 6th edition.
2. Newton steeds & Garrett, "The Motor vehicle", Society of Automotive Engineers, 13th edition.
3. G.B.S. Narang, "Automotive Engineering", Khanna Publishers, 5th edition.
4. Joseph Heitner, "Automotive Mechanics", IPC Transport Press Ltd, 2nd Edition.
5. Harbons singh Reyat, "The Automobile", S. Chand & company pvt. ltd., 6th edition.

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Open Elective - I

INTRODUCTION TO MICROPROCESSORS AND MICROCONTROLLERS

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with architecture of 8086 microprocessor and 8051 microcontroller.
- To introduce the assembly language programming concepts of 8086 processor.
- To expose with various interfacing devices with 8086 using 8255.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- gain the knowledge of the architecture and instruction set of 8086. Microprocessor and 8051 micro controller.
- design and develop various interfacing circuits with 8086 using 8255.
- differentiate various Serial data transfer schemes.
- develop 8051 based different kinds of applications.

Course Content

UNIT - I: 8086 Microprocessor

Introduction 8086 processor, architecture-functional diagram, register organization, memory segmentation, physical memory organization, signal descriptions of 8086-common function signals, minimum and maximum mode signals, timing diagrams.

UNIT - II: Instruction Set and Assembly Language Programming of 8086

Addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

UNIT - III: Interfacing with 8086

8255 PPI architecture, modes of operation, keyboard, stepper motor, D/A and A/D converter, memory interfacing to 8086.

UNIT - IV: Interrupt Structure and Serial Communication

Interrupt structure of 8086, vector interrupt table, interrupt service routine, serial communication standards, serial data transfer schemes,8251 USART architecture and interfacing, RS- 232.

UNIT - V: Introduction to 8051 Microcontroller

Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, Interrupts, timer/ Counter and serial communication.

UNIT - VI: Interfacing with 8051

Addressing modes and instruction set of 8051, interfacing 8051 to LED's, seven segment display, relays.

Text Books

1. D. V. Hall' "Microprocessors and Interfacing", TMH, 2nd edition, 2006. (I to IV Units).
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", Pearson, 2nd Edition. (IV to VI Units)

Reference Books

1. Barry B.Brey, "The Intel Microprocessors", PHI, 7th Edition, 2006.
2. Liu and GA Gibson, "Micro Computer System 8086/8088 Family Architecture. Programming and Design", PHI, 2nd Edition.
3. Kenneth. J. Ayala, "The 8051 Microcontroller", 3rd Edition, Cengage Learning, 2010.

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Open Elective - I

FUNDAMENTALS OF COMMUNICATIONS

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce various analog and digital modulation and demodulation techniques
- To familiarize with various multiplexing schemes and Data communication protocols
- To impart the standards and mechanisms of television systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- . understand the concepts of various analog and digital modulation techniques.
- . analyze transmission mechanism in transmission lines and optical fiber.
- . compare different multiplexing techniques.
- . understand the principles of wireless communication systems.
- . differentiate the different telephone systems.
- . ascertain error detection and correction capabilities of various codes.

Course Content

UNIT - I: Signals, Noise, Modulation and Demodulation

Signal analysis, electrical noise and signal-to-noise ratio, analog modulation systems, information capacity, bits, bit rate, baud, and M-ary encoding, digital modulation.

UNIT - II: Metallic Cable Transmission Media

Metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves

Optical Fiber Transmission Media: Advantages of optical fiber cables, disadvantages of optical fiber cables, electromagnetic spectrum, optical fiber communications system block diagram, propagation of light through an optical fiber cable, optical fiber comparison.

UNIT - III: Digital Transmission

Pulse modulation, pulse code modulation, dynamic range, signal voltage to-quantization noise voltage ratio, linear versus nonlinear PCM codes, companding, delta modulation, differential PCM.

UNIT - IV: Wireless Communications Systems

Electromagnetic polarization, electromagnetic radiation, optical properties of radio waves, terrestrial propagation of electromagnetic waves, skip distance, free-space path loss, microwave communications systems, satellite communications systems.

UNIT - V: Telephone Instruments and Signals

The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller ID, electronic telephones, paging systems.

Cellular Telephone Systems: First- generation analog cellular telephone, personal communications system, second-generation cellular telephone systems, digital cellular telephone, global system for mobile communications.

UNIT - VI: Data Communications Codes, Error Control and Data

Formats: Data communications character codes, bar codes, error control, error detection and correction, character synchronization.

Text Books

1. Wayne Tomasi "Introduction to Data Communications and Networking", Pearson Education.
2. Behrouz A Forouzan "Data Communications and Networking", 4th Edition. TMH.

Reference Books

1. William Stallings "Data and Computer communications", 8th Edition, PHI.
2. Gallow "Computer Communications and Networking Technologies", 2nd Edition.
3. Fred Halsll, Lingana Gouda Kulkarni "Computer Networking and Internet", 5th Edition, Pearson Education.

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Open Elective - I

COMPUTER GRAPHICS

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce computer graphics applications and functionalities of various graphic systems.
- To familiarize with 2D and 3D geometrical transformations.
- To disseminate knowledge on the visible surface detection and animation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- design a conceptual model for the mathematical model to determine the set of pixels to turn on for displaying an object.
- analyze the functionalities of various display devices and visible surface detection methods.
- analyze the performance of different algorithms to draw different shapes.
- choose different transformations and viewing functions on objects.
- apply raster animations for Engine oil advertisements.

Course Content

UNIT - I: Introduction

Introduction: Application of computer graphics, raster scan and random scan Displays.

Filled Area Primitives: Points and lines, inside and outside tests, line drawing algorithms, Scan line polygon fill algorithm.

UNIT - II: 2-D Geometrical Transforms

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transformations.

UNIT - III: 2D Viewing

The viewing pipeline, window to view-port coordinate transformation, Cohen-Sutherland line clipping algorithm, Sutherland –Hodgeman polygon clipping algorithm.

UNIT - IV: 3D Geometric Transformations

Translation, rotation, scaling, reflection and shear transformations, composite transformations, types of projections.

UNIT - V: Visible Surface Detection Methods

Classification – types, back-face detection, depth-buffer, BSP tree, area sub-division method.

UNIT - VI: Computer Animation

Animations: General computer animation, raster animation, key frame systems, Graphics programming using OpenGL: Basic graphics primitives, drawing three dimensional objects, drawing three dimensional scenes.

Text Books

1. Donald Hearn, M.Pauline Baker, "Computer Graphics *C* version", 2nd Edition, Pearson Education.
2. Francis S. Hill, Stephen M. Kelley, "Computer Graphics using OpenGL", 3rd edition, Pearson Education.

Reference Books

1. Foley, VanDam, Feiner, Hughes, "Computer Graphics Principles and Practice", 2nd edition, Pearson Education.
2. Rajesh K Maurya, "Computer Graphics with Virtual Reality Systems", Wiley.

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Open Elective - I

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of object oriented programming.
- To impart the knowledge of AWT components in creation of GUI.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply Object Oriented approach to design software.
- create user defined interfaces and packages for a given problem.
- develop code to handle exceptions.
- implement multi tasking with multi threading.
- develop Applets for web applications
- design and develop GUI programs using AWT components.

Course Content

UNIT - I: Fundamentals of OOP and JAVA

Need of OOP, principles of OOP languages, procedural languages vs. OOP, Java virtual machine, java features.

Java Programming constructs: variables, primitive data types, identifiers, keywords, Literals, operators, arrays, type conversion and casting.

UNIT - II: Class Fundamentals and Inheritance

Class fundamentals, declaring objects, methods, constructors, this keyword, overloading methods and constructors, access control.

Inheritance- Basics, types, using super keyword, method overriding, dynamic method dispatch, abstract classes, using final with inheritance, Object class.

UNIT - III: Interfaces and Packages

Interfaces: Defining an interface, implementing interfaces, nested interfaces, variables in interfaces and extending interfaces.

Packages: Defining, creating and accessing a package.

UNIT - IV: Exception Handling and Multithreading

Exception Handling- exception-handling fundamentals, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, user-defined exceptions.

Multi Threading - Introduction to multitasking, thread life cycle, creating threads, synchronizing threads, thread groups.

UNIT - V: Applets and Event Handling

Applets- Concepts of Applets, differences between applets and applications, life cycle of an applet, creating applets.

Event Handling- Events, event sources, event classes, event listeners, Delegation event model, handling mouse and keyboard events, adapter classes.

UNIT - VI: AWT

The AWT class hierarchy, user interface components- label, button, checkbox, checkboxgroup, choice, list, textfield, scrollbar, layout managers –flow, border, grid, card, gridbag.

Text Books

1. Herbert Schildt, “Java The Complete Reference”, 7th edition, TMH.
2. Sachin Malhotra, Saurabh Choudhary, “Programming in Java”, 2nd edition, Oxford.

Reference Books

1. Joyce Farrel, Ankit R.Bhavsar, “Java for Beginners”, 4th edition, Cengage Learning.
2. Y.Daniel Liang, “Introduction to Java Programming”, 7th edition, Pearson.
3. P.Radha Krishna, “Object Oriented Programming through Java”, Universities Press.

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Open Elective - I

SYSTEMS SOFTWARE

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objective

- To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline the relationship between system software and machine architecture.
- analyze working of assembler for a simplified Instructional computer.
- describe the important features of linkage Editors and Dynamic Linking .
- identify the mostly used macro processors algorithms and data structures.
- compare the functions of Absolute Loader , Bootstrap Loaders.

Course Content

UNIT - I: Introduction

System software and machine architecture, The Simplified Instructional Computer (SIC), Machine architecture, Data and instruction formats, addressing modes, instruction sets, I/O and programming System.

UNIT - II: Assemblers

Basic assembler functions, SIC assembler, assembler algorithm and data structures, machine dependent assembler features.

UNIT - III: Implementation of Assemblers

Instruction formats and addressing modes, program relocation, machine independent assembler features, literals, symbol, defining statements, expressions, one pass assemblers, multi pass assemblers, implementation example, MASM assemble.

UNIT - IV: Loaders

Basic loader functions, design of an absolute loader, simple bootstrap loader, machine dependent loader features, relocation, loader options, loader design options, bootstrap loaders.

UNIT - V: Linkers

Program linking, algorithm and data structures for linking loader, machine independent loader features, automatic library search, linkage editors, dynamic linking, implementation example, MS DOS linkers.

UNIT - VI: Macro Processors

Basic macro processor functions, macro definition and expansion, macro processor algorithm and data structures, machine independent macro processor features, concatenation of macro parameters, generation of unique labels, conditional macro expansion.

Text Book

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd edition, Pearson Education Asia, 2000.

Reference Book

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", 2nd Revised edition, Tata McGraw-Hill, 1999.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

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Open Elective - I

WEB PROGRAMMING

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To develop real time web applications.
- To get acquainted with skills for creating websites and web applications by learning various technologies like HTML, CSS, JavaScript, XML, JSP and JDBC.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify HTML tags with their purpose
- develop User Interface for web applications using HTML and CSS.
- design dynamic web pages using Java Script.
- use XML for storing data.
- design JSP applications
- apply the concept of sharing data between dynamic web pages
- create pure Dynamic web application using JDBC
- describe the usage of JDBC API

Course Content

UNIT - I: HTML & CSS

HTML –HTML versions, Basic HTML Tags, working with Lists, Tables, Forms, Frames,div, Images, Navigation.

UNIT - II: Cascading Style sheets

CSS rules, Types of CSS, Selectors ,CSS Properties for Styling Backgrounds, Text, Fonts, Links, and Positioning.

UNIT - III: Java Script

Introduction to Java Script, Variables, Data types, Functions, Operators, Control flow statements, Objects in Java Script with examples.

UNIT - IV: XML

Basic building blocks, DTD and XML Schemas, XML Parsers- DOM and SAX, using CSS with XML and XML AJAX.

UNIT - V: JSP

Basic of a JSP Page, JSP Processing, Generating Dynamic Content-Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods, Passing Control and Data between pages, creation of Session

UNIT - VI: Database Access

JDBC Drivers, Database Programming using JDBC, Accessing a database from a JSP Page.

Text Books

1. Web Technologies, "Black book", Kogent Learning Solutions, Dreamtech press.
2. Chris Bates, "Web Programming: building internet applications", WILEYDreamtech, 2nd edition.

Reference Books

1. Uttam K Roy, "Web Technologies", Oxford.
2. John Duckett, "Beginning Web Programming".
3. Wang Thomson, "An Introduction to web design and Programming".

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Open Elective - I

MATHEMATICAL CRYPTOGRAPHY

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To give a simple account of classical number theory, prepare students towards the concepts of Network Security and to demonstrate applications of number theory (such as public-key cryptography).
- To students will have a working knowledge of the fundamental definitions and theorems of elementary number theory, be able to work with congruences.
- To solve congruence equations and systems of equations with one and more variables.
- To students will also have an exposure to cryptography.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand the properties of divisibility and prime numbers, compute the greatest common divisor and least common multiples and handle linear Diophantine equations.
- understand the operations with congruences, linear and non-linear congruence equations.
- understand and use the theorems: Chinese Remainder Theorem, Lagrange theorem, Fermat's theorem, Wilson's theorem.
- use arithmetic functions in areas of mathematics.
- understand continue fractions and will be able to approximate reals by rationals.
- understand the basics of RSA security and be able to break the simplest instances.

Course Content

UNIT - I: Divisibility

Greatest common divisor, Fundamental theorem of arithmetic, Congruence, Residue classes and reduced residue classes, Euler's theorem, Fermat's theorem, Wilson Theorem, Chinese remainder theorem with applications.

UNIT - II: Polynomial Congruences

Primitive roots, Indices and their applications, Quadratic residues, Legendre symbol, Euler's criterion, Gauss's Lemma, Quadratic reciprocity law, Jacobi symbol.

UNIT - III: Arithmetic Functions

ϕ(x), d (x), μ(x), σ (x) , Mobius inversion formula, LinearDiophantine equations

UNIT - IV: Farey Series

Continued fractions, Approximations of reals by rationals, Pell's equation.

UNIT - V: Introduction to Cryptography

Encryption schemes, Cryptanalysis, Block ciphers, Stream ciphers.

UNIT - VI: Public Key Encryption

RSA cryptosystem and Rabin encryption.

Text Books

1. Jeffrey Hoffstein, Jill Pipher, Joseph H. Silverman, **An Introduction to Mathematical Cryptography**, springer, second edition (2014).
2. Gilbert Baumslag, Benjamin Fine, Martin Kreuzer, A Course in Mathematical Cryptography, Walter de Gruyter GmbH & Co KG(2015).

Reference Books

1. Hardy and Wright W.H., **Theory of Numbers**, Oxford University Press (1979).
2. Niven I., Zuckerman S.H. and Montgomary L.H., **An Introduction to Theory of Numbers**, John Wiley and Sons (1991).

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Open Elective - I

SEMICONDUCTOR PHYSICS

II Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To know the physics and applications of semi conductor.
- To understand fundamental principles and applications of the electronic and optoelectronic.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- classify semi conductors.
- discuss photonic devices.
- Interpret formation of band structure.

Course Content

UNIT - I: Electronic Materials (8)

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirecT bandgaps, Types of electronic materials: metals, semiconductors, and insulators.

UNIT - II: Semiconductors (10)

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentrationand temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift

UNIT - III: Light-Semiconductor Interaction (6)

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulateD Emission.

UNIT - IV: Engineered Semiconductor Materials (6)

Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques. Hetero junctions and associated band-diagrams

UNIT - V: Photo Detectors (6)

Types of semiconductor photo detectors -p-n junction, PIN, and Avalanche and their structure, materials, working principle, and characteristics, Noise limits on performance; Solar cells.

UNIT - VI: Semiconductor Light Emitting Diodes

Rate Equation for carrier density - Radiative and non-radiative recombination mechanisms in semiconductor - LED: device structure, material, characteristics and figures of merit.

Text Books

1. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).

Reference Books

1. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
2. A. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
3. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
4. Online course: "Semiconductor Optoelectronics" by M R Shenoy on NPTEL
5. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL.

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OPERATING SYSTEMS LAB

II Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To develop the concepts of process and memory management techniques.
- To know the problems of deadlock and study the various handling mechanisms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- implement CPU and disk scheduling algorithms.
- develop code for memory management techniques.
- develop code to implement Bankers algorithm to avoid deadlocks.

List of Experiments

1. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
2. Simulate MVT and MFT
3. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) Optimal
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate the following disk scheduling algorithms
   a) FCFS b) SSTF c) SCAN d) CSCAN

Text Books

1. Abraham Silberschatz, Peter B, Galvin, John Wiley, Greg Gagne, “Operating System Principles”, 7th edition.
2. William Stallings, “Operating Systems - Internal and Design Principles”, Pearson Education, 6th edition, 2005.

Reference Books

1. D. M. Dhamdhere, “Operating systems- A Concept based Approach”, 2nd edition, TMH.
2. Andrew S Tanenbaum, “Modern Operating Systems”, 3rd edition, PHI.

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DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE & IT)
II Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	xternal Marks	: 60

Course Objectives

- To familiarize with creation of database and formulate SQL solutions to manipulate the database.
- To disseminate knowledge on integrity constraints, triggers and PL/SQL programs in a database environment.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- create relational database with constraints.
- formulate simple and complex queries using features of Structured Query Language (SQL) for storage, retrieval and manipulation of data in a relational database.
- create views on relational database based on the requirements of users.
- implement PL/SQL programs for processing multiple SQL statements.
- implement triggers on a relational database.

List of Experiments

1. Execute DDL, DML, DCL and TCL Commands.
2. Implement the following Integrity Constraints on Database
   a. Primary Key b. Foreign Key c. Unique
   d. Not NULL e. Check.
3. Execute a single line and group (Aggregate) functions on Relation.
4. Execute Set operations on various Relations.
5. Execute Groupby, Orderby clause on Relations.
6. Execute Sub Queries and Co-Related Nested Queries on Relations.
7. Perform the following join operations
   a. Cross b. Inner c. Outer (left, right, full)
   d. Self
8. Creating Views.
9. Write PL/SQL basic programs.

10. Write a PL/SQL block for transaction operations of a typical application using triggers.

Text Books

1. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 3rd edition, Pearson Education.
2. Scott Urman, "Oracle Database 10G PL/SQL Programming", Tata Mc-Graw Hill.
3. Dr.P.S. Deshpande, "SQL and PL/SQL for Oracle 10g".

Reference Books

1. Elmasri Navate, "Fundamentals of Database Systems", 6th edition, Pearson Education
2. C.J.Date, "Introduction to Database Systems", 8th edition, Pearson Education
3. Peter Rob and C Coronel, "Database Systems Design, Implementation, and Management", 7th edition.

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Optional Elective - I

ENVIRONMENTAL IMPACT ASSESSMENT

II Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with various methodologies of EIA for project assessment.
- To distinguish impact prediction, assessment based on significance and preparation of audit report.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the concept and importance of EIA
- delineate various methodologies available for assessment
- assess and predict the impacts related to soil and water.
- assess and predict the impacts related to air, noise, vegetation and wild life.
- prepare the outline of environmental audit.
- quote case studies of prominent developmental project.

Course Content

UNIT - I: Introduction

Salient Features of EIA, EIA Procedure, Scope of EIA, Classification And prediction of Impacts, Systematic Approach for Using EIA as a planning tool for major project Activities, Preparation of an EIA report

UNIT - II: EIA Methodologies

introduction, Criteria for the selection of EIA Methodology, EIA methods, Ad-hoc methods, matrix methods, Network method, Environmental Media Quality Index method, overlay methods, cost/ benefit Analysis, Predictive or Simulation Methods

UNIT - III: Soil and Water Assessment

Prediction and Assessment of Impacts on Soil and Ground Water Environment, Prediction and Assessment of Impacts on Surface Water Environment- (relevant case studies addressing the above impacts).

UNIT - IV: Prediction and Assessment of Impacts- Air, Noise, vegetation and wild life

Prediction and Assessment of Impacts on the Air Environment, Prediction and Assessment of Impacts of Noise on the Environment, Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - (relevant case studies addressing assessment of impacts)

UNIT - V: Environmental Audit

Environmental Audit & Environmental legislation, objectives of Environmental Audit, Types of environmental Audit, stages of Environmental Audit, preparation of Audit report-(relevant case study addressing audit process)

UNIT - VI: Case Studies

Case studies of EIA of developmental projects, Guidelines for Preparations of TOR's for Life of Industrial Development Projects for Initial Environmental Examination.

Text Books

1. Y. Anjaneyulu, V. Manickam, "Environmental Impact Assessment Methodologies", 2nd edition, B.S. Publication.
2. Larry W. Canter, "Environmental Impact Assessment", 1st edition, McGraw-Hill (international edition).

Reference Books

1. David P. Lawrence, "Environmental Impact Assessment - Practical Solutions to Recurrent Problems", 1st Edition, Wiley-Interscience.
2. Judith Petts, "Handbook of Environmental Impact Assessment" Volume I and II, Conwell Science.

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Optional Elective - I

SIGNALS AND SYSTEMS
(Common to CSE & IT)
II Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the basic concepts of signals and systems.
- To introduce various transform techniques on signals.
- To develop an understanding of sampling and correlation techniques on signals.

Course Outcomes

Upon successful completion of the course, the students will be able to

- classify the signals and various operations on signals.
- perform Fourier analysis on the signals.
- analyze the various systems.
- perform correlation operational on signals.
- apply the various sampling techniques on continuous time signals.
- analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.

Course Content

UNIT - I: Signal Analysis

Classification of signals, basic operations on signals-amplitude and time scaling, time shifting, addition and multiplication, introduction to elementary signals-unit step, impulse, ramp, parabolic, rectangular, triangular, sinusoidal, exponential, signum, sinc and gaussian functions.

UNIT - II: Fourier Series Representation of Continuous Time Signals

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, representation of a periodic function by the Fourier series over the entire interval, convergence of Fourier series, alternate form of trigonometric series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

Representation of an arbitrary function over the entire interval: Fourier transform, Fourier transform of some useful functions and periodic function, properties of Fourier transform, energy density spectrum, Parseval's theorem.

Sampling: Sampling theorem for band limited signals- explanation, reconstruction of signal from samples, aliasing, sampling techniques- impulse, natural and flat top sampling.

UNIT - IV:LTI Systems

Properties of systems, Linear Time Invariant (LTI) system, response of LTI system- convolution integral, properties of LTI system, transfer function and frequency response of LTI system.

Signal Transmission Through LTI Systems: Filter characteristics of LTI systems, distortion less transmission through LTI system, signal bandwidth, System bandwidth, ideal LPF, HPF and BPF characteristics, causality and physical realizability- Paley-Wiener criterion, relationship between bandwidth and rise-time.

UNIT - V: Correlation of Continuous Time Signals

Cross correlation and auto correlation of continuous time signals (finite and nonfinite energy signals), relation between convolution and correlation, properties of cross correlation and autocorrelation, power density spectrum, relation between auto correlation function and energy/power spectral density function.

UNIT - VI: Laplace Transform

Laplace transform of signals, properties of Region of Convergence (ROC), unilateral Laplace transform, properties of unilateral Laplace transform, inversion of unilateral and bilateral Laplace transform, relationship between Laplace and Fourier Transforms.

Text Books

1. B.P.Lathi, "Signals, Systems &Communications", BS Publications, 2003 (Units I-VI).
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, "Signals and Systems",PHI, 2nd Edition (Units I, III, VI)

Reference Books

1. Simon Haykin and Van Veen, "Signals &Systems", Wiley, 2nd edition
2. Michel J. Robert , "Fundamentals of Signals and Systems", TMGH Int. Edition, 2008.
3. C.L.Philips, J.M. Parr and Eve A. Riskin, "Signals, Systems and Transforms", Pearson Education, 3rd Edition, 2004.

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Optional Elective - I

FUZZY LOGIC

II Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge of fuzzy set theory and its applications in Engineering.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish between crisp set and fuzzy set.
- compose the operations on fuzzy sets to quantify the belongingness of elements in the sets.
- construct fuzzy relations to draw inferences.
- illustrate the methods of defuzzification to drive the control mechanism.
- apply fuzzy logic to control automatic engineering systems.

Course Content

UNIT - I: Crisp Sets Vs Fuzzy Sets

Crisp sets an overview, Concept of fuzziness, the notion of Fuzzy sets, basic concepts of fuzzy sets.

UNIT - II: Operations of Fuzzy Sets

Fuzzy set operations-fuzzy complement, fuzzy union, fuzzy intersection, combinations of operations.

UNIT - III: Fuzzy Relations

Fuzzy Cartesian product , Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, lamda cut for fuzzy relations and composition, Fuzzy tolerance and equivalence relations.

UNIT - IV: Fuzzification and Defuzzification

Features of membership function, fuzzification, defuzzification to crisp set, defuzzification to scalars (centroid method, centre of sums method and mean of maxima method).

UNIT - V: Fuzzy Logic

Introduction to fuzzy logic, crisp connectives vs fuzzy logical connectives, approximate reasoning.

UNIT - VI: Applications of Fuzzy Systems

Fuzzy control system, control system design problem, simple fuzzy logic controller, general applications of fuzzy logic (washing machine, air conditioner controller).

Text Books

1. Timothy J.Ross., “Fuzzy Logic with Engineering Applications”, 2nd edition, Wiley Publications.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications”, Prentice-Hall of India Private Limited, New Delhi.

Reference Book

1. H.J. ZIMMERMAN, Fuzzy set theory and its applications, 4th edition — SPRINGER, 2006. New Delhi.
2. Recommended Text S.Nanda and N.R.Das “Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

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SOFTWARE ENGINEERING
(Common to CSE & IT)
III Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To illustrate basic taxonomy and terminology of the software engineering.
- To plan and monitor the control aspects of project.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the basic concepts of Software Engineering.
- select the suitable process model based on the client requirements.
- calculate software proficiency in terms of cost and schedule.
- list the specifications of end-user according to business needs
- choose the appropriate architectural style for a given Scenario.
- infer the system model for a sample case study.
- deduce test cases by following different testing methodologies.

Course Content

UNIT - I: Introduction to Software Engineering

The evolving role of software, changing nature of software, software myths.

The software problem: Cost, schedule and quality, scale and change.

UNIT - II: Software Process

Process and project, software development process models: Waterfall model, prototyping, iterative development, relational unified process, extreme programming and agile process.

UNIT - III: Planning a software project

Effort estimation, project schedule and staffing, quality planning, risk management planning,

UNIT - IV: Software requirement analysis and specification

Introduction, value of good SRS, requirement process, requirement specification, functional specifications with use-cases.

UNIT - V: Software Architecture and Design

Software Architecture: Role of software architecture, architecture views, components and connector view, architecture styles for C & C view.

Design: Function-oriented design, object oriented design, metrics for design.

UNIT - VI: Coding and Testing

Programming principles and guidelines, testing concepts, testing process, black-box testing, white-box testing, and metrics for testing.

Text Books

1. Pankaj Jalote, "A Concise Introduction to Software Engineering", Springer International Edition.
2. Roger S. Pressman, "Software Engineering", 7th edition, TMH.

Reference Books

1. K.K Aggarwal and Yogesh Singh, "Software Engineering", 3rd Edition, New Age Publications.
2. Sommerville, "Software Engineering", 8th edition, Pearson.

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COMPILER DESIGN
(Common to CSE & IT)
III Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To familiarize with lexical analyzer and different parsers.
- To introduce various storage allocation strategies, code generation and code optimization techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- list out compilation process steps of a language.
- use regular languages to identify the tokens of a programming language.
- design a parser to verify the syntax of a programming language.
- compare top down parser with bottom up parser
- create symbol table to access identifier information
- apply code optimization techniques to enhance the efficiency of the intermediate code.
- write a program for the execution of DAG to generate the code.

Course Content

UNIT - I: Lexical Analysis

Overview of language processing, preprocessors, compiler, assembler, interpreters, linkers and loaders, phases of a compiler. Lexical Analysis- role of lexical analysis, token, patterns and lexemes, transition diagram for recognition of tokens, reserved words and identifiers.

UNIT - II: Top-down Parsing

Syntax analysis, role of a parser, classification of parsing techniques, top-down parsing techniques-recursive descent parsing, first and follow, LL(1) grammars, non-recursive predictive parsing.

UNIT - III: Bottom-up Parsing

Shift-Reduce parsing, operator precedence parsing, LR Parsers: construction of SLR, CLR (1), LALR parsers.

UNIT - IV: Semantic Analysis

SDT, evaluation of semantic rules, Symbol tables- use of symbol tables, contents of symbol-table, operations on symbol tables, symbol table organization for block and non-block structured languages. Runtime Environment- storage organization-static, stack allocation, heap management.

UNIT - V: Intermediate Code Generation

Intermediate code- Three address code-quadruples, triples, abstract syntax trees. basic blocks, flow graph, DAG construction and its applications.

Machine independent code optimization- common sub expression elimination, constant folding, copy propagation, dead code elimination, loop optimization-strength reduction, code motion.

UNIT - VI: Code Generation

Code Generation- issues in code generation, generic code generation, code generation from DAG. Machine dependent code optimization: Peephole optimization, register allocation.

Text Books

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers, Principles Techniques and Tools”, 2nd edition, Pearson.
2. V. Raghavan, “Principles of compiler design”, 2nd edition, TMH.

Reference Books

1. Kenneth C Louden, “Compiler construction, Principles and Practice”, 1st edition, Cengage.
2. Yunlinsu, “Implementations of Compiler, A new approach to Compilers including the algebraic methods”, Springer.
3. Jean-Paul Trembly, Paul G. Sorenson, “The theory and practice of Compiler writing”, 1st edition, McGraw-Hill.
4. Nandini Prasad, “Principles of compiler design”, 2nd edition, Elsevier.

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COMPUTER NETWORKS

III Year – I Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To introduce the fundamental concepts of computer networking.
- To familiarize with networking concepts to work on various Protocols of ISO-OSI and TCP/IP.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.
- design a network by deciding relevant multiplexing and switching technique to improve performance of the network.
- apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network.
- specify and identify deficiencies in MAC sublayer protocols.
- apply routing and congestion control algorithms to deliver data packets across the networks.
- use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet.

Course Content

UNIT - I: Introduction

Introduction-components of data communication, data flow, network topologies, categories of networks-LAN, MAN, WAN, ISO-OSI model, TCP/IP.

UNIT - II: Physical Layer

Multiplexing- frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, Introduction to switching - circuit switched networks, datagram networks, virtual circuit networks.

UNIT - III: Data Link Layer

Design issues, framing, error control, error detection and correction, CRC, checksum, hamming code. Elementary data link layer protocols- simplex protocol, simplex stop and wait, simplex protocol for noisy channel. Sliding window protocol-one bit, Go back N, selective repeat, data link layer in HDLC, PPP.

UNIT - IV: Medium Access Control Sub Layer

ALOHA, CSMA, CSMA/CD, IEEE standards-standard Ethernet, wireless LAN, bridges.

UNIT - V: Network Layer

Routing algorithms- shortest path routing, distance vector, link state routing, and hierarchical routing. Congestion control algorithms-congestion control in virtual circuit subnets, datagram subnet, leaky bucket, token bucket. The network layer in the Internet: The IP protocol, IP Addresses-IPv4, IPv6.

UNIT - VI: Transport and Application Layers

Transport layer: Transmission Control Protocol (TCP)- services, segment header, connection establishment, termination, transmission policy, congestion control. User Datagram Protocol (UDP)- header format.

Application layer: The Domain Name System (DNS), electronic mail-architecture-SMTP, POP3, FTP, HTTP.

Text Books

1. Andrew S Tanenbaum, “Computer Networks”, 4^{th} edition, Pearson.
2. Behrouz A Forouzan, “Data Communications and Networking”, 5^{th} edition, TMH.

Reference Books

1. S. Keshav, “An Engineering Approach to Computer Networks”, 2^{nd} dition, Pearson Education.
2. W.A. Shay, Thomson, “Understanding Communications and Networks”, 3^{rd} edition, Cengage Learning.

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WEB TECHNOLOGIES
(Common to CSE & IT)
III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with various technologies like HTML, CSS, JavaScript, XML, JSP and PHP to develop real-time web applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify various HTML tags and their purpose
- develop dynamic web pages using HTML, CSS and Javascript
- use XML to store and transport data
- design web applications using JSP and PHP
- connect to heterogeneous databases using JSP as well as PHP

Course Content

UNIT - I: HTML and CSS

HTML: Basic HTML tags, working with lists, tables, forms, frames, iframes and images.

Cascading Style sheets**:** CSS rules, selectors, types of CSS, CSS properties for styling backgrounds, text, fonts, cursors and links.

UNIT - II: JavaScript

Introduction to javascript, variables, data types, operators, control flow statements, built-in objects, functions, event handling, DHTML with java script.

UNIT - III: XML

Basic building blocks, validating XML documents using DTD and XML schemas, XML Parsers: DOM and SAX, XSLT.

UNIT - IV: JSP

Introduction to web servers, the anatomy of a JSP page: directives, actions, scripting elements, implicit JSP objects, life cycle, declaring variables and methods, passing control and data between JSP pages, sharing session and application data.

UNIT - V: PHP Programming

Introduction: Creating and running a PHP script, using variables, constants, data types and operators, control statements, arrays and functions.

Forms: Processing a web form, validating a web form and enforcing data rules

UNIT - VI: Database Connectivity using JSP and PHP

JDBC drivers, database programming using JDBC, accessing a database from a JSP page and performing various operations on database.

Introduction to MySQL, connecting to MySQL server using PHP and performing various operations on database.

Text Books

1. Chris Bates, "Web Programming, Building Internet Applications", 2nd edition, Wiley Dreamtech.
2. Kogent Learning Solutions, "Web Technologies, Black book", Dreamtech press.

Reference Books

1. Uttam K Roy, "Web Technologies", Oxford.
2. Robet W Sebesta, "Programming the World Wide Web", 7th edition, Pearson.
3. John Duckett, "Beginning Web Programming with HTML, XHTML, and CSS", 2nd edition.

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Professional Elective - I

C# .NET

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the concepts of control structures, classes, objects in .NET
- To demonstrate the concept of exception handling and threads.
- To impart the working style of forms in web applications.
- To edify the connection to a database using web application.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- configure the .NET environment for an application.
- compose simple programs in C# using control structures.
- apply the inheritance mechanism to solve simple problems in C#.
- apply the exception handling mechanism to improve the robustness of an application.
- create user interface components for a .NET application.
- connect web pages with a database.

Course Content

UNIT - I: Introduction to .NET

Basics of .NET framework, components of .NET, architecture of .NET framework, list of .NET languages, Microsoft visual studio, benefits of .NET framework.

Basics of C#: writing a program, program structure, using specific functions and command line arguments.

UNIT - II: Control Statements

Introduction to data types, value types, classes and objects, keywords, variables, operators, special operators in C#, type casting.

Conditional Statements: if, if-else, if-else-if ladder, nested if, switch statements with examples.

Iterative Statements: while, do-while, for, foreach, break, continue statements.

UNIT - III: Classes and Objects

Introduction, design of a class, array of objects, constructors, this, static members, passing objects to function, basic object oriented programming, access level, components of a class. Inheritance: Visibility control, types of inheritances, overriding methods, abstract class and methods. Interfaces: Interface definition and syntaxes, extending interface.

UNIT - IV: Error and Exceptions

Types of errors, effective exception handling mechanism, try-catch, user defined exception, finally statement.

UNIT - V: Windows Forms and Basic Controls

Form, basic properties of form, anchor docks, controls.

Advanced Controls and Dialogs: Advanced controls, common dialogs.

UNIT - VI: Data Connectivity

Creating database in MS Access, connection object, command object, dataset and data table objects, inserting and updating records.

Introduction to ASP.NET: Difference between ASP.NET and ASP, advantages of ASP.NET, web forms, creating an ASP website, common HTML tags, creating user form, database creation in SQL Express.

Text Books

1. Harsh Bhasin, “Programming in C#”, OXFORD.

Reference Books

1. Andrew Troelsen, “C# and the .NET Platform”, Second Edition, Apress Publication.
2. Herbert Schildt, “The Complete Reference C# 4.0.”.
3. Erik Brown, “Windows Forms Programming With C#.”
4. Peter Sestoft and Henrik I. Hansen, “C# Preciesely”, Prentice Hall of India.

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Professional Elective - I

ADVANCED DATA STRUCTURES

(Common to CSE & IT)

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce dictionaries, priority queue and balanced trees.
- To disseminate knowledge on Pattern Matching Algorithms and Tries.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- illustrate representations of sets and operations on sets and dictionaries.
- construct Priority queues such as min heap and max heap for the given data.
- create AVL, Red Black, Splay, B and B+ Trees for the given data and perform insertion, deletion and search operations on them.
- search for a pattern in the given text using Pattern Matching Techniques.
- demonstrate insertion and search operations on tries and also list its applications.

Course Content

UNIT - I: Sets and Dictionaries

Sets: Definition, set representation techniques, set operations.

Dictionaries: Definition, operations, ADT for dictionary, representation of dictionaries, applications of dictionaries.

UNIT - II: Priority Queues

Introduction, types of priority queues, implementation methods of priority queues, binary heap: min heap and max heap, applications of heap.

UNIT - III: Balanced Trees-1

AVL Trees: introduction, maximum height of an AVL tree, insertion and deletion operations.

UNIT - III: Balanced Trees-2

Red Black Trees - insertion and deletion operations, splay trees- insertion and deletion operations.

UNIT - IV: B and B+ Trees

B Trees - insertion and deletion operations, B+ trees- insertion and deletion operations.

UNIT - V: Pattern Matching

Introduction, pattern matching algorithms- the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, applications of pattern matching.

UNIT - VI: Tries

Introduction, advantages of tries, digital search tree, binary trie, compressed binary trie, patricia, multi way trie.

Text Books

1. Horowitz, Sahni, Anderson Freed, "Fundamentals of Data Structure in C", 2nd edition, University Press.
2. Richard F, Gilberg, Forouzan, "Data Structures", 2nd edition, Cengage.

Reference Books

1. Mark Allen Weiss, "Data structures and Algorithm Analysis in C", Pearson, 2nd edition.
2. Debasis Samanta, "Classic Data Structures", PHI, 2nd edition.

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Professional Elective - I

SOFTWARE TESTING METHODOLOGIES

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To disseminate knowledge on software testing techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate problem by following software testing life cycle.
- design test cases for testing a software project using black box testing techniques.
- apply path testing on a given program and uncover bugs present in the program.
- compare verification and validation in the context of software testing
- describe regression testing and software quality assurance.
- demonstrate the use software testing tools for testing projects.

Course Content

UNIT - I: Introduction and Methodology

Introduction, myths and facts, software testing terminology, software testing life cycle.

UNIT - II: Dynamic Testing I

Black Box Testing Techniques: Boundary value analysis, equivalence class testing, state table based testing and decision table based testing.

UNIT - III: Dynamic Testing II

White-Box Testing Techniques: Need, logic coverage criteria, basis path testing, loop testing, mutation testing, static testing: inspections-inspection team, inspection process, benefits of inspection process, structured walkthroughs, technical reviews.

UNIT - IV: Verification and Validation

Verification and validation activities, verification, verification of requirements, validation, validation activities.

UNIT - V: Regression Testing

Objectives of regression testing, when regression testing done? regression testing types, regression testing techniques. Software Quality Management: SQA models, debugging: process, techniques, correcting bugs.

UNIT - VI: Automation and Testing Tools

Need for automation, categorization of testing tools, selection of testing tools, cost incurred, guidelines for automated testing, overview of some commercial testing tools.

Text Books

1. Naresh Chauhan, "Software Testing, Principles and Practices", 1st edition, Oxford.
2. Aditya P Mathur, "Foundations of Software Testing", 2nd edition, Pearson.

Reference Books

1. Yogesh Singh, "Software Testing", Cambridge.
2. M G Limaye, "Software Testing, Principles, Techniques and Tools", TMH.
3. Willian E Perry, "Effective Methods for Software Testing", 3rd edition, Wiley.

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Professional Elective - I

PRINCIPLES OF PROGRAMMING LANGUAGES

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To understand and describe syntax and semantics of programming languages.
- To understand data, data types, and basic statements.
- To understand call-return architecture and ways of implementing them.
- To understand object-orientation, concurrency, and event handling in programming languages.
- To develop programs in non-procedural programming paradigms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe syntax and semantics of programming languages.
- explain data, data types, and basic statements of programming languages.
- design and implement subprogram constructs, Apply object - oriented, concurrency, and event handling programming constructs.
- develop programs in Scheme, ML, and PROLOG.
- understand and adopt new programming languages.

Course Content

UNIT - I: Syntax and Semantics

Evolution of programming languages, describing syntax, context-free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive-decent, bottom-up parsing.

UNIT - II: Data, Data Types, and Basic Statements

Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded statements.

UNIT - III: Subprograms and Implementations

Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks.

UNIT - IV: Object- Orientation and Concurrency

Object orientation, design issues for OOP languages, implementation of object oriented constructs, concurrency, semaphores, monitors, message passing, threads, statement level concurrency, exception handling.

UNIT - V: Functional Programming Languages

Introduction to lambda calculus, fundamentals of functional programming languages, programming with scheme.

UNIT - VI: Logic Programming Languages

Introduction to logic and logic programming, programming with PROLOG, multi-paradigm languages.

Text Books

1. Robert W. Sebesta, "Concepts of Programming Languages", 10th edition, Addison Wesley.
2. Allen B Tucker, Robert E Noonan, "Programming Languages, Principles and Paradigms", 2nd edition, TMH.

Reference Books

1. R. Kent Dybvig, "The Scheme programming language", 4th edition, MIT Press.
2. Jeffrey D. Ullman, "Elements of ML programming", 2nd edition, Prentice Hall.
3. Richard A. O'Keefe, "The craft of Prolog", MIT Press.
4. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", 5th edition, Springer.

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Open Elective - II

GEOINFORMATICS

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course objectives

- To introduce the basic concepts and principles of remote sensing.
- To familiarize with structure and function of Geographic Information Systems.
- To illustrate the multidisciplinary nature of Geospatial applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- relate the scientific theories to the behaviour of electromagnetic spectrum.
- distinguish between different types of satellites and identify appropriate remote sensing data products for mapping, monitoring and management applications.
- interpret Satellite images and processed outputs for extracting relevant information.
- structure the concept of a spatial decision support system in its analog and digital forms.
- perform tasks related to building a GIS database with location, attribute and meta-data.
- list and elaborate applications of Geoinformatics in various fields.

Course Content

UNIT - I: Electro-Magnetic Radiation (EMR), its interaction with Atmosphere & Earth

Definition of remote sensing and its components – Electromagnetic spectrum, wavelength regions important to remote sensing, wave theory, particle theory, Stefan-Boltzmann and Wien's Displacement Law – Atmospheric scattering, absorption, atmospheric windows, spectral signature concepts, typical spectral reflective characteristics of water, vegetation and soil.

UNIT - II: Platforms and Sensors

Types of platforms, orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors, resolution concept, payload description of important Earth Resources and Meteorological satellites – Airborne and Space-borne TIR (Thermal Infrared Radiation) and microwave sensors.

UNIT - III: Image Interpretation and Analysis

Types of Data Products – types of image interpretation, basic elements of image interpretation, visual interpretation keys – Digital Image Processing, pre-processing, image enhancement techniques – multispectral image classification, supervised and unsupervised

UNIT - IV: Geographic Information System

Introduction to Maps, definitions, map projections, types of map projections, map analysis – GIS definition, basic components of GIS, standard GIS software's – Data types, spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems(DBMS).

UNIT - V: Data Entry, Storage and Analysis

Data models, vector and raster data – data compression – data input by digitisation and scanning – attribute data analysis – integrated data analysis – modelling in GIS for scenario analysis and planning.

UNIT - VI: RS and GIS Applications

Land cover and land use, agriculture, forestry, urban applications, hydrology, flood zone delineation & mapping, groundwater prospects & recharge, reservoir storage estimation.

Text Books

1. Remote Sensing and Geographical Information Systems, M.Anji Reddy, 4^{th} Edition, B.S.Publications.
2. Remote Sensing and GIS, Basudeb Bhatta, 2^{nd} Edition, Oxford University Press.

Reference Books

1. Remote Sensing and Image Interpretation, Lillesand, T.M, R.W. Kiefer and J.W. Chipman , 7^{th} Edition (2015), Wiley India Pvt. Ltd., New Delhi
2. Remote Sensing Digital Image Analysis, Richard, John A, 5^{th} Edition (2014), Springer.

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Open Elective - II

ENVIRONMENTAL SANITATION

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To communicate the importance of institutional sanitation in maintaining public health.
- To introduce the strategies for maintaining healthy living and working environment.
- To delineate the role of environmental engineer in industrial environments.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the common communicable diseases and the solutions for controlling them.
- suggest appropriate sanitation measures for water supply and sanitation in un-sewered areas.
- describe the process of refuse disposal in rural areas.
- draw out the procedures adopted for maintaining hygiene in institutional buildings.
- list out the occupational comfort parameters to be considered for designing built environment.
- introduce the notion of occupational health, safety and the related management approaches.

Course Content

UNIT - I: Epidemics, Epizootics

Origin and spread of Communicable diseases like Cholera, Smallpox, Tuberculosis, Malaria, Filaria, and Plague, common methods (nose, throat, intestinal discharges) – Role of Public Health Engineering in the preventive aspects of the above diseases – Role of vectors in transmitting diseases and Rodent control methods.

UNIT - II: Rural water supply and Sanitation

Sanitary protection of wells, springs, economic methods of treatment – Excreta disposal systems – Types of sanitary privies.

UNIT - III:Refuse Sanitation

Quality and quantity of garbage, rubbish, ashes, street sweepings, night soil; methods of conveyance and sanitary disposal methods, latest technologies adopted to dispose off the solid wastes.

UNIT - IV: Food Hygiene and Sanitation

Milk and milk products, sanitary maintenance of catering, establishment, measures – Sanitary requirements and maintenance of the public utility services like schools, hospitals, offices and in other public buildings.

UNIT - V:Ventilation, Air Conditioning And Light

Composition of ambient air, air pollutants, bacteria, odours – Effective Temperature – Comfort standards of ventilation, air interchange, natural ventilation, artificial ventilation, air conditioning – Measurement of light, illumination standards, natural lighting, artificial lighting.

UNIT - VI: Occupational Health and Safety

Occupational hazards in public buildings, schools, hospitals, eating establishments, swimming pools – Cleanliness and maintenance of comfort – Industrial plant sanitation – OHSAS 18001 and the WELL Building Standard and rating for built environment.

Text Books

1. Municipal and Rural Sanitation, Victor M.Ehlers, Ernest W. Steel, 6th Edition, McGraw Hill.
2. Environmental Sanitation, Joseph A. Salvato, Nelson L. Nemerow, Franklin J. Agardy , 5th Edition, John Wiley and Sons.
3. OHSAS 18001 Manual.
4. WELL Rating System Manual.

Reference Books

1. Integrated Solid Waste Management, George Tchobanoglous, Hilary Theisen, Samuel A Vigil,McGraw Hill.
2. Not in my backyard – Solid Waste Management in Indian Cities, Sunita Narain, Jain Book Agency.
3. National Building Code of India, Bureau of Indian Standards.

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Open Elective - II

MODELING AND SIMULATION OF ENGINEERING SYSTEMS

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with programming skills using basic MATLAB and its associated tool boxes.
- To impart knowledge on building SIMULINK and Graphical user interface.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop MATLAB programme for the solution of engineering system.
- build a SIMULINK model and GUI to simulate engineering system and asses its performance.
- solve and visualize the dynamic performance of engineering systems through MATLAB tool boxes.
- compute and analyse the data of a physical system using advanced programming methods in MATLAB.

Course Content

UNIT - I: Variables, scripts, and operations

Getting Started, Scripts, Making Variables, Manipulating Variables, Basic Plotting

UNIT - II: Visualization and programming

Functions, Flow Control, Line Plots, Image/Surface Plots, Vectorization

UNIT - III: Solving equations and curve fitting

Linear Algebra, Polynomials, Optimization, Differentiation/Integration, Differential Equations

UNIT - IV: Advanced methods

Probability and Statistics, Data Structures, Images and Animation, Debugging, Online Resources

UNIT - V: Symbolics, Simulink®, file I/O, building GUIs

Symbolic Math, Simulink, File I/O, Graphical User Interfaces

UNIT - VI:

Examples on statistics, optimization, plots.

Text Books

1. "Getting started with MATLAB" by Rudra pratap, Oxford University, 2002.
2. MATLAB and SIMULINK for Engineers by Agam Kumar Tyagi, OUP 2011

Reference Books

1. Spencer, R.L. and Ware, M (2008), Introduction to MATLAB, Brigham Young Unviersity, available online, accessed, 7, 2008.
2. David F.Griffiths, October (2012) "An introduction to MATLAB" the Unviersity of Dundee, available online, Acessed, October 2012.

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Open Elective - II

POWER SYSTEMS ENGINEERING

III Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introduce the working of power plants in power generation and layout of substations.
- To familiarize with the concepts of corona, insulators and sag in overhead lines.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the operation of thermal power station.
- describe the operation of nuclear and hydel power plants.
- distinguish various bus bar arrangements in substation
- analyze the phenomenon of corona.
- determine the sag in over head lines

Course Content

UNIT - I: Thermal Power Stations

Single line diagram of Thermal Power Station showing paths of coal, steam, water, air, ash and flue gasses-Brief description of TPS components: Economizers, Boilers, super heaters, Turbines ,condensers, chimney and cooling towers.

UNIT - II: Nuclear Power Stations

Working principle, Nuclear fuels. Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR.

UNIT - III: Hydal power stations

Selection of site, block diagram approach of hydro electric power plant and classification of pumped storage power plants.

UNIT - IV: Air insulated substations

Equipments used in substations, Classification of substations: - Indoor & Outdoor substations: Single line diagram of substation. Bus bar arrangements and their classification.

UNIT - V : Overhead Line Insulators and Corona

Types of Insulators, String efficiency and methods for improving string efficiency, Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss.

UNIT - VI: Sag and Tension Calculations

Sag and Tension calculations with equal and unequal heights of towers, effect of Wind and Ice on weight of Conductor, Stringing chart and sag template and its applications.

Text Books

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.

Reference Books

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand& Company Ltd.New Delhi 2004.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.

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Open Elective - II

ELEMENTS OF MECHANICAL TRANSMISSION

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the principles of mechanical power transmission elements

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Identify suitable shaft couplings for a given application.
- describe various transmission elements like belts, ropes and chain drives.
- Explain different thread profiles and applications of power screws
- explain the working of various gears, gear trains and gear box.

Course Content

UNIT - I: Shaft Couplings

Shaft couplings: Rigid couplings – Muff, split muff and flange couplings, Flexible coupling-Modified Flange coupling

UNIT - II: Belt Drives

Flat Belts: Introduction, Selection of a Belt Drive, Types of Belt Drives, Length of Belts, Materials, Belt Joints, Types of Flat Belt Drives, Power transmitted.

UNIT - III: V-Belt, Rope Drives & Chain Drives

V-belts: Introduction, Types of V-belts, Ratio of Driving Tensions for V-belt, Power transmitted.

Rope Drives: Introduction, Classification of rope drives, Power transmitted

Chain drives: Introduction, Chain drives, Polygonal effect, Selection of roller chains, length of chain.

UNIT - IV: Power Screws

Forms of Threads, Multi-start Threads, Right Hand and Left Hand Threads, nut, compound screw, differential screw

UNIT - V: Gears and Gear trains

Types, terminology, materials, law of gearing, velocity of sliding, forms of teeth, path of contact, arc of contact, interference, Gear Trains - Types, differential of an automobile.

UNIT - VI: Gearbox

Introduction, types, constant mesh gearbox, sliding type gear box, single and multi stage gear box

Text Books

1. Design of machine elements by Bhandari, Tata McGraw Hill book Co.3rd Edition,2010.
2. Machine Design by P.C. Sharma & D.K. Agarwal. 4th Edition-1996.S.K.Kataria & Sons

Reference Book

1. Design of Machine Elements by Sharma & Purohit ,PHI, 10th Edition,2011.
2. Design of Machine Elements by Kannaiah.5th Edition,1999.Scitech Publication.

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Open Elective - II

MATERIAL HANDLING EQUIPMENT

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide knowledge on materials handling equipment.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand the basic concepts of material handling equipments.
- illustrate the working principle of conveyors, industrial trucks, hoppers, hoists and cranes.

UNIT - I: Introduction

Types of industrial transport – classification and characteristics of materials – classification and selection of materials handling.

UNIT - II: Conveyor Equipment

Classification of conveyors – description and uses of belt – conveyors – apron conveyors -Roller conveyors – water – screw conveyors – pneumatic and hydraulic conveyors, Computer controlled conveyor system.

UNIT - III: Industrial Trucks

Industrial trucks – main types – purpose of hand trucks – tractors and trailers – self propelled trucks – fork trucks , Automated guided vehicles.

UNIT - IV: Auxiliary Equipment

Hoppers and gates – uses, auxiliary equipment – feeders – chutes – uses.

UNIT - V: Hoisting Appliances

types, description and uses of chain – ropes – types and description and purpose of crane hooks – Grab buckets, lifts – excavators.

UNIT - VI: Cranes

Hand-propelled and electrically driven E.O.T overhead Traveling, cranes; Traveling mechanisms of cantilever and monorail cranes.

Text Books

1. Conveyor Equipment Manufacturer's Association, "*Belt conveyors for bulk materials*" 6th edition, The New CEMA Book.
2. Rudenko N., "*Materials handling equipment*", Elnvee Publishers, 1970
3. Ishwar G Mulani and Mrs. Madhu I Mulani, "*Engineering Science and application design for belt conveyor*", Madhu I. Mulani, 2002.

Reference Books

1. Spivakovsy A.O. and Dyachkov V.K., "*Conveying Machines, Volumes I and II*", MIR Publishers, 1985.
2. Alexandrov, M., "*Materials Handling Equipments*", MIR Publishers, 1981.
3. Boltzharol, A.,"*Materials Handling Handbook*", The Ronald press company 1958.

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Open Elective - II

AUTOMOTIVE ELECTRONICS

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the electronic systems inside an automotive vehicle.
- To introduce the concepts of advanced safety systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- learn the fundamentals of automotive technology.
- describe the operation of microcomputer systems.
- acquire knowledge in automotive sensors and control systems.
- develop communications & navigation/routing in automotive vehicles.

Course Content

UNIT - I: Automotive Fundamentals

Use of electronics in the automobile, evolution of automotive electronics, the automobile physical configuration, evolution of electronics in the automobile, survey of major automotive systems, engine control or electronic control unit, ignition system.

UNIT - II: Automotive Micro-Computer System

Binary number system, binary counters, Microcomputer fundamentals-digital versus analog computers, basic computer block diagram, microcomputer operations, CPU registers, accumulator registers, condition code register-branching; microprocessor architecture, memory-ROM, RAM; I/O parallel interface, digital to analog converter and analog to digital converters with block diagram.

UNIT - III: Basics of Electronics Engine Control

Motivation for electronic engine control, exhaust emissions, fuel economy, concept of an electronic engine control system, engine functions and control, electronic fuel control configuration, electronic ignition with sensors.

UNIT - IV: Sensors and Actuators

Introduction; basic sensor arrangement; types of sensors such as oxygen sensors, crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, altitude sensors, flow sensors, throttle position sensors, solenoids, stepper motors, actuators – fuel metering actuator, fuel injector, and ignition actuator.

UNIT - V: Electronic Vehicle Management System

Cruise control system, antilock braking system, electronic suspension system, electronic steering control, and transmission control, safety: air bags, collision avoidance radar warning system with block diagram, low tire pressure warning system, advanced cruise control system.

UNIT - VI: Automotive Instrumentation System

Speech synthesis, sensor multiplexing, control signal multiplexing with block diagram, fibre optics inside the car, automotive internal navigation system, GPS navigation system, voice recognition cell phone dialling.

Text Books

1. William B. Ribbens, "Understanding Automotive Electronics", SAMS/Elsevier Publishing, 6th Edition. (UNIT I to VI).
2. Robert Bosch Gambh, "Automotive Electrics Automotive Electronics Systems and Components", John Wiley& Sons Ltd., 5th edition, 2007.

Reference Books

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
2. G. Meyer, J. Valldorf and W. Gessner, "Advanced Microsystems for Automotive Applications", Springer, 2009.
3. Robert Bosch, "Automotive Hand Book", SAE, 5th Edition, 2000.

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Open Elective - II

INTRODUCTION TO MEMS

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce lithography principles, mechanical sensors and actuators.
- To make it known the thermal sensors and actuators, magnetic sensors and actuators.
- To present formally micro fluidic systems and chemical and bio medical micro systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- define MEMS, lithography methods, sensors and actuators.
- describe the principles of MOEMS technology and its applications.
- elucidate different magnetic sensing and detection for MEMS.
- apply sensing principles and mechanisms the chemical and bio medical micro systems.

Course Content

UNIT - I: Introduction

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

Mechanical Sensors and Actuators: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT - II: Thermal Sensors and Actuators

Thermal energy basics and heat transfer processes, thermistors, thermo devices, thermo couple, micro machined thermo couple probe, Peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT - III: Micro-Opto-Electro Mechanical Systems

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT - IV: Magnetic Sensors and Actuators

Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT - V: Micro Fluidic Systems

Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, optoelectro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps. RADIO FREQUENCY (RF) MEMS: RF based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

UNIT - VI: Chemical and Bio Medical Micro Systems

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluroscence detection, calorimetric spectroscopy.

Text Book

1. Nitaigour Premchand Mahalik “MEMS”, TMH Publishing co.

Reference Books

1. Chang Liu “Foundation of MEMS”, Prentice Hall Ltd.
2. Sergey Edwrd Lyshevski “MEMS and NEMS”, CRC Press, Indian Edition.
3. Tai-Ran Hsu “MEMS and Micro Systems: Design and Manufacture”, TMH Publishers.
4. Richard A Layton, Thomas M Adams “Introductory MEMS”, Springer International Publishers.

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Open Elective - II

DATA SCIENCE

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with statistical methods to analyze data using classification, graphical and computational methods
- To introduce Data Wrangling approaches and descriptive analytics on large data sets.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply statistical methods to data for inferences.
- analyze data using Classification, Graphical and computational methods.
- describe Data Wrangling approaches.
- perform descriptive analytics over massive data.

Course Content

UNIT - I: Introduction and Linear Regression

Overview of random variables and distributions, statistical learning, assessing model accuracy, descriptive statistics, dependent and independent events

Linear Regression: Simple and multiple linear regressions, comparison of linear regression with k-nearest neighbors.

UNIT - II: Hypothesis Testing

Simple Hypothesis testing, student's t-test, paired t and u test, correlation and covariance, tests for association.

UNIT - III: Graphical Analysis

Histograms and frequency polygons, box-plots, quartiles, scatter plots, heat maps.

UNIT - IV: Computational Methods

Programming for basic computational methods such as Eigen values and Eigen vectors, sparse matrices, QR and SVD.

UNIT - V: Data Wrangling

Data acquisition, data formats, imputation, the split-apply-combine paradigm.

UNIT - VI: Descriptive Analytics

Data warehousing and OLAP, data summarization, data de-duplication, data visualization using CUBEs.

Text Book

1. Gareth James, Trevor Hastie, Robert Tibshirani, Daniela Witten, “An Introduction to Statistical Learning with Applications in R”.

Reference Book

1. Mark Gardener, “Beginning R The statistical Programming Language”, Wiley.

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Open Elective - II

VIRTUAL AND AUGMENTED REALITY

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce key elements of virtual Reality with the components in VR systems.
- To gain knowledge of various input and output devices required for interacting in virtual world and augmented reality.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify basic elements of virtual reality
- describe various input and output devices required for VR experience
- classify human factors that affect VR experience
- distinguish augmented reality from virtual reality
- express the object position and orientation in virtual space.

Course Content

UNIT - I: Introduction

The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.

UNIT - II: Input Devices

Trackers, Navigation, and Gesture Interfaces: Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces.

UNIT - III: Output Devices

Graphics displays, sound displays and haptic feedback.

UNIT - IV: Human Factors

Methodology and terminology, user performance studies, VR health and safety issues. Applications: Medical applications, military applications, robotics applications.

UNIT - V: Augmented Reality

Introduction - head-up displays, helmet-mounted sights and displays, smart glasses and augmenting displays

UNIT - VI: Understanding Virtual Space

Visual and object space, defining position and orientation in three dimensions.

Text Books

1. John Vince, “Virtual Reality Systems”, Pearson Education.
2. Steve Aukstakalnis, “Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR”, Addison-Wesley.

Reference Books

1. Brett S. Martin, “Virtual Reality”, Norwood House Press, 2017.
2. Alan B. Craig, “Understanding Augmented Reality: Concepts and Applications”, Newnes.

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Open Elective - II

OPEN SOURCE SOFTWARE

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the opportunities for open source software in the global market.
- To familiarize with different steps in implementing the open source.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- state the need and applications of open source software.
- compare and Contrast between Open source and commercial software
- demonstrate LINUX operating systems concepts.
- create database in MYSQL and perform operations on it.
- design and develop a web application using PHP.

Course Content

UNIT - I: Introduction

Introduction to Open sources, Need of Open Sources, Advantages of Open Sources and Application of Open Sources.

UNIT - II: LINUX

LINUX Introduction, General Overview, Kernel Mode and user mode , Process, Advanced Concepts - Personalities, Cloning, Signals.

UNIT - III: Open Source Programming Languages

PHP- Introduction, Programming in web environment, variables, constants, data types, operators Statements, Arrays.

UNIT - IV: Introduction to MySQL

MySQL: Introduction, Setting up account, Starting, terminating and writing your own SQL programs, Record selection Technology, Working with strings, Date and Time.

UNIT - V: Working with MySQL

Sorting Query Results, Generating Summary, Working with metadata, Using sequences.

UNIT - VI: Advanced PHP

OOP – String Manipulation, PHP and SQL database, PHP Connectivity, Debugging and error handling.

Text Books

1. Remy Card, Eric Dumas and Frank Mevel, “The Linux Kernel Book”, WileyPublications,2003.
2. Steve Suchring, “MySQL Bible”, John Wiley, 2002

Reference Books

1. RasmusLerdorf and Levin Tatroe, “Programming PHP”, O’Reilly, 2002.
2. Steven Holzner, “PHP: The Complete Reference”, 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
3. VikramVaswani, “MYSQL: The Complete Reference”, 2nd Edition, TataMcGraw –Hill Publishing Company Limited, Indian Reprint 2009.

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Open Elective - II

CYBER LAWS

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To expose the need of cyber laws to prosecute cybercrimes in the society.
- To familiarize with Licensing Issues Authorities for Digital Signatures.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline the pros and cons of Internet.
- operate on confidential data in a precautious manner.
- discuss Criminal Justice in India and its Implications.
- interpret the Cyber Consumers under the consumer Protection Act.
- devise the legal framework for Confidential Information.
- determine the e-commerce issues for copyright protection and defend personal data from being hacked.

Course Content

UNIT - I: The IT Act, 2000- A Critique

Crimes in this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce?,Forgetting the Line between Cognizable and Non - Cognizable Officers, Arrest for"About to Commit" an Offence Under the IT Act, A Tribute to Darco, Arrest But NoPunishment.

UNIT - II: Cyber Crime and Criminal Justice

Penalties, Adjudication and Appeals Under the IT Act, 2000: Concept of CyberCrime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber fraud andCyber Cheating, Virus on Internet Deformation, Harassment and E- mail Abuse

UNIT - III: Cyber Criminality Strategies and Trends

Network Service Providers, Jurisdiction and CyberCrimes, Nature of Cyber Criminality Strategies to Tackle Cyber Crime and Trends,Criminal Justice in India and Implications.

UNIT - IV: Digital Signatures, Certifying Authorities and e-Governance

Introduction to Digital Signatures, Certifying Authorities and Liability in the Eventof Digital Signature compromise, E - Governance in the India. A Warming toBabudom, Are Cyber Consumers Covered under the Consumer Protection, Goodsand Services, Consumer Complaint Defect in Goods and Deficiency in ServicesRestrictive and Unfair Trade Practices

UNIT - V: Traditional Computer Crime

Early Hacker and Theft of Components Traditional problems, Recognizing andDefining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computersas Commodities, Theft of intellectual Property.

UNIT - VI: Web Based Criminal Activity

Interference with Lawful Use of Computers, Malware, DoS (Denial of Service) andDDoS (Distributed Denial of Service) Attacks, Spam ,Ransomware and Kidnappingof Information, Theft of Information, Data Manipulation, and Web EncroachmentOnline Gambling Online Fraud, Securities Fraud and stock Manipulation, Ancillarycrimes

Text Books

1. Vivek Sood, " Cyber Law Simplefied", Tata McGraw Hill.
2. Marjie T. Britz, "Computer Forensics and Cyber Crime", Pearson

Reference Book

1. Cyber Laws Texts and Cases, Ferrera, CENGAGE.

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Open Elective - II

QUALITY, RELIABILITY AND OPERATIONS RESEARCH

III Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To equip students with basic practical skills with sufficient theory.
- To understand the principles involved in the application area.
- To develop the power of systematic thinking and reasoning, practical approach and exposition in the students.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Construct the control charts to understand whether the process is under control.
- Solve various problems regarding quality and life testing of a given product(s).
- Form the real life situations/practical problems into LPP.
- Apply various algorithms like graphical method, simplex method, Charne's method, Hungarian method etc.
- Find the optimal Transportation cost and optimal assignment policy.
- Appreciate Travelling Salesman Problem.
- Identify the job sequence to the given situation and to find the total elapsed time.

Course Content

UNIT - I: Statistical Process Control

Importance of Statistical Quality Control (SQC) in industry, Statistical basis of Shewart Control Charts, Construction of control charts for variables and attributes (with fixed and varying sample sizes), Interdependence of control charts, Natural tolerance limits and specification limits, process capability index, concept of Six sigma and its importance.

UNIT - II: Accepting Sampling Plans

Producer's Risk and Consumer's Risk, Concept of AQL and LTPD. Single and Double Sampling plans for attributes and derivation of their OC and ASN functions, design of single and double sampling plans for attributes using Binomial distribution.

UNIT - III: Reliability

Introduction, Hazard function, Exponential distribution as life model, its memory less property, Reliability function and its estimation, concepts of censoring and truncation, system reliability - series, parallel and k out of N systems and their reliabilities.

UNIT - IV: Linear Programming

Meaning and scope of OR, Convex sets and their properties. Definition – general LPP, formulation of LPP, solution of LPP by Graphical method, Simplex algorithm, concept of degeneracy and resolving it, concept of duality , duality as LPP, Dual-Primal relationships.

UNIT - V: Transportation Problem

Definition of Transportation problem(TP) – TP as a special case of LPP, Feasible solutions by North-west corner rule, Matrix minima method, Vogel's Approximation method. Optimal solution through MODI tableau method for balanced and unbalanced TPs. Degenercy in TP and resolving it.

UNIT - VI: Assignment and Sequencing Promlems

Description of Assignment problem(AP) and its variations, AP as a special case of TP and LPP (both balanced and unbalanced cases), Optimum solution by Hungarian method. Travelling salesman problem.

Introduction to Sequencing problem, optimum sequence of N jobs on two an three machines (without passing).

Text Books

1. Kanti Swaroop, P. K. Gupta and Man Mohan: Operations Research, Sultan Chand Company.
2. L. S. Srinath: Reliability Engineering, Affiliated East-West Press.
3. Parimal Mukhopadhyay: Applied Statistics, New Central Book Agency.
4. Gass: Linear Programming, Mc Graw Hill.
5. R. C. Gupta: Statistical Quality Control.

Reference Books

1. V. K. Kapoor and S. C. Gupta: Fundamentals of Applied Statistics, Sultan Chand.
2. S. K. Sinha: Reliabilty and Life Testing
3. S. M. Ross: Probability Models, Harcourt India Pvt. Ltd.
4. D. C. Montgomory: Introduction to Statistical Quality Control, Wiley.
5. Hadly: Linear Programming, Addison – Wiley.
6. Taha: Operation Research: An Introduction, Mac Millan.
7. Wayne L. Wiston: Operations Research, Thomson, India edition, 4^{th} Edition.

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COMPUTER NETWORKS AND COMPILER DESIGN LAB

III Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To demonstrate the functionalities of various layers of OSI model.
- To demonstrate lexical analysis and syntax analysis phases of a compiler.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- implement data link layer framing and error detection methods.
- analyze the topological and routing strategies for an IP based networking infrastructure.
- develop code to implement lexical analyzer.
- implement lexical analyzer using LEX tool
- implement parser using YACC tool.

List of Experiments

Computer Networks

1. Implement the data link layer framing methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters using two CRC polynomials – CRC 12, CRC 16.
3. Implement Dijkstra‘s algorithm to compute the shortest path through graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.
5. Implement hierarchal routing algorithm.
6. Implement error detecting techniques.

Compiler Design

1. Implement DFA for the regular languages.
2. Implement a PDA for context free languages.
3. Implement a TM for phrase-structured languages.
4. Design lexical analyzer to recognize the tokens and removes the comment lines and the blank spaces.

5. Implement the lexical analyzer using LEX tool.
6. Implement predictive parser for a given language.
7. Implement LALR bottom up parser for the given language.
8. Implement the syntax analyzer using YACC tool.

Text Books

1. Andrew S Tanenbaum, “Computer networks”, 4th edition, Pearson.
2. Behrouz A Forouzan, “Data communications and networking”, 5th edition, TMH.
3. Alfred V Aho, Monical S Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers, Principles Techniques and Tools”, 2nd edition, Pearson.

Reference Books

1. Mayank Dave, “Computer networks”, Cengage.
2. Kenneth C Louden, “Compiler construction, Principles and Practice”, Cengage.

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WEB TECHNOLOGIES LAB
(Common to CSE & IT)
III Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To introduce concepts of designing dynamic web pages using HTML, CSS and Javascript.
- To familiarize with JSP programming and master database access using JSP and JDBC.
- To impart PHP programming and master database access using PHP and MySQL.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- design dynamic web pages using HTML, CSS and JavaScript.
- access and Validate form data using JavaScript and PHP.
- connect to database using JSP and JDBC and perform various operations.
- connect to MySQL using PHP and perform various operations.

List of Experiments

1. Design the following static web pages required for an online book store web site.

   i. Home Page ii. Login Page iii. Catalogue Page

2. Design the following static web pages required for an online book store web site.

   i. Registration Page ii. Cart Page

3. Design a web page using CSS which includes the following:

   i. Use different font and text styles

   ii. Set a background image for both the page and single element on the page.

   iii. Define styles for links

   iv. Working with layers

   v. Adding a Customized cursor

4. i. Write a JavaScript to validate the fields of the login page.

   ii. Write a JavaScript to validate the fields of the Registration page

5. Write an XML file which will display the Book information which includes the following: Title of the book, Author Name, ISBN number, Publisher name, Edition and Price. Validate the above document using DTD and XML Schema.
6. i. Write a PHP program to validate the fields of the login page.

   ii. Write a PHP program to validate the fields of the Registration page
7. Write a JSP to connect to the database and extract data from the tables and display them to the user.
8. Design a JSP to insert the details of the users who register through the registration page and store the details in to the database.
9. Write a PHP program to connect to MySQL database which retrieves the data from the tables and display them to the user.
10. Write a PHP program to insert the details entered by the user in the Registration form into MySQL database.

Text Books

1. Chris Bates, "Web Programming, Building Internet Applications", 2nd edition, Wiley Dreamtech.
2. Kogent Learning Solutions, "Web Technologies, Black book", Dreamtech press.

Reference Books

1. Uttam K Roy , "Web Technologies", Oxford.
2. Robet W Sebesta , "Programming the World Wide Web", 7th edition, Pearson.
3. John Duckett , "Beginning Web Programming with HTML, XHTML, and CSS", 2nd edition.

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Optional Elective - III

HUMAN COMPUTER INTERACTION

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce guidelines, principles, and theories influencing human computer interaction.
- To familiarize with range of approaches, techniques, tools and methods available to them when designing useful and usable technology.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain human and computer components functions regarding interaction with computer.
- illustrate the interaction between human and computer components.
- apply the screen design guidelines in creating User Interface.
- develop effective GUI using appropriate controls for windows based applications.
- choose appropriate widgets, components and tools for effective design of User Interface

Course Content

UNIT - I: Introduction

Importance of user interface – definition, history of screen design, importance of good design, benefits of good design.

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, characteristics.

UNIT - II: Design Process

Human interaction with computers, importance of human characteristics, human consideration, human interaction speeds, understanding business junctions.

UNIT - III: Screen Designing

Design goals, organizing screen elements, ordering of screen data and content, visually pleasing composition, focus and emphasis, presentation information, statistical graphics.

UNIT - IV: Windows

Navigation schemes, selection of devices based and screen based controls.

UNIT - V: Components

Text and messages, icons, colors, user problems, choosing colors.

UNIT - VI: Software Tools

Interaction Devices, speech recognition digitization and generation, image and video displays, drivers.

Text Books

1. Wilbert O. Galitz, "The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques", 2nd edition, John Wiley & Sons.
2. Ben Shneidermann, "Designing the User Interface", 3rd edition, Pearson Education Asia.

Reference Books

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human–Computer Interaction", 3rd edition, Pearson.
2. Jenny Preece, Yvonne Rogers, Helen Sharp, "Interaction Design : Beyond Human-Computer Interaction", Wiley.
3. Soren Lauesen, "User Interface Design: A Software Engineering Perspective", Addison Wesley.

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Optional Elective - III

DIGITAL SIGNAL PROCESSING

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the basic concepts of discrete time signals and systems
- To introduce the concepts of Z-transform and frequency domain representation of discrete time signals.
- To familiarize with the designing of digital filters and their realization.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze and process signals in the discrete domain.
- determine the Fourier series coefficients and z-transform of discrete time signals.
- apply the various transform techniques on discrete time signals.
- design digital filters (IIR and FIR) for a given specifications.
- apply various windowing techniques in the design of FIR filter.
- realize digital filters (IIR and FIR).

Course Content

UNIT - I: Discrete Time Signals and Systems

Discrete time signals- classification, elementary discrete time signals, basic operations on sequences; discrete time systems-classification, discrete time linear time invariant systems and their properties, convolution sum.

UNIT - II: Z-Transform and Discrete Fourier series

Z transform of sequence, properties of ROC, properties of Z transform, inverse z transform- partial fraction method.

Discrete Fourier Series: Fourier series for discrete time periodic signals, Fourier Transform for discrete time aperiodic signals, energy density spectrum, relationship of Fourier transform to Z transform, frequency response.

UNIT - III: Discrete Fourier Transform

Frequency Sampling- Discrete Fourier Transform (DFT), properties of DFT, linear convolution of sequences using DFT, relationship between DFT and Z transform.

UNIT - IV: Fast Fourier Transforms (FFT)

Fast Fourier Transform-Radix-2 decimation in time and in frequency FFT algorithms, IDFT using FFT algorithms.

UNIT - V: Design of IIR Filters

Analog filter approximation-Butterworth and Chebyshev (Type-I) filters, Design of IIR filters from analog filters- Impulse invariant technique, bilinear transformation

UNIT - VI: Design of FIR Filters and Realization of Digital Filters

Linear Phase FIR filters-Frequency response, Fourier series method of designing FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hamming, Hanning).

Realization of Digital Filters: Realization of IIR filters**-** Direct form I, II; Realization of FIR Filters**-** Transversal structure, cascade realization.

Text Books

1. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithms, and Applications", 4th edition, Pearson Education.

Reference Books

1. A. V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 3rd edition, PHI.
2. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill.
3. MH Hayes, "Digital Signal Processing", Schaum's Outline Series, 2nd edition, TATA Mc-Graw Hill.

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Optional Elective - III

CONTROL SYSTEMS

III Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the basic concepts of control systems by developing mathematical models for physical systems.
- To equip the students to analyze the time domain behavior of linear control systems.
- To impart analytical and graphical methods to quantify stability of linear control systems.
- To introduce the state variable theory as a pre-requisite to advance control systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop mathematical models for physical systems.
- employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- quantify time and frequency domain specifications to determine stability margins.
- apply state variable theory to determine controllability and observability of linear control systems.

Course Content

UNIT - I: Introduction

Concepts of control systems, Open loop and closed loop control systems and their differences, different examples of control systems, classification of control systems, feed-back characteristics, effects of feedback, mathematical models, differential equations, impulse response and transfer function.

UNIT - II: Control Systems Components

Transfer function of DC servo motor, AC servo motor, synchro transmitter and receiver, block diagram representation of systems considering block diagram algebra, representation by signal flow graph, reduction is using Mason's gain formula.

UNIT - III: Time Response Analysis

Standard test signals, time response of first order systems, characteristic equation of feedback control systems, transient response of second order systems, time domain specifications, steady state response, steady state errors and error constants, introduction to P, PI, PD and PID controllers.

UNIT - IV: Stability Analysis in S-Domain

The concept of stability–Routh's stability criterion, qualitative stability and conditional stability, limitations of Routh's stability.

Root locus technique: The root locus concept, construction of root loci, effects of adding poles and zeros to G(s) H(s) on the root loci.

UNIT - V: Frequency Response Analysis

Introduction, frequency domain specifications, Bode diagrams, determination of frequency domain specifications and transfer function from the Bode diagram, phase margin and gain margin, stability analysis from Bode Plots, Polar plots-Nyquist plots, stability analysis.

UNIT - VI: State Space Analysis of Continuous Systems

Concept of state, state variables and state model, derivation of state models from physical systems (Electrical), solving the time invariant state equations, state transition matrix and its properties, concepts of controllability and observability.

Text Books

1. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Limited Publishers, 2nd edition.
2. B.C.Kuo , John Wiley and sons , "Automatic Control System", 8th edition.

Reference Books

1. K.Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5th edition.
2. N.K.Sinha, "Control system", New Age International (p) Limited Publishers, 3rd edition.
3. Norman S-Nice, "Control System Engineering", Willey Studio Edition, 4th edition.
4. Joseph J Distefa, "Feedback and Control System", 2nd edition.

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DESIGN AND ANALYSIS OF ALGORITHMS
(Common to CSE & IT)
III Year – II Semester

Lecture	: 3	Tutorial	: 1	Internal Marks	: 40
Credits	: 3			External Marks	: 60

Course Objectives

- To disseminate knowledge on analyzing the running time of algorithms using asymptotic notations.
- To introduce algorithmic design paradigms such as Divide and Conquer, Greedy Method, Dynamic Programming, Back Tracking, Branch and Bound with illustrations.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the performance of algorithms by calculating time and space complexity.
- design algorithms for binary search, quick sort and merge sort by applying divide and conquer technique.
- apply Greedy technique to find solution for knapsack, job sequencing, single source shortest path and minimum cost spanning trees.
- design algorithm to find optimal solution to matrix chain multiplication, 0/1 knapsack, all pairs shortest paths and travelling salesperson problems using dynamic programming
- construct state space tree to find all possible solutions to various problems using back tracking and branch and bound techniques.

Course Content

UNIT - I: Introduction

Algorithm, characteristics of algorithms, Performance Analysis: Space and time complexity, Asymptotic Notations- Big O, Omega and Theta.

UNIT - II: Divide and Conquer

General method, Solving recurrence relations-Substitution method, master theorem, Applications-Binary search, Quick sort, Merge sort.

UNIT - III: Greedy Method

General method, Applications-Knapsack problem, job sequencing with deadline problem, single source shortest path problem and minimum cost spanning trees.

UNIT - IV: Dynamic Programming

General method, Applications-Matrix chain multiplication, 0/1 knapsack problem, all pairs shortest paths problem, travelling salesperson problem.

UNIT - V: Backtracking

General method, Applications-n queens problem, graph coloring problem, Hamiltonian cycle problem.

UNIT - VI: Branch and Bound

General method, LC search, Applications-0/1 knapsack problem: LCBB, FIFOBB solutions, Travelling salesperson problem: LCBB solution.

Text Books

1. Ellis Horowitz, Sartaj Sahni and Rajasekharan, “Fundamentals of Computer Algorithms”, 2nd edition, Galgotia publications Pvt. Ltd.
2. T. H. Cormen, C. E. Leiserson, “Introduction to Algorithms”, 2nd edition, PHI Pvt. Ltd.

Reference Books

1. Aho, Ullman and Hopcroft, “Design and Analysis of algorithms”, 1st edition, Pearson Education.
2. Allen Weiss, “Data structures and algorithm analysis in C++”, 2nd edition, Pearson Education.

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DATA WAREHOUSING AND DATA MINING
(Common to CSE & IT)
III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts of Data warehousing and Data mining.
- To familiarize with the concepts of association rule mining, classification, clustering techniques and algorithms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline different types of databases used in data mining.
- apply pre-processing methods on raw data to make it ready for mining.
- illustrate the major concepts and operations of multi dimensional data models.
- analyze the performance of association rules mining algorithms for finding frequent item sets from the large databases.
- simplify the data classification procedure by selecting appropriate classification methods / algorithms.
- classify various clustering methods and algorithms on data sets to create appropriate clusters.

Course Content

UNIT - I: Introduction

Motivation and importance of data mining, types of data to be mined: Relational databases, data warehouses, transactional databases, advanced database systems, data mining functionalities.

UNIT - II: Data Pre-processing

Major tasks in data pre-processing, Data cleaning: Missing values, noisy Data; Data reduction: Overview of data reduction strategies, principal components analysis, attribute subset selection, histograms, sampling; Data transformation: Data transformation strategies overview, data transformation by normalization.

UNIT - III: Data Warehousing and Online Analytical Processing

Data warehouse: Basic concepts, OLAP vs. OLTP; Data warehousing: A multi-tiered architecture; Data warehouse modelling: Data cube and OLAP; Data cube: A multidimensional data model, star, snowflake and fact constellation schemas for multidimensional data models, the role of concept hierarchies, typical OLAP operations.

UNIT - IV: Mining Frequent Patterns, Associations, and Correlations

Basic concepts, frequent item sets, closed item sets and association rules, frequent item set mining methods: Apriori Algorithm, generations, association rules form frequent item sets, A Pattern- Growth approach for mining frequent item sets.

UNIT - V: Classification

Basic concepts, what is classification, general approach to classification, decision tree induction, Attribute selection measures: Information gain, Bayes classification methods: Bayes' theorem, Naive Bayesian classification.

UNIT - VI: Cluster Analysis

Introduction, overview of basic clustering methods, partitioning methods: k-means, k-medoids; Hierarchical methods: Agglomerative versus divisive hierarchical clustering, Density based method: DBSCAN.

Text Book

1. Jiawei Han, Micheline Kamber & Jian pei, "Data Mining Concepts and Techniques", 3rd edition, Morgan Kaufmann Publisher an imprint of Elsevier,.

Reference Books

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar "Introduction to Data Mining", 1st edition, Pearson.
2. Margaret H Dunham, "Data Mining Introductory and Advanced Topics", 1st edition, Pearson Education.

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UML AND DESIGN PATTERNS

III Year – II Semester

Lecture : 3	Practical : 2	Internal Marks	: 40
Credits : 3		External Marks	: 60

Course Objectives

- To get familiar with the Object Oriented Analysis and Design in software development, develop UML structural and behavioral models of an application.
- To describe and choose an appropriate Design Pattern to refine the model.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- apply the object oriented analysis and designs in software development and familiar with the UML concepts.
- develop static conceptual models of the system.
- generate dynamic behavioral models of the system to meet user needs.
- design object oriented architecture models.
- describe and select an appropriate design pattern to refine the model.
- classify and explain given design pattern.

Course Content

UNIT - I: Introduction to UML

Importance of modelling, principles of modelling, object oriented modelling, conceptual model of the UML.

Lab Experiment

1. Demonstration of Visual Paradigm software tool for UML.

UNIT – II: Structural Modelling

Classes, Relationships-Dependency, Generalization, Realization, Association-Advanced features of association, class diagrams and object diagrams.

Case Study: Online shopping system.

Lab Experiments

2. Create a requirement model using UML class notations for railway reservation system and ATM application.
3. Develop class diagram for railway reservation system and ATM application.

UNIT - III: Behavioral and Advanced Behavioral Modelling

Behavioral modelling: Interaction diagrams - Sequence diagram, Collaboration diagram; Usecase diagram, Activity diagram.

Case study: Online shopping system.

Lab Experiments

4. Develop interaction diagram, state chart and activity diagrams for railway reservation system and ATM application.

UNIT - IV: Advance Behavioral and Architectural Modelling

Advanced behavioral modelling: Events and signals, state machines, state chart diagram.

Architectural modelling: Component diagrams, Deployment diagrams.

Case study: Online shopping system.

Lab Experiment

5. Develop component and deployment diagrams for railway reservation system and ATM application.

UNIT - V: Introduction to Design patterns

What is a design pattern? describing design patterns, how to select a design pattern, how to use a design pattern.

UNIT - VI: Types of Design patterns

Creational design patterns - Factory method, Prototype, Structural design patterns – Bridge, Facade, Behavioral design patterns - Chain of responsibility, Template method.

Lab Experiments

6 Using UML designs develop factory method, facade design patterns.

7. User gives a print command from a word document. Design to represent this chain of responsibility design pattern.

Text Books

1. Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, 2nd edition, Pearson Education.
2. Erich Gamma, Ralph Johnson, John Vlissides, Richard Helm, “Design Patterns: Elements of Reusable Object-Oriented Software”, 1st edition, Pearson.

Reference Books

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, Pearson Education.
2. Grady Booch, “Object Oriented Analysis and Design with Applications” Pearson Education Asia, 2nd edition.
3. Wolfgang Pree, “Design Patterns for Object-Oriented Software Development”, Addison Wesley, ACM Press.

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Professional Elective - II

ARTIFICIAL INTELLIGENCE

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize the concepts of AI for representation of knowledge and problem solving.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the problems that are amenable and can be solved by using AI techniques.
- analyse the problem solving and game playing techniques.
- specify the classical Artificial Intelligence algorithms, which are used to solve the heuristic search and game playing problems.
- apply the basic principles and algorithms of Artificial Intelligence to recognise, model and solve the state space search, knowledge representation and reasoning problems.
- formulate the Reasoning model and state the conclusion for the uncertainty problems using actions and their effects over the time.
- describe expert systems and their applications.

Course Content

UNIT - I: Introduction to Artificial Intelligence

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, current trends in AI.

UNIT - II: Problem solving and game playing

State-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques-Hill climbing, iterative-deepening A*, problem reduction, constraint satisfaction.

Game playing: Introduction, game playing, min-max algorithm, alpha-beta pruning.

UNIT - III: Logic Concepts

Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution in proportional logic, resolution in predicate logic and unification algorithm.

UNIT - IV: Knowledge Representation

Introduction, approaches to knowledge representation, knowledge representation using semantic network, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure.

UNIT - V: Reasoning in Uncertain Situations

Introduction to non-monotonic reasoning, truth maintenance systems, logics for non-monotonic reasoning, classical planning problem: Goal stack, hierarchical planning.

UNIT - VI: Expert Systems and Applications

Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems, model-based expert system, case-based expert system and hybrid expert system and application of expert systems.

Text Books

1. Elaine Rich, Kevin Knight, "Artificial Intelligence", Tata McGraw Hill edition, 2nd edition.
2. Stuart J. Russell, "Artificial Intelligence: A Modern Approach", 2nd edition.

Reference Books

1. Patrick Henry Winston, "Artificial Intelligence", 3rd edition, Pearson Education.
2. Russel and Norvig, "Artificial Intelligence", 3rd edition, Pearson Education, PHI.
3. Patterson, "Introduction to Artificial Intelligence and Expert Systems", 2nd edition, PHI publication.

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Professional Elective - II

SCRIPTING LANGUAGES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with jQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use jQuery with DOM to manipulate HTML elements, attributes and CSS.
- store and exchange data between server and browser using JSON.
- develop PERL scripts using arrays, hashes, control structures and subroutines.
- write Ruby scripts using data types, arrays, hashes, control structures and classes.
- retrieve data from a database using PHP and AJAX

Course Content

UNIT - I: jQuery

Introduction, selectors, events, effects, manipulating HTML and CSS using jQuery

UNIT - II: JSON

Introduction, syntax rules, JSON vs XML, data types, objects, arrays, parsing JSON and using stringify() function

UNIT - III: Introduction to PERL

Basic syntax, Perl language elements: variables, operators, control flow statements, arrays, hashes and file handling; Regular expressions, subroutines

UNIT - IV: Working with PERL

Packages and modules, working with files, retrieving documents from the web with Perl.

UNIT - V: Ruby

Introduction to Ruby, variables, types, simple I/O, control, arrays, hashes, methods, classes, iterators, pattern matching. Overview of rails.

UNIT - VI: AJAX a New Approach

Introduction, creating XMLHttpRequest object, integrating AJAX with PHP, retrieving data from a database using PHP and AJAX, handling XML data using PHP and AJAX.

Text Books

1. Kogent, “HTML 5 Black Book”, 2^{nd} Edition, Dreamtech Press.
2. Dave Thomas, “Programming Ruby 1.9 & 2.0: The Pragmatic Programmers’ Guide”, 4^{th} Edition, Pragmatic Bookshelf.
3. Randal L. Schwartz, ý Brian D. Foy,ý Tom Phoenix, “Learning Perl”, 6^{th} edition, O’REILLY Publications.

Reference Books

1. Uttam K Roy, “Web Technologies”, Oxford
2. Chris Bates, WILEY, “Web Programming: building internet applications”, Dreamtech, 2^{nd} edition.
3. Robert W Sebesta, “Programming the World Wide Web”, Pearson publications, 4^{th} edition

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Professional Elective - II

MICROPROCESSORS AND INTERFACING

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the architecture of 8086 microprocessor.
- To introduce the assembly language programming concepts of 8086 processor.
- To impart knowledge on I/O interfacing.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand the architecture of 8086 microprocessor.
- develop programs to run on 8086 microprocessor based system.
- design system using memory chips and peripheral chips for 8086 microprocessor.
- know the concepts of interrupts and serial communication using 8086.

Course Content

UNIT - I: Introduction to 8086

Features of 8086 processor, architecture-functional diagram, register organization, memory segmentation, physical memory organization, signal descriptions of 8086-common function signals, minimum and maximum mode signals, timing diagrams.

UNIT - II: Instruction Set and Addressing Modes of 8086

Instruction formats, instruction set, addressing modes

UNIT - III: Assembly language programming of 8086

Assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

UNIT - IV: Basic Peripheral Interfacing to 8086

8255 PPI-Various modes of operation and interfacing to 8086, interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter.

UNIT - V: Memory Interfacing and Interrupt Structure of 8086

Memory interfacing to 8086, need for DMA, architecture of 8257,interfacing DMA controller 8257 to 8086,interrupt structure of 8086, vector interrupt table, interrupt service routine, interfacing 8259 to 8086.

UNIT - VI: Serial Communication Using 8086

Serial communication standards, serial data transfer schemes, 8251 USART architecture and interfacing, RS- 232, IEEE-4-88, prototyping and trouble shooting.

Text Books

1. D. V. Hall, “Microprocessors and Interfacing”, TMGH, 2nd edition.
2. Barry B.Brey, “The Intel Microprocessors –architecture, interfacing and programming”, PHI, 8th edition.

Reference Books

1. A.K.Ray and K.M.Bhurchandi, “Advanced Microprocessors and Peripherals”, 2nd edition, TMGH.
2. Triebel & Singh, “The 8088 & 8086 Microprocessors-Programming, interfacing, Hardware & Applications”, PHI.

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Professional Elective - II

SOFTWARE PROJECT MANAGEMENT

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce plan and manage projects at each stage of the software development life cycle (SDLC).
- To impart effective software projects that support organization's strategic goals.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the different software projects.
- prepare project plans that address real time management challenges.
- relate important risks facing a new project.
- design effective software development model to meet organizational needs.
- recognize appropriate methodology to develop a project schedule.
- apply appropriate techniques to assess ongoing project performance.

Course Content

UNIT - I: Conventional Software Management

The waterfall model, conventional software management performance.

Evolution of software economics: Software economics, pragmatic software cost estimation.

Improving software economics: Reducing software product size, improving software processes, improving team effectiveness.

UNIT - II: Principles of Modern Software Management

The old way and the new: The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, inception, elaboration, construction, transition phases.

UNIT - III: Checkpoints and Process Planning

Checkpoints of the process: Major mile stones, minor milestones, periodic status assessments.

Iterative process planning: Work breakdown structures, planning guidelines, cost and schedule estimating.

UNIT - IV: Project Organizations

Project organizations and responsibilities: Line-of-Business organizations, project organizations, evolution of organizations.

Process automation: Automation building blocks.

UNIT - V: Project Control and Process Instrumentation

The seven core metrics, management indicators, quality indicators, life cycle expectations, pragmatic software metrics, metrics automation, Tailoring the process-Process discriminants.

UNIT - VI: Future Software Project Management

Modern project profiles, next generation software economics, modern process transitions.

Text Book

1. Walker Royce, "Software Project Management", 1st edition, Pearson Education.

Reference Books

1. Bob Hughes and Mike Cotterell, "Software Project Management", 5th edition, Tata McGraw-Hill.
2. Joel Henry, "Software Project Management", Pearson Education.
3. Pankaj Jalote, "Software Project Management in practice", Pearson Education.

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Open Elective - III

HYDROLOGY

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge of essential components of the hydrologic cycle
- To provide an overview and understanding of Unit Hydrograph theory and its analysis.
- To familiarize with different methods of flood frequency analysis and flood routing.
- To impart knowledge on groundwater movement and well hydraulics
- To familiarize with the relationships between soil, water and plant and their significance in planning an irrigation system

Learning Outcomes

Upon successful completion of the course, the students will be able to

- measure and analyze the rainfall in any given area and develop intensity-duration-frequency curves.
- quantify the abstractions from precipitation and the factors affecting
- determine runoff in a catchment and prepare the unit hydrograph which in-turn determines the runoff for any given rainfall
- estimate flood magnitude and carry out flood routing
- determine hydraulic properties of an aquifer and specific capacity, efficiency and yield of a well
- choose appropriate method of irrigation for different crops and cropping patterns and determine the quality and quantity of water required for a crop

Course Content

UNIT - I: Hydrologic Cycle

Introduction: Engineering hydrology and its applications, Hydrologic cycle. Precipitation: Types and forms of precipitation, rainfall measurement, types of rain gauges, rain gauge network, average rainfall over a basin, consistency of rainfall data, frequency of rainfall, intensity-duration-frequency curves, probable maximum precipitation.

UNIT - II: Abstractions

Abstractions: Evaporation, factors affecting evaporation, measurement of evaporation, evaporation reduction, evapotranspiration, factors affecting evapotranspiration, measurement of evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT - III: Runoff

Runoff :Factors affecting runoff ,components of runoff, computation of runoff-rational and SCS methods, separation of base flow ,Unit Hydrograph, assumptions, derivation of Unit Hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of UH

UNIT - IV: Floods

Floods-Causes and effects, flood frequency analysis-Gumbel's method, flood control methods, flood routing-hydrologic routing, hydraulic routing, channel and reservoir routing- Muskingum method of routing

UNIT - V Ground Water

Ground Water Occurrence: Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

UNIT - VI: Irrigation

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, water logging and drainage, standards of quality for Irrigation water, principal crops and crop seasons, crop rotation.

Text Books

1. Engineering Hydrology, P. Jayaram Reddy, third edition, Laxmi publications
2. Irrigation and water power engineering, B.C. Punmia, Pande B.B Lal, Ashok Kumar Jain & Arun Kumar Jain sixteenth edition, Laxmi publications.

Reference Books

1. Engineering Hydrology, K. Subramanya, third edition, Tata McGraw-Hill.. Hydrology principles, analysis and design, HM Raghunath, revised second edition, New Age International Publishers.
2. Irrigation Water Resources and Water Power Engineering, P.N.Modi, seventh edition, Standard Book House.

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Open Elective - III

PLANNING FOR SUSTAINABLE DEVELOPMENT

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objective

- To familiarize the concept of sustainable development
- To introduce various components of sustainable development

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the importance of sustainable development
- use various strategies for promoting sustainable development
- analyze important current issues and areas of debate in relation to sustainable development.
- implement policy responses in environmental degradation.

Course Content

UNIT - I: Introduction

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

UNIT - II: Key Components in Sustainable Development

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

UNIT - III: Innovation for Sustainable Development

Innovation for sustainable development- Environmental management and innovation strategies.

UNIT - IV: Theories of Sustainable Development

Societal transformations.Institutional theory.

UNIT - V: Governance and Policy Response

Governance for sustainable development.Policy responses to environmental degradation.

UNIT - VI: Research in Sustainable Development

Capacity development for innovation.Research methods.

Text Books

1. Basic Principles for Sustainable Development,Harris, J.M, 2004.
2. Some thoughts on the idea of sustainable development Ecological Economics, Robinson, J. (2004), 48(4): 369-384.

Reference Books

1. Navigating towards Sustainable Development: A System Dynamics Approach, Hjorth, P. and A. Bagheri (2006), Futures 38: 74-92.
2. Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs ,Mog, J.M. (2004), World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure
3. Global Development and Environment Institute, working paper 00-04. Available at:http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF.

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Open Elective - III

ELECTRICAL AND HYBRID VEHICLES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts on working principles of electric drives used for different hybrid electric vehicles.
- To familiarize with the different energy storage systems and their management strategies.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe hybrid vehicles and their performance
- analyze various power converter configurations of hybrid electric drives.
- analyze and suggest possible energy storage systems for different applications.
- apply the appropriate energy management strategies for various applications.

Course Content

UNIT - I: Introduction to Hybrid Electric Vehicles

History of hybrid and electric vehicles, electric vehicles, impact of modern drive-trains on energy supplies.

UNIT - II: Hybrid Electric Drive-trains

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies

UNIT - III: Electric Drive-trains

Basic concept of electric traction Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC and AC Motor drives

UNIT - IV: Energy Storage

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis.

UNIT - V: Hybridization of different energy storage devices

Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine, sizing the power electronics, selecting the energy storage technology.

UNIT - VI: Energy Management Strategies

Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Text Books

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015

Reference Books

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

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Open Elective - III

POWER PLANT INSTRUMENTATION

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide an overview of different methods of power generation with a particular stress on thermal power generation.
- To impart knowledge on the different types of control loops.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe the constructional details, working principles of various generating stations.
- analyze the working of different types of controls and control loops.
- choose various measurements involved in power generation plants.
- understand the knowledge about the different types of devices used for analysis.

Course Content

UNIT - I: Overview Of Power Generation

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT - II: Measurements In Power Plants

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.

UNIT - III: Analyzers In Power Plants

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT - IV: Control Loops In Boiler

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – super heater control – attemperator –deaerator control – distributed control system in power plants – interlocks in boiler operation.

UNIT - V: Turbine – Monitoring And Control

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

UNIT - VI: Analysis in Power Plant

Thermal conductive type, paramagnetic type-Oxygen analyzer, hydrogen purity meter-chromatography – PH meter,fuel analyzer, pollution monitoring and control

Text Books

1. Sam G. Dukelow, 'The control of Boilers', Instrument Society of America,1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.
3. E.L Wakil, M.M./Power Plant technology/Mc Graw Hill 1984.
4. J.Balasubramaniam & R.K Jain/Modern Power Plant Engineering/Khanna

Reference Books

1. Elonka,S.M.and Kohal A.L.Standard Boiler Operations, McGraw-Hill, New Delhi,1994.
2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, New Delhi, 1995.

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Open Elective - III

MATERIAL SCIENCE

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- to understand the properties of engineering materials, so as to manipulate them for the desired engineering applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- compare the different types of conductors and semi conductors and their applications
- classify magnetic materials based on their parameters
- understand the applications of dielectric principles in engineering devices.
- propose a corrosion prevention technique for a particular application
- summarize the different optical properties of metallic materials
- apply different characterization techniques for validation of metals.

Course Content

UNIT - I: Conductors, Semi Conductors and Resisters

Resistivity, Range of Resistivity- free electron theory - classical theory & quantam theory. Semiconducting materials: Energy gap in solids - intrinsic semi conductors - extrinsic semi conductors - element & compund semi conductors - crystal structure - growth & purification of semi conductor crystals.

UNIT - II: Magnetic Materials

Magnetic Materials: Classification of magnetic materials based on spin - Hard and soft magnetic materials - Dia, Para & Ferro types, atomic magnetic moment - anti ferro magnetism.

UNIT - III: DIELECTRIC MATERIALS

Dielectric Materials: Dielectric susceptability - complex die electric constant - Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism - Dielectric loss - Dielectric waveguide and dielectric resonator antenna - Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT - IV: Optical Properties of Materials

Introduction - electromagnetic radiation - light interactions with solids - Refraction, Reflction, Absorption, Transmission, Opacity & Translucency in insulators - Luminescence - Photo conductivity.

UNIT - V: Corrosion & Oxidation

Corrosion: Principles of corrosion - electrode potential - galvanic series - galvanic cell - polarization - passivation - electro chemical considerations - corrosion rate - forms of corrosion - corrosion prevention.

Oxidation: Mechanisms of oxidation - oxidation resistant materials.

UNIT - VI: Materials Characterization

X-ray diffraction, Neutron diffraction and Electron diffraction - X-ray fluorescence spectroscopy - Thermogravimetric Analysis (TGA) - Differential Thermal Analysis (DTA) - Differential Scanning Calorimetry (DSC).

Text Books

1. V. Raghavan, “Materials Science and Engineering”, PHI Learning Publication, 5th edition.
2. Rajendran, V. “Materials Science”,Tata McGraw- Hill,New Delhi,2011.

Reference Books

1. William D. Callister, “Materials Science and Engineering” 9th ed., John Wiley and sons, Incorporated.
2. Sam Zhang, “Materials Characterization Techniques”, CRC Press.
3. J. M. D. Coey, “Magnetism and Magnetic Materials”, Cambridge University Press.

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Open Elective - III

RENEWABLE ENERGY SOURCES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To study various types of non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and bio-fuels.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the significance of renewable energy.
- describe the principles of solar radiation and design the solar collectors.
- know the functioning of basic components of wind energy and understand the utilization of biomass in power generation.
- discuss the working principles of geothermal, ocean, tidal and wave energy techniques.
- know the functioning of direct energy conversion techniques.

Course Content

UNIT - I: Introduction

Energy Sources and their availability, Role and potential of renewable source.

Principles of Solar Radiation: Solar constant, Solar Radiation outside the Earth's atmosphere, Solar Radiation at the Earth's surface, instruments for measuring solar radiation, solar radiation geometry, solar radiation on titled surfaces with numerical problems.

UNIT - II: Solar Energy Storage and Applications

Different methods, sensible, latent heat and stratified storage, solar ponds. Solar Applications-solar heating/cooling technique, solar distillation, drying, photovoltaic energy conversion, solar central power tower concept and solar chimney. solar collectors- flat plate, concentric collectors.

UNIT - III: Wind Energy

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

Bio-Mass: Biomass Energy Sources, methods for obtaining energy from biomass, Biomass gasification.

UNIT - IV:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy.

Ocean Energy: OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and wave energy: Potential and conversion techniques, Mini-hydel power plants

UNIT - V:

Direct Energy Conversion (DEC): Need for DEC, limitations, principles of DEC. Thermoelectric Power – See-beck, Peltier, Joule -Thomson effects, Thermo-electric Power generators.

UNIT - VI: MHD Power Generation

Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion.

Fuel cells: Principles, Faraday's laws, thermodynamic aspects, selection of fuels and operating conditions, applications.

Text Books

1. Tiwari and Ghosal, "Renewable energy resources", Narosa.
2. B.H.Khan "Non – conventional Energy Resources" Tata McGraw Hill education Pvt Ltd.

Reference Books

1. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons
2. Twidell & Weir, "Renewable Energy Sources " Sukhatme, "Solar Energy", Tata McGraw-Hill Education.

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Open Elective - III

ASSISTIVE TECHNOLOGIES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce different assistive technology devices
- To familiarize with the concepts of enhance speech communication and independent living.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the legislative policies connected with assistive Technologies
- know the universal design principles in the context of general education environments and curriculum materials.
- explore the process for finding the right technology and the right applications and determine how to pay for it.

Course Content

UNIT - I: Introduction to Assistive Technology (AT) Devices and Services

Assistive technology defined, historical overview of assistive technology, multidisciplinary nature of service provision.

UNIT - II: Adaptations Framework for Considering Assistive Technology

Introduction to the adaptations framework, setting-specific demands, person-specific characteristics, adaptations, evaluation of effectiveness of adaptations.

UNIT - III: Assistive Technology Assessments

Overview of assessment issues, overview of general assessments, assistive technology assessments, assessment components.

UNIT - IV: Enhance Speech Communication

Nature of spoken language, introduction to augmentative and alternative communication systems, selection techniques for aided communication systems, overview of non-electronic systems and electronic devices.

UNIT - V: Mobility and Access to Information

Introduction to mobility adaptations, basic design considerations, seating and positioning issues, introduction to information access, computer access, telecommunication, listening and print access.

UNIT - VI: Enhance Independent Living

Introduction to independent living, devices for daily life, switches and scanning, environmental control units, access to management devices.

Text Books:

1. Diane P edrotty Bryant, Brian R. Bryant, Allyn and Bacon "Assistive Technology for People with Disabilities", 2nd edition, Psycho Educational Services.
2. Amy G.Dell, Deborah A. Newton, Jerry G.Petroff, "Assistive Technology in the class room Enhancing the school experiences of students with disabilities", Pearson Publications, 2nd edition.

Reference Books

1. Marion A.Hersh, Michael A.Johnson, "Assistive Technology for the Hearing impaired, Deaf and Deafblind", Springer Publications, 2003.
2. Meeko Mitsuko K.Oishi, Ian M.Mitchell, H.F. Machiel vanderloss, "Design and use of Assistive Technology", Springer Publications, 2010.
3. Eckehard Fozzy Moritz, "Assistive Technologies for the Interaction of the Elderly", Springer Publications, 2014.

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Open Elective - III

BIO-MEDICAL ENGINEERING

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the basics of biological concepts and relate it to engineering.
- To familiarize with physiology of cardio-vascular system, respiratory system & the elements of Patient Care Monitoring.
- To impart the knowledge on the patient monitoring displays, diagnosis & techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- know the concept of bio-medical engineering, evolution, age, development, advancements and applications.
- get awareness on noval theory related to human body and various components.
- analyze the operation of measuring the cardio-vascular system by knowing its inner organization, sensor and transducer theory & plethysmographical concepts.
- learn the principles of respiration and respiratory therapy equipment.
- understand the fundamental principles & techniques of diagnosys and bio-telemetry, monitors, recorders.

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,Electro-Cardiogram(ECG),Electro-Encephalogram(EEG), Electro Myogram (EMG),envoked responses.

UNIT - II: Electrodes & Transducers

Bio-potential electrodes, basic transducers-transduction principles, biochemical transducers, active & passive transducers, transducers of bio-medical applications, pulse sensors, respiration sensors.

UNIT - III: Cardio-Vascular System & Respiratory System Measurements

The heart & cardiovascular system, Electro-Cardiography, blood pressure measurement, measurement of blood flow & cardiac output, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis, calibration & repair ability of patient monitoring equipment, organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques & Bio-Telemetry

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis X-Ray & Radio-Isotope Instrumentations CAT Scan, Emission Computerized Tomography, MRI, Introduction & components of bio-telemetry system.

UNIT - VI: Monitors, Recorders & Shocking Hazards

Monitors, recorders, shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention, isolated power distribution system.

Text Books

1. Onkar N. Pandey, Rakesh kumar, “Bio-Medical Electronics and Instrumentation”, S. K. Kataria & Sons, 2007.
2. Cromewell, Wiebell, P.feiffer, “Biomedical instrumentation and measurements”, Prentice-Hall, 1973.

Reference Books

1. Joseph J.Carr, John M.Brown, “Introduction to Bio-Medical Equipment Technology”, Pearson Publications, 4th Edition.
2. Khandapur, “Handbook of Bio-Medical Instrumentation”, TMH, 2nd Edition.

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Open Elective - III

NODE AND ANGULAR JS

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with defining own custom AngularJS directives that extend the HTML language
- To introduce the concepts of client-side services that can interact with the Node.js web server
- To understand the best practices for server -side JavaScript

Learning Outcomes

Upon successful completion of the course, the students will be able to

- develop single page applications that reduces app's time to market without plugins.
- identify the services, modules and directives to subdivide application logic into modules and share code across apps
- explain the routing process in angular for managing URL's.
- interpret command line applications in Node.js that allows developers a more maintainable code
- develop code with use of Node.js and JSON services for web applications.
- examine how error events affect piped streams and handling events in Node.js

UNIT - I: Introduction to Node.js and JSON

Introduction, operators, decision and iterative statements, Node.js collections: create array object, insert, access, update and remove data. JSON:Create JSON object, display, access and edit data. JSON Array: Creation, display, access and edit data. Check JSON attribute.

UNIT - II: Node.js Files, Functions and Strings

File modules, reading text, creating file. Functions: creating function, types of functions, callback function. Strings: operations, string to numeric and vice-versa, string parser.

UNIT - III: Node.js Modules, Error Handling & Logging and Events

Create simple module, module class. Error handling and logging. Events: Events module, once event listener, remove events.

UNIT - IV: Introduction to Angular

Introduction to TypeScript (TS), node package manager, introduction to Angular 4, create angular application using TS and angular CLI, webpack, gulp introduction.

UNIT - V: Elements in Angular

Angular components, controllers, modules, dependency injection, angular service, providers and directives, pipes and filters, Angular forms-Reactive, lifecycle hooks.

UNIT - VI: Routing in Angular

Routing-module, component, lazy loading of components, apply route guards-security, Angular material design.

Text Books

1. Andrew Grant, “Beginning AngularJS”, Apress Publishers.
2. Agus Kurniawan, “Nodejs Programming By Example”, PE Press.

Reference Books

1. Ken Williamson,”Learning AngularJS: A Guide to AngularJS Development”, O’Relly Media.
2. Matt Frisbie, “AngularJS Web Application Development Cookbook”, Packt Publishing Ltd.
3. David Herron, “Node.js Web Development”, 4th edition, Packt Publishing Ltd.
4. Marc Wandschneider, “Learning Node.js: A Hands-On Guide to Building Web Applications in JavaScript”, Addison Wesley.

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Open Elective - III

CYBER SECURITY

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To understand security concepts, Ethics in Network Security.
- To familiarize with new algorithms (mathematical formulas) and statistical measures that assesses relationships among members of large data sets.
- To identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply those to design and evaluate counter measure tools.
- To gain knowledge on security threats, and the security services and mechanisms to counter them.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline management framework.
- describe various tools that can be used in cyber security management.
- write a secure access client for access to a server.
- determine firewall requirements, and configure a firewall.
- employ policies and standards to solve security problems.
- use security techniques in an organisational context.

UNIT - I: Systems Vulnerability Scanning

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks vulnerability scanning - Netcat, understanding port and Services tools-Datapipe, Fpipe, Network reconnaissance –Nmap, THC-Amap. Network sniffers and injection tools–Tcpdump and Windump.

UNIT - II: Network Defence Tools

Firewalls and packet filters: Firewall basics, packet filter vs firewall, how a firewall protects a network, packet characteristic to filter, stateless vs stateful firewalls, network address translation (NAT) and port forwarding, the basic of virtual private networks, Snort: Intrusion detection system.

UNIT - III: Web Application Tools

Scanning for web vulnerabilities tools: Nikto, HTTP utilities-Curl, OpenSSL and stunnel, password cracking and Brute-Force tools–John the Ripper,L0phtCrack, pwdump, HTC-Hydra.

UNIT - IV: Introduction to Cyber Crime and Law

Cyber crimes, types of cyber crime, hacking, attack vectors, cyberspace and criminal behavior, clarification of terms, traditional problems associated with computer crime.

UNIT - V: Introduction to Incident Response

Digital forensics, computer language, network language, realms of the cyber world, a brief history of the Internet, recognizing and defining computer crime, contemporary crimes, computers as targets, contaminants and destruction of data, Indian IT ACT 2000.

UNIT - VI: Introduction to Cyber Crime Investigation

Firewalls and packet filters, password cracking, keyloggers and spyware, virus and worms, Trojan and backdoors, steganography, attack on wireless networks.

Text Books

1. Mike Shema, "Anti-Hacker Tool Kit (Indian Edition)", Publication Mc Graw Hill.
2. Computer forensics and cyber crime : an introduction by Marjie T. Britz.

Reference Books

1. James Graham, Ryan Olson, Rick Howard, "Cyber Security essentials", 1st edition.
2. Chwan-Hwa (John) Wu, J. David Irwin, "Introduction to Computer Networks and Cybersecurity".
3. Nina Godbole and Sunit Belpure, "Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Publication Wiley.

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Open Elective - III

SCRIPTING LANGUAGES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use jQuery with DOM to manipulate HTML elements, attributes and CSS.
- store and exchange data between server and browser using JSON.
- develop PERL scripts using arrays, hashes, control structures and subroutines.
- write Ruby scripts usingdata types, arrays, hashes, control structures and classes.
- retrieve data from a database using PHP and AJAX.

Course Content

UNIT - I : jQuery

Introduction, Selectors, Events, Effects, Manipulating HTML and CSS using jQuery

UNIT - II: JSON

Introduction, Syntax rules, JSON Vs XML, Data types, Objects, Arrays, Parsing JSON and using stringify() function

UNIT - II: Introduction to PERL

Basic syntax, Perl language elements: variables, operators, control flow statements, Arrays, Hashes and File handling; Regular expressions, Subroutines

UNIT - IV: Working with PERL

Packages and modules, Working with files, Retrieving documents from the web with Perl.

UNIT - V: Ruby

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, classes, Iterators, Pattern Matching. Overview of Rails.

UNIT - VI: AJAX A New Approach

Introduction, Creating XMLHttpRequest object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX, Handling XML data using PHP and AJAX.

Textbooks

- Kogent , HTML 5 Black Book, 2^{nd} Edition, Dreamtech Press
- Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4^{th} Edition, Pragmatic Bookshelf
- Randal L. Schwartz,ý Brian D. Foy ,ý Tom Phoenix, Learning Perl, 6^{th} edition,O'REILLY Publications.

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Open Elective - III

SOFTWARE PROJECT MANAGEMENT

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce plan and manage projects at each stage of the software development life cycle (SDLC).
- To impart effective software projects that support organization's strategic goals.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the different software projects.
- prepare project plans that address real time management challenges.
- relate important risks facing a new project.
- design effective software development model to meet organizational needs.
- recognize appropriate methodology to develop a project schedule.
- apply appropriate techniques to assess ongoing project performance.

Course Content

UNIT - I: Conventional Software Management

The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness.

UNIT - II: Principles of Modern Software Management

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT - III: Checkpoints and Process Planning

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating.

UNIT - IV: Project Organizations

Project Organizations And Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Process Automation: Automation Building blocks.

UNIT - V: Project Control and Process Instrumentation

The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation, T**ailoring the Process**- Process discriminants.

UNIT - VI: Future Software Project Management

Modern Project Profiles, Next generation Software economics, modern process transitions.

Text Books

1. Walker Royce,Software Project Management, Pearson Education, 2005.

Reference Books

1. Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw-Hill Edition.
2. Joel Henry, Software Project Management, Pearson Education.
3. PankajJalote, Software Project Management in practice, Pearson Education, 2005.

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Open Elective - III

ELEMENTS OF STOCHASTIC PROCESSES

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Outcomes

- To study and understand the systems which evolve randomly over time, especially in long run.
- To survey the important tools of stochastic processes.
- To model and solve engineering problems arising in real life situations.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate and solve probabilistic problems using random variables.
- distinguish between Poisson process and the exponential random variable and apply this knowledge to solve problems involving memory less processes.
- use renewal theory to solve problems where Poisson is not a realistic processes.
- ise Markov chain is discrete and continuous time to solve queuing problems.

Course Content

UNIT - I: Generating Functions

Introduction, Definitions and elementary results, Convolutions, Compound distributions, Partial fraction expansions, Moment and cumulant generating functions.

UNIT - II: Recurrent Events

Definitions, Basic theorems, Delayed recurrent events.

Random Walk Models: Introduction, Gambler's Ruin, Probability distribution of ruin at nth trial and extensions.

UNIT - III: Markov Chains

Introduction, Notation and definition, classification of states, classification of chains, Evaluation of P^n (transition probability matrix)

UNIT - IV: Markov Process

Discrete and continuous – The Poisson process, Use of generating functions, Random variable technique, Solution of linear partial deferential equations.

UNIT - V: Homogeneous and Non-Homogeneous Birth and Death Processes

Introduction, simple birth process, general birth process, divergent birth processes. Simple death process, simple birth and death processes, the effect of immigration, the general birth and death process, multiplication processes. Polya process, a simple non-homogeneous birth and death process. The effect of immigration.

UNIT – VI: Queuing process

Introduction, Equilibrium theory, Queues with many servers, Monte carlo methods in appointment systems, Non-equilibrium treatment of a sample queue, First passage times, Diffusion process.

Text Book

1. The Elements of Stochastic Processes, Norman T.J. Bailey.

Reference Book

1. Stochastic Processes, J. Mehdi

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Open Elective - III

ACADEMIC COMMUNICATION

III Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To acquaint the students with the process and elements of academic writing.
- To help them gain accuracy in the academic writing tasks they will be called upon to perform as part of their graduate and postgraduate studies.
- To empower them to carry out academic writing tasks such as project report writing with success.

Learning Outcomes

Upon successful completion of the course, the student will be able to produce successful academic writing tasks (such as designing and reporting a survey/project, writing discussion essays, and composing formal letters) with attention to:

- the writing process involving a good understanding of the purpose and the register as well as organizational strategies such as introduction, main body, conclusion, paragraphing;
- the elements of academic writing such as argument, cause and effect, cohesion and coherence, generalizations, references, style, and visual information; and
- the kind of accuracy, technical as well as grammatical, that writing in academic contexts demands

Course Content

I. The Writing Process

a. Background to writing

i. The purpose of academic writing

ii. Common types of academic writing

iii. The features of academic writing

iv. Writing in paragraphs

b. From understanding to planning

i. The planning process

ii. Analyzing essay titles

iii. Brainstorming

c. Organizing paragraphs

i. Paragraph structure ii. Development of ideas

iii. Linking paragraphs together

d. Introductions and conclusions

i. Introduction contents ii. Introduction structure

iii. Opening sentences iv. Conclusions

e. Re-writing and proof-reading

i. Re-writing ii. Proof-reading

II. Elements of Writing

a. Cohesion

i. Reference words ii. Preventing confusion

b. Comparisons

i. Comparison structures ii. Forms of comparison

iii. Using superlatives

c. Style

i. Components of academic style ii. Guidelines

d. Visual information

i. The language of change ii. Types of visuals

iii. Describing visuals iv. Labelling

III. Accuracy in Writing

a. Academic vocabulary b. Remedial grammar

c. Punctuation

IV. Writing Models

a. Formal/Professional emails b. CVs

c. Reports d. Scholarly essays

Suggesting Reading

1. Bailey, Stephen. (2011). *Academic Writing A Handbook for International Students*. Routledge: London.

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DATA MINING LAB

III Year – II Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To exercise the data mining techniques such as classification, clustering, pattern mining etc with different datasets and dynamic parameters using WEKA tool.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- Learn to execute data mining tasks using a data mining toolkit (such as WEKA) and visualize the results.
- Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression.

Experiment No. 1: Explore WEKA Data Mining/Machine Learning Toolkit

i. Downloading and/or installation of WEKA data mining toolkit,

ii. Understand the features of WEKA toolkit such as explorer, knowledge flow interface, experimenter, command-line interface.

iii. Navigate the options available in the WEKA (ex. Select attributes panel, preprocess panel, classify panel, cluster panel, associate panel and visualize panel).

iv. Study the arff file format

v. Explore the available data sets in WEKA.

vi. Load a data set (ex. Weather dataset, Iris dataset, etc.)

vii. Load each dataset and observe the following:

a) List the attribute names and they types
b) Number of records in each dataset
c) Identify the class attribute (if any)
d) Plot histogram
e) Determine the number of records for each class.
f) Visualize the data in various dimensions

Experiment No. 2: Perform data preprocessing tasks on

i. Add attribute ii. Add expression iii. Copy attribute iv. Remove attribute

Experiment No. 3: Demonstrate performing classification on data sets

A.

i. Load weather dataset into WEKA and run Id3, J48 classification algorithm. Study the classifier output. Compute entropy values, kappa statistic.

ii. Extract if-then rules from the decision tree generated by the classifier, observe the confusion matrix and derive Accuracy, F-measure, TPrate, FPrate, precision and recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.

B.

i. Load weather dataset into WEKA and perform Naive-Bayes classification

ii. K-nearest neighbour classification. Interpret the results obtained.

Experiment No. 4: Demonstrate performing association rule mining on data sets

i. Load transaction dataset into WEKA and run Aprori algorithm with different support and confidence values.

ii. The Apriori algorithm uses a generate and count strategy for deriving frequent items sets and generate association rules

Experiment No. 5: Demonstrate performing regression on data sets

i. Load numeric dataset into WEKA and build linear regression model.

ii. Explore simple linear regression technique that only looks at one variable

Experiment No. 6: Demonstrate performing SVM classification on data sets

i. Load each dataset into WEKA and run proximal SVM to find a classifiers.

ii. Load each dataset into WEKA and run liner classifier using linear Programming.

Experiment No. 7: Demonstrate performing clustering on data sets

i. Load each dataset into WEKA and run simple k-means clustering algorithm with different values of k (number of desired clusters).

ii. Explore visualization features of WEKA to visualize the clusters. Derive interesting insights and explain.

Experiment No. 8: Demonstrate performing knowledge flow on WEKA

i. Perform pre-processing tasks. ii. Perform decision-tree

iii. Perform clustering

Text Books

1. K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining Theory and Practice".

Reference Books

1. Ian.H.Witten and Eibe Frank , "Data Mining: Practical Machine Learning Tools and Techniques", 2nd edition.
2. Jiawei Han, Micheline Kamber, Jian, "Data Mining: Concepts and Techniques", 3rd edition.

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Optional Elective - V

GRAPH THEORY

III Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To apply the concepts of graph theory in real world problem solving.
- To apply a combination of theoretical knowledge and independent mathematical thinking to investigate questions in graph theory

Learning Outcomes

Upon successful completion of the course, the students will be able to

- define various types of graphs.
- identify the connectivity and planarity of graphs.
- determine chromatic number for performing partitioning of graph.
- analyze directed graphs and paths to solve path finding problems.
- discuss the principles of permutations and combinations to find all possible arrangements.
- apply generating functions to solve recurrence relations.

Course Content

UNIT - I: Introduction

Graphs –Introduction , isomorphism , sub graphs, walks, paths, Circuits–Connectedness, components , Euler graphs, Hamiltonian paths and circuits, trees, properties of trees, distance and centers in tree, rooted and binary trees.

UNIT - II: Trees, Connectivity and Planarity

Spanning trees, fundamental circuits, spanning trees in a weighted graph, cut sets, properties of cut set, all cut sets, fundamental circuits and cut sets , connectivity and separability, network flows, 1-Isomorphism , 2-Isomorphism, combinational and geometric graphs, planer graphs, different representation of a planer graph.

UNIT - III: Matrices, Colouring and Directed Graph

Chromatic number, chromatic partitioning, chromatic polynomial, matching, covering, four color problem, directed graphs, types of directed graphs, digraphs and binary relations, directed paths and connectedness, Euler graphs.

UNIT - IV: Permutations and Combinations

Fundamental principles of counting, permutations and combinations, Binomial theorem, combinations with repetition, combinatorial numbers, principle of inclusion and exclusion, derangements, arrangements with forbidden positions.

UNIT - V: Generating Functions

Generating functions, partitions of integers, exponential generating function, summation operator.

UNIT - VI: Recurrence Relations

Recurrence relations, first order and second order, non-homogeneous recurrence relations, method of generating functions.

Text Books

1. Narsingh Deo, “Graph Theory -with application to Engineering and Computer science”, 1st edition, Prentice Hall of India.
2. Ralph P. Grimaldi, “Discrete and Combinatorial Mathematics, 5th edition.

Reference Books

1. Clark John and Holton D.A, “A first look at Graph Theory”.
2. Kenneth H. Rosen, “Discrete Mathematics and its Applications”, 4th edition.

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Optional Elective - V

EMBEDDED SYSTEM DESIGN

III Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts of embedded system design and to show how such systems are developed using a concrete platform built around.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish between the general computing system and the embedded system.
- differentiate general purpose processors and single purpose processors.
- model different state machines and concurrent process.
- specify different design technologies of software and hardware design.

Course Content

UNIT - I: Introduction

Embedded System-Definition, classification, application areas and purpose of embedded systems, The typical embedded system-Core of the embedded system, memory, sensors and actuators, communication interface, embedded firmware. Design challenge-Optimizing design metrics, processor technology, IC technology, design technology.

UNIT - II: Single Purpose Processors

RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

UNIT - III: General Purpose Processors

Basic architecture, operation, pipelining, programmer's view, development environment, Application Specific Instruction-Set Processors(ASIPs), micro controllers and digital signal processors.

UNIT - IV: State Machine and Concurrent Process Models

Introduction, models vs languages, finite state machines with data path model (FSMD) using state machines, program state machine model (PSM), concurrent process model.

UNIT - V: Interfacing

Communication basics, arbitration, multilevel bus architectures, advanced communication principles

UNIT - VI: Design Technology

Automation: Synthesis-parallel evolution of compilation and synthesis, synthesis levels, logic Synthesis, RT synthesis, behavioral synthesis, systems synthesis and hardware/software co-design, Verification: hardware/software co-simulation

Text Books

1. Frank Vahid, Tony D. Givargis, "Embedded System Design - A Unified Hardware/Software Introduction", John Wiley.
2. Shibu.K.V, "Introduction to Embedded Systems" - Tata McGraw Hill Education Private Limited.

Reference Books

1. Raj kamal, "Embedded Systems", 2nd edition , TMH.
2. Tammy Noergaard, "Embedded Systems Architecture", 1st edition, Elsevier Publications.

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Optional Elective - V

DIGITAL CONTROL SYSTEMS

III Year – II Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the concepts on digital control systems and their associated components.
- To impart knowledge on z–transformations for the analysis of digital control systems.
- To familiarize with the concepts on state model representation of discrete–time systems and its stability testing methods.
- To impart knowledge on design of state feedback controller using pole placement method.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- specify the components of digital control systems.
- employ z–transformations to analyze digital control systems
- assess the stability of digital systems and suggest methods to improve stability margins.
- employ the state–space representation for the analysis and design of digital systems.

Course Content

UNIT - I: Introduction and Signal Processing

Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT - II: Z–Transformations

Z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT - III: State Space Analysis and the Concepts of Controllability and Observability

State Space Representation of discrete time systems – State transition matrix and Electrical and Electronics Engineering 182 methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests (without proof).

UNIT - IV: Stability Analysis

Mapping between the S–Plane and the Z–Plane – Primary strips and Complementary Strips – Stability criterion – Modified routh's stability criterion and jury's stability test.

UNIT - V: Design of Discrete–Time Control Systems by Conventional Methods

Transient and steady state specifications – Design using frequency response in the w–plane for lag and led compensators – Root locus technique in the z– plane.

UNIT - VI: State Feedback Controllers

Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text Books

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition
2. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.

Reference Books

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.
2. Digital Control and State Variable Methods by M.Gopal, TMH.

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CRYPTHOGRAPHY AND NETWORK SECURITY
(Common to CSE & IT)
IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize different types of security attacks and services.
- To expose different cryptographic techniques and algorithms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe security attacks and services over networks.
- differentiate symmetric and asymmetric encryption techniques.
- apply integrity checking and authentication techniques.
- compare E-mail security and IP level security.
- use firewalls and intrusion detection techniques for system security.
- outline web security threats and counter measures.

Course Content

UNIT - I: Security Fundamentals

Security Attacks, Security Services, Security Mechanisms, A model for Network security. Non-cryptographic protocol vulnerabilities - Session hijacking and Spoofing. software vulnerabilities - Phishing, Buffer Overflow, Format string Attacks, SQL Injection.

UNIT - II: Secret Key Cryptography

Symmetric cipher model, Block and Stream ciphers, Data Encryption Standard (DES), Strength of DES, Block cipher design principles and modes of operation, Triple DES, AES Structure.

UNIT - III: Public-key Cryptography

Public-key Cryptography, Principles of public-key crypto systems, RSA algorithm, Diffie-Hellman key exchange, Introduction to elliptic curve cryptography.

UNIT - IV: Hash Functions and Digital Signatures

Cryptographic hash functions, Applications of cryptographic hash functions, secure hash algorithm, authentication algorithms- HMAC, Digital signatures, Digital Signature algorithm.

UNIT - V: E-mail Security and IP Security

E-mail Security: PGP, S/MIME.

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload.

UNIT – VI: Web Security and System Security

Web Security-Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS).

System Security -Firewall Design principles, Intrusion Detection Systems.

Text Books

1. William Stallings, "Cryptography and Network Security Principles and Practice", 5th edition, Pearson Education.
2. Bernard Menezes, "Network security and cryptography", Cengage Learning.

Reference Books

1. William Stallings, "Network Security Essentials", 4th edition, Pearson education.
2. Eric Maiwald, "Fundamentals of Network Security", 1st edition, Dream Tech press.
3. Buchmann, "Introduction to Cryptography", Springer.

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BIG DATA ANALYTICS
(Common to CSE & IT)
IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the architectural concepts of Hadoop and introducing map reduce paradigm.
- To disseminate knowledge on how to summarize, query, and analyze data with Hive.
- To familiarize with business decisions and create competitive advantage with Big Data analytics.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- summarize the importance of Big Data and its problems (storage and analysis).
- outline the building blocks of hadoop and anatomy of file read and write.
- analyze data with hadoop MapReduce.
- generalize how MapReduce works when running a job.
- choose best programming tools for solving real world and industrial problems.

Course Content

UNIT - I: Introduction to Big Data

Big Data, Characteristics of Big Data - The Four V's, Why Big Data is important, data, data storage and analysis, comparison with other systems, brief history of Hadoop, Apache Hadoop and the Hadoop eco system.

UNIT - II: The Hadoop Distributed File System

The design of Hadoop Distributed File System (HDFS), Architecture, Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Basic file system operations, anatomy of a File read, anatomy of a File write.

UNIT - III: Introduction to Map Reduce

A Weather Dataset, analyzing weather data with UNIX tools, analyzing data with Hadoop, Map and reduce, java map reduce, The old and new Java MapReduce APIs, data flow, combiner functions, running a distributed map reduce job.

UNIT - IV: How Map Reduce works

Anatomy of a MapReduce job run: job submission, job initialization, task assignment, task execution, progress and status updates, job completion; Shuffle and sort: the map side, the reduce side.

UNIT - V: Pig

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT - VI: Hive

Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables with Hive, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text Books

1. Tom White, "Hadoop: The Definitive Guide", 3rd edition, O'Reilly.
2. Chuck Lam, "Hadoop in Action", 1st edition, Manning Publications.
3. Dirk deRoos, "Hadoop for Dummies", 1st edition, John Wiley & Sons.

Reference Books

1. Paul Zikopoulos, Chris Eaton, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", 1st edition, TMH.
2. Srinath Perera, Thilina Gunarathne, "Hadoop Map Reduce Cookbook", Packt Publishing.

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Professional Elective - III

MACHINE LEARNING

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the field of machine learning, in particular focusing on the core concepts of supervised learning.
- To familiarize with different types of learning algorithms.

Course Outcomes

Upon successful completion of the course, the students will be able to

- describe the features of a learning system.
- apply Find-S and Candidate-elimination algorithms to solve problems of moderate complexity.
- demonstrate different types of neural networks and their representation.
- calculate posterior probabilities using Bayes theorem.
- differentiate lazy and eager learning algorithms along with their strengths and weaknesses.
- Illustrate the use of genetic algorithms in machine learning.

Course Content

UNIT - I: Introduction

Well- posed learning problems, designing a learning system, perspectives and issues in machine learning.

UNIT - II: Concept learning and the General to Specific Ordering

Introduction, a concept learning task, concept learning as search, find-s: finding a maximally specific hypothesis, version spaces and the candidate-elimination algorithm, remarks on version spaces and candidate-elimination.

UNIT - III: Bayesian Learning

Introduction, Bayes theorem, maximum likelihood and least-squared error hypotheses, minimum description length principle, Bayes optimal classifier, Naive Bayes Classifier, Bayesian belief networks.

UNIT - IV: Artificial Neural Networks

Introduction, neural network representation, appropriate problems for neural network learning, perceptrons – representational power of perceptrons, the perceptron training rule, gradient descent and the delta rule; multilayer networks and the back propagation algorithm – the differential threshold unit, the back propagation Algorithm.

UNIT -V: Instance-Based Learning

Introduction, k-nearest neighbour learning, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT - VI: Genetic Algorithms

Motivation, genetic algorithms, genetic programming.

Text Books

1. Tom M. Mitchell, "Machine Learning", MGH.
2. Peter Harrington, "Machine Learning in Action", Manning Publications.

Reference Books

1. Ethem Alpaydin, "Introduction to Machine Learning", 3rd edition, PHI.
2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley.

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Professional Elective - III

INTERNET OF THINGS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the fundamentals of Internet of Things.
- To familiarize with the building of small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline the basic concepts of Internet of Things.
- analyze the requirements and specifications to design home automation applications.
- develop smart city applications using Arduino IoT kit.
- design agricultural applications using Raspberry Pi IoT kit.
- use the tools such as AutoBahn, Xively Cloud communication API's to exchange data between cloud and IoT kit.
- analyze Home automation, Agriculture, Smart city applications.

Course Content

UNIT - I: Fundamentals of IoT

Introduction, characteristics, physical design, protocols, logical design, enabling technologies, IoT levels and deployment templates, M2M, IoT vs M2M.

UNIT - II: IoT Design Methodology

IoT Design Methodology: Purpose and requirements specification, process specification, domain model specification, information model specification, service specification, IoT level specification, functional view specification, operational view specification, device and component integration, application development.

UNIT - III: Prototyping Embedded Device with Arduino

Sensors, Actuators, Embedded computing basics: Micro controllers, System on Chips, choosing your platform, Arduino: Developing on the Arduino.

UNIT - IV: Prototyping Embedded Device with Raspberry Pi

Raspberry Pi: Introduction, cases and extension boards, developing on the Raspberry Pi.

UNIT - V: IoT Physical Servers & Cloud Offerings

Introduction to cloud storage, Models and communication APIs, WAMP, AutoBahn for IoT, Xively cloud for IoT, Python web application framework: Django.

UNIT - VI: Domain Specific Applications of IoT

Home Automation, Agriculture Applications, Smart City applications.

Text Books

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press.
2. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons.

Reference Books

1. Marco Schwartz, “Internet of Things with the Arduino Yun”, PACKT Publishing.
2. Manoel Carlos Ramon, “Intel Galileo and Intel Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress.
3. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”, Wiley.

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Professional Elective - III

NoSQL DATABASES

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with various NoSQL Databases to handle structured, semi-structured and unstructured data

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the need of NoSQL Databases.
- compare different NoSQL Databases such as Document-Oriented, Key-Value Pairs, Column-Oriented and Graph Databases.
- categorize NoSQL Databases using CAP theorem.
- apply create, report, update, and delete (CRUD) operations on NoSQL databases.
- create NoSQL databases using MongoDB, Cassandra, Neo4J and Redis/Riak.
- analyze NoSQL database strengths and weaknesses.

Course Content

UNIT - I: Introduction

Overview and history of NoSQL databases, the value of relational databases, getting at persistent data, concurrency, integration, impedance mismatch, application and integration databases, the emergence of NoSQL, NoSQL database properties (CAP Theorem).

UNIT - II: Aggregate Data Models

Aggregates, key-value and document data models, column-family stores, graph databases, NoSQL database strengths and weaknesses.

UNIT - III: Key-Value databases

What is key-value store? key-value store features, suitable use cases- storing session information, user profiles, shopping cart data, key-value database using redis/riak.

UNIT - IV: Document Databases

What is a document database? features, suitable use cases- event logging, blogging platforms, web analytics or real-time analytics, e-commerce applications, document databases using MongoDB.

UNIT - V: Column-Family Stores

What is a column-family data store? features, suitable use cases- event logging, content management systems, counters, expiring usage, column-oriented NoSQL databases using Apache Cassandra.

UNIT - VI: Graph Databases

What is a graph database? features, suitable use cases- connected data, routing, dispatch, and location-based services, recommendation engines, graph NoSQL databases using Neo4J.

Text Book

1. Pramod J Sadalage, Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison Wesley.

Reference Books

1. Eric Redmond, Jim R Wilson, "Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", 1st edition.
2. Dan Sullivan, "NoSQL for Mere Mortals", 1st edition, Addison Wesley.

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Professional Elective - III

SOFTWARE REQUIREMENTS ENGINEERING AND ESTIMATION

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart knowledge on good practices for requirements engineering, Requirements elicitation, elicitation techniques,
- To familiarize knowledge on analysis models, Software quality attributes, software estimation, size estimation, Effort, Schedule and Cost Estimation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- gain knowledge about software requirements.
- analyze requirement elicitation techniques and prototyping.
- gain knowledge about requirement management, their principles and practices.
- analyze use case modeling and different data diagrams.
- estimating the software in terms of size, cost, effort and schedule.

Course Content

UNIT - I: Software Requirements

Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management. Software Requirements Engineering: Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality.

UNIT - II: Software Requirements Management

Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain.

UNIT - III: Software Estimation

Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation.

Size Estimation: Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures.

UNIT - IV: Effort, Schedule and Cost Estimation

What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation.

UNIT - V: Tools for Requirements Management

Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation.

UNIT - VI: Software Estimation Tools

Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools.

Text Book

1. Swapna Kishore, Rajesh Naik, "Software Requirements and Estimation", 1st edition, Tata Mc Graw Hill.

Reference Book

1. Karl E. Wiegers, "Software Requirements", 2nd edition, Microsoft Press.

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Professional Elective - IV

MOBILE COMPUTING
(Common to CSE & IT)
IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of mobile computing paradigm, GSM, and various layers of mobile networks.
- To introduce the database issues, data delivery models, ad hoc networks platforms and protocols used in mobile environment.

Course Outcomes

Upon successful completion of the course, the students will be able to

- explain mobile computing paradigm, GSM, and layers of mobile networks.
- outline the mobile IP and Dynamic Host Configuration Protocol in network layer.
- describe the different TCP's and transmission mechanisms in transport layer.
- llustrate Data Dissemination and Synchronization models for applications.
- synthesize MANET applications and routing algorithms with security mechanisms.
- summarize the layers and functionalities in wireless application protocol and Bluetooth.

Course Content

UNIT - I: Introduction

Introduction to MC, novel applications, limitations, and architecture.

GSM-Mobile services, system architecture, radio interface, protocols, localization and calling, handover, security, and new data services.

[**UNIT - II: Mobile Network Layer**

Mobile IP (goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

UNIT - III: Mobile Transport Layer

Traditional TCP, indirect TCP, snooping TCP, mobile TCP, fast retransmit/fast recovery, transmission /time-out freezing, selective retransmission, transaction oriented TCP.

UNIT - IV: Database Issues and Dissemination

Database Issues-Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Data Dissemination-Communications asymmetry, Classification of new data delivery mechanisms.

UNIT - V: Mobile Adhoc Networks

Overview, properties of a MANET, spectrum of MANET applications, routing and algorithms, security in MANETs.

UNIT - VI: Protocols and Tools

Wireless Application Protocol-Introduction, protocol architecture, and treatment of protocols of all layers, Bluetooth-user scenarios, physical layer, MAC layer, networking, security, link management.

Text Books

1. Jochen Schiller,"Mobile Communications",2nd Edition, AddisonWesley.
2. Raj Kamal, "Mobile Computing", 2nd Edition, Oxford University Press.

Reference Books

1. Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill.
2. Martyn Mallick, "Mobile and Wireless Design Essentials", Wiley.

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Professional Elective - IV

IMAGE PROCESSING

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To disseminate knowledge on various image processing techniques.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- use appropriate image enhancement technique to improve the quality of an image.
- apply suitable image segmentation technique for an application.
- analyze various image compression techniques.
- apply morphological operations to modify the structure of an image.

Course Content

UNIT - I: Introduction

Digital image processing, examples of fields that use digital image processing, fundamental steps in digital image processing

Digital image fundamentals- Image sensing and acquisition, sampling and quantization, basic relationships between pixels.

UNIT - II: Image Enhancement in the Spatial Domain

Introduction, Basic gray-level transformations, histogram processing, enhancement using arithmetic and logic operators. Basics of spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods.

UNIT - III: Color Image Processing

Introduction, color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transformations, color image smoothing and sharpening, color segmentation.

UNIT - IV: Image Compression

Fundamentals, image compression models, error-free compression, lossy predictive coding.

UNIT - V: Morphological Image Processing

Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms.

UNIT VI: Image Segmentation

Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation.

Text Books

1. Rafeal C. Gonzalez, Richard E.Woods, "Digital Image Processing", 2nd edition, Pearson Education.

Reference Books

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis, and Machine Vision", 2nd edition, Thomson Learning.
2. Adrian Low, "Computer Vision and Image Processing", 2nd edition, McGraw-Hill.
3. William K. Pratt, "Digital Image Processing", 3rd edition, Wiley.
4. B. Chanda, D. Dutta Majumder, "Digital Image Processing and Analysis", 2nd edition, Prentice Hall of India.

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Professional Elective - IV

INFORMATION RETRIEVAL SYSTEMS

IV Year – I Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To introduce foundation knowledge in information retrieval.
- To familiarize about different applications of information retrieval techniques in the Internet or Web environment.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify basic theories in information retrieval systems.
- identify the analysis tools as they apply to information retrieval systems.
- understands the problems solved in current IR systems.
- describes the advantages of current IR systems.
- understand the difficulty of representing and retrieving documents.
- understand the latest technologies for linking, describing and searching the web.

Course Content

UNIT - I: Introduction to Information Storage and Retrieval System

Introduction, domain analysis of IR systems and other types of information systems, IR system evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic concepts, Data structures, Algorithms.

UNIT - II: Inverted files

Introduction, structures used in inverted files, building inverted file using a sorted array, modifications to basic techniques.

UNIT - III: Signature Files

Introduction, concepts of signature files, compression, vertical partitioning, horizontal partitioning.

UNIT - IV: New Indices for Text

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, algorithms on the PAT trees, building PAT trees as PATRICA trees, PAT representation as arrays.

UNIT - V: Stemming Algorithms

Introduction, types of stemming algorithms, experimental evaluations of stemming to compress inverted files.

UNIT - VI: Thesaurus Construction

Introduction, features of thesauri, thesaurus construction, thesaurus construction from texts, merging existing thesauri.

Text Books

1. William B. Frakes, Ricardo Baeza-Yates, "Information Retrieval: Data Structures and Algorithms", Prentice Hall.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, "Modern Information Retrieval", Pearson Education.
3. Robert R. Korfhage, "Information Storage and Retrieval", John Wiley & Sons.

Reference Books

1. Gerald Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems-Theory and Implementation", 2nd edition, Kluwer Academic Press.
2. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", 2nd edition, Springer.

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Professional Elective - IV

OPTIMIZATION TECHNIQUES

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce how to formulate allocation problems as LPP, transportation problem and assign problems and locate solution.
- To familiarize with the concepts of queuing theory.
- To impart knowledge on game theory concepts and to apply basic mathematical concepts to game Problems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate the problem as LPP and to find optimal solution.
- determine optimal distribution & optimal cost.
- find minimal sequence and total elapsed time.
- evaluate operating characteristics in queuing models.
- determine optimal strategies for players.

Course Content

UNIT - I: Linear Programming - I

Introduction to OR, definition, characteristics, modelling in OR-classification by structure, linear programming problem, formulation, solution by graphical method.

UNIT - II: Linear Programming - II

Standard form of LPP, simplex method, artificial variable technique, Big-m method, duality principle, rules to convert primal to dual.

UNIT - III: Transportation-Assignment Problems (Allocation Methods)

Transportation problem – balanced and unbalanced, finding IBFS-north west corner rule, matrix minima method, VAM, optimal solution-MODI Method, degeneracy.

Assignment problems-optimal solution by Hungarian method, special cases - unbalanced and maximal assignment problems, travelling sales man problem.

UNIT - IV: Job Sequencing

Introduction–types of sequencing problems-processing n jobs through two machines, processing n jobs through three machines and processing n jobs through m machines.

UNIT - V: Queuing Theory (Waiting line Theory)

Introduction, elements of queuing system, operating characteristics, Classification of queuing models: Single channel, Poisson arrivals, exponential service times with infinite and finite population capacity. Multi service channel with infinite queue size.

UNIT - VI: Game Theory

Introduction to game theory, two person zero sum games, Maximin - Minimax principle, solution of games with and without saddle points, dominance property and graphical solution of 2Xn and mX2 games.

Text Books

1. Kanthi Swarup, P.K.Gupta and Man Mohan, "Operations Research", 14th edition, S. Chand & Sons.
2. S.D. Sharma, Himanshu Sharma, "Operations Research: Theory, Methods and Applications", 15th edition, Kedar Nath Ram Nath, 2010.

Reference Books

1. Hamdy A. Taha, "Operations Research:An Introduction", 8th edition, PHI Publications.
2. Billy E. Gillett, "Introduction to Operations Research: A Computer-oriented Algorithmic Approach", Tata McGraw-Hill.

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Open Elective - IV

DISASTER MANAGEMENT

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with disaster occurrence, strategies and remedial measures.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- explain the aspects of disaster management and various types of disasters.
- assess and evaluate the impact of hazards on structures.
- identify the vulnerability conditions against disasters.
- adopt the rehabilitation procedures.

Course Content

UNIT - I: Introduction

Concept of Disaster Management.Types of Disasters.Disaster mitigating agenciesand their organizational structure at different levels.

UNIT - II: Overview of Disaster Situations in India

Vulnerability of profile of India and Vulnerability mapping including disaster – prone areas, communities, places. Disaster preparedness – ways and means; skillsand strategies; rescue, relief reconstruction. Case Studies: Lessons andExperiences from Various Important Disasters in India

UNIT - III: Flood and Drought Disaster

Raising flood damage, assessing flood risk, flood hazard assessment, flood impactassessment, flood risk reduction options. Drought and development, reliefmanagement and prevention, drought mitigation and management-integratingtechnology and people.

UNIT - IV: Landslide and Earthquake Disaster

Land slide hazards zonation mapping and geo environmental problems associatedwith the occurrence of landslides. The use of electrical resistivity method in thestudy of landslide.Causes and effects of earth quakes. Secondary effects. Criteria for earthquake resistant design.

UNIT - V: Cyclone and Fire Disaster

Cyclone occurrence and hazards.Cyclone resistant house for coastal areas.Disaster resistant construction role of insurance sector.Types of fire. Fire safetyand fire fighting method, fire detectors , fire extinguishers.

UNIT - VI: Rehabilitation

Rehabilitation programmes, Management of Relief Camp, information systems &decision making tools

Text Books

1. Disaster Management – Future Challenges and Opportunities, Jagbir Singh, 2007, I K International Publishing House Pvt. Ltd.
2. Disaster Management – Global Challenges and Local Solutions, Rajib shah & R R Krishnamurthy, 2009, Universities press.

Reference Books

1. Disaster Science & Management, Tushar Bhattacharya, 2012, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. Disaster Management, H K Gupta, 2003, Universities press.
3. Natural Disaster management, Jon Ingleton, Leigh Trowbridge,1999, Tudor Rose Holdings Ltd.

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Open Elective - IV

REPAIR AND RETROFITTING TECHNIQUES

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with durability aspects, quality of concrete causes of deterioration.
- To impart the knowledge on inspection and assessment of distressed structures, strengthen measures and demolition procedures.
- To familiarize with various concrete materials for repairs, and various precautions during retrofitting.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify and evaluate the degree of damage in structures.
- explain the cause of deterioration of concrete structures.
- point out the causes of distress in concrete
- explain the concept of Serviceability and Durability.
- assess damage to structures and select suitable retrofitting and repair techniques
- apply different materials for repairing

Course Content

UNIT - I: Assessment, Maintenance and Repair Strategies

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT - II: Serviceability and Durability of Concrete

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness and cracking.

UNIT - III: Materials for Repair

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete.

UNIT - IV: Techniques for Repair and Protection Methods

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Expoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and catholic protection. Engineered demolition techniques for dilapidated structures.

UNIT - V: Repair, Rehabilitation and Retrofitting of Structures

Repairs to overcome low member strength.Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

UNIT - VI: Work Site Safety

General safety-vehicles, eye and ear protection, clothing; Tool safety-drills and bits, power saws, power mixers, ladders, screwdrivers and chisels; co-worker safety.

Text Books

1. Concrete Structures, Materials, Maintenance and Repair, Denison Campbell, Allen and Harold Roper, edition-1991, Longman Scientific and Technical UK.
2. Repair of Concrete Structures, Allen R.T. & Edwards S.C, edition-1991 Blakie and Sons, UK.

Reference Books

1. Concrete Technology-Theory and Practice, M.S.Shetty, Edition-2006 S.Chand and Company.
2. Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures, Ravishankar.K, Krishnamoorthy.T.S, Edition-2004, Allied Publishers.
3. Hand book on Seismic Retrofit of Buildings, CPWD and Indian Buildings Congress, Narosa Publishers Edition-2004.
4. Hand book on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, Edition-2002.
5. Repair and protection of concrete structures, Noel P.Mailvaganam, Edition-1991 CRC Press London.

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Open Elective - IV

MODERN OPTIMIZATION TECHNIQUES

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of evolutionary optimization
- To introduce the principles of soft computing optimization algorithes such as Genetic Algorithm, Particle Swarm Optimization, Differential Evolution and Ant Colony Optimization.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish the various optimization techniques.
- describe the concepts of various optimization techniques.
- develop suitable algorithms for the implementation of optimization techniques.
- apply suitable optimization technique to solve various engineering optimization problems

Course Content

UNIT - I: Definition-Classification Of Optimization Problems

Unconstrained and Constrained optimization-Optimality conditions, Evolution in nature-Fundamentals of Evolutionary algorithms- Evolutionary Strategy and Evolutionary Programming.

UNIT - II: Genetic Algorithm

Basic concepts- search space- working principle -encoding-fitness function - Genetic Operators-Selection: Roulette-wheel, Boltzmann, Tournament, Rank and Steadystate-Elitism- Crossover: single-pint, two-point, multi-point, uniform, matrix and cross over rate, mutation, mutation rate.

UNIT - III: Variations of GA & PSO

Variations of GA: Adaptive GA and Real coded GA - Issues in GA implementation-Particle Swarm Optimization: Introduction- Fundamental principles of Particle Swarm Optimization-Velocity Updating-Advanced operators-Parameter selection.

UNIT - IV: Variations of PSO

Implementation issues-Convergence issues, Multi-objective PSO (Dynamic neighbourhood PSO-Vector evaluated PSO)-Variations of PSO: weighted, repulsive, stretched, comprehensive learning, combined effect PSO and clonal PSO.

UNIT - V: Differential Evolution

Introduction-Fundamental principles of Differential Evolution- different strategies of differential evolution-function optimization formulation-mutation and crossover operators-estimation and selection-Discrete Differential Evolution.

UNIT - VI: Ant Colony Optimization

Introduction-Fundamental principles of Ant colony optimization-Ant foraging behaviour-initialization-transition strategy-pheromone update rule- applications.

Text Books

1. Kalyanmoy Deb, “Multi objective optimization using Evolutionary Algorithms”,John Wiley and Sons, 2008.
2. E. Goldberg, Genetic Algorithms in search, Optimization and machine learning,1989
3. Particle Swarm Optimization, An overview by Riccardo Poli, James Kennedy,Tim Blackwell, pringer
4. Differential Evolution, A Practical Approach to Global Optimization, Authors:Price, Kenneth, Storn, Rainer M., Lampinen, Jouni A. , Springer
5. Ant Colony Optimization by Marco Dorigo, Thomas Stutzle, MIT Press.

Reference Books

1. “Modern optimization techniques with applications in Electric Power Systems”, Soliman Abdel Hady, Abdel Aal Hassan Mantawy, Springer,2012.
2. ‘Introduction to Genetic Algorithms”, M. Mitchell, Indian reprint, MIT press Cambridge, 2nd edition, 2002.
3. R.C. Eberhart, Y.Sai and J. Kennedy, Swarm Intelligence , The Morgan Kaufmann Series in Artificial Intelligence, 2001.
4. “Biomimicry for optimization, Control and Automation, K.M. Passino, Springer-Verlag, London, UK, 2005.
5. “New Optimization Techniques in Engineering, G. C. Onwubolu, & B. V. Babu,Springer- Verlag Publication, Germany, 2003.

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Open Elective - IV

ELECTRICAL POWER UTILIZATION

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the mechanics of train movement.
- To impart knowledge on various heating methods and laws of illumination.
- To familiarize with the concepts of refrigeration and air-conditioning.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the appropriate type of traction system.
- select a suitable method of heating for a given application.
- design an illumination system.
- calculate the required tonnage capacity for a given air-conditioning system.
- select a suitable charging method.
- evaluate domestic wiring connection and debug any faults occured.

Course Content

UNIT - I: Electrical Traction

Features of an Ideal Traction System, Systems of Electrical Traction, Traction Supply System, Mechanism of Train Movement, Speed- Time Curve, Traction Motors, Tractive Effort and Horse Power, Speed Control Schemes, Electric Braking,Recent Trends in Traction.

UNIT - II: Electric Heating

Classification, Heating Element, Losses in Oven and Efficiency, Resistance Furnace, Radiant Heating, Induction Heating, High Frequency Eddy Current Heating, Dielectric Heating, Arc Furnace, Heating of Furnace, Electric Welding, Methods and Equipments.

UNIT - III: Illumination

Radiant Energy, Terms and Definitions, Laws of Illumination, Polar Curves, Photometry, MSCP, Integrating Sphere, Luminous Efficacy, Electrical Lamps, Design of Interior and Exterior Lighting Systems, Illumination Levels for Various Purposes, Light Fittings, Factory Lighting, Flood Lighting, Street Lighting, Energy Conservation in Lighting.

UNIT - IV: Air Conditioning and Refrigeration

Control of Temperature, Protection of Motors, Simple Heat-Load and Motor Calculations, Various Types of Air Conditioning, Functioning of Complete Air Conditioning System, Type of Compressor Motor, Cool Storage, Estimation of Tonnage Capacity and Motor Power.

UNIT - V: Electro-Chemical Processes

Electrolysis – Electroplating – Electro deposition – Extraction of metals current, Efficiency - Batteries – types – Charging Methods.

UNIT - VI: Basics of Domestic Electrical Wiring

Types of Cables, Flexible Wires Sizes and Current Capacity, Use of Fuse, MCB and MCCB (Working and Construction), Idea about Megger, Earthling – Domestic and Industrial.

Text Books

1. "Utilisation of Electric Energy" Garg and Girdhar, 1982, Khanna Publisher.
2. "Art and Science of Utilization of Electrical Energy", Pratab H., Second Edition, Dhanpat Rai and Sons, New Delhi.

Reference Books

1. "Generation, Distribution and Utilization of Electrical Energy",Wadhwa C.L., 1993, Wiley Eastern Limited,
2. "Electric Energy Utilization and Conservation", S.C.Tripathy, 1993, Tata McGraw Hill.
3. "Utilization of Electric Power", R.K. Rajaput,Laxmi Publications, 1st Edition, 2007.
4. "Utilization of Electric Power", N.V.Suryanarayana, New Age International, 2005.
5. "Generation, Distribution and Utilization of Electrical Energy, C.L.Wadhwa, New Age International, 4th Edition, 2011.
6. Refrigiration and Air-conditioning, M. Prasad, Wiley Eastern Ltd., 1995 .
7. "Utilization of Electrical Energy", Taylor E. Openshaw, 1968, Orient Longman.
8. "Utilization of Electric Power and Electric Traction", Gupta J. B., 2002, S. K. Kataria and Sons.

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Open Elective - IV

GREEN ENGINEERING

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- evaluate the impact of technology on environment
- compare biological ecology to industrial ecology
- design eco friendly product.
- create sustainable products, facilities, processes and infrastructure
- asses the life cycle of a product to evaluate its impact on energy and materials use
- determine the effects of air and water quality

Course Content

UNIT - I: Introduction

Humanity and technology, the concept of sustainability, quantifying sustainability, industrial ecology

UNIT - II: Frame work for green engineering

The relevance of biological ecology to industrial ecology, metabolic analysis, technology and risk, the social dimensions of industrial ecology.

UNIT - III: Implementation

Technological product development,design for environment and sustainability- customer products- buildings and infrastructure.

UNIT - IV: Life Cycle Assessment

An introduction to life cycle assessment, the LCA impact and interpretation stages, streamlining the LCA process.

UNIT - V: Analysis of Technological Systems-material flow and energy

Systems Analysis, industrial ecosystems, material flow analysis, energy and industrial ecology,

UNIT - VI: Analysis of Technological Systems-air-water

Air quality impacts, carbon cycles and energy balance, water quality impacts, urban industrial ecology, modelling in industrial ecology.

Text Books

1. T E Graedel, Braden R Allenby "Industrial ecology and sustainable engineering" Prentice Hall.
2. David T. Allen, David R Shonnard "Sustainable Engineering Concepts, Design and Case Studies" Prentice Hall.

References Books

1. Bradley A. Striebig, Adebayo A. Ogundipe, Maria Papadakis "Engineering applications in sustainable design and development" Cengage Learning.
2. Anastas, Paul T, Zimmerman, Julie B, "Innovations in Green Chemistry and Green Engineering", Springer, First Edition.
3. Daniel A. Vallero, Chris Brasier, "Sustainable Design: The Science of Sustainability and Green Engineering", Wiley, First Edition.

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Open Elective - IV

NON DESTRUCTIVE EVALUATION

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of various NDE techniques to identify the defect in a mechanical elements.

Course Outcomes

Upon successful completion of the course, the students will be able to

- choose a suitable non destructive method to find the defect in the given mechanical components using radiography, ultrasonic test, magnetic particle test etc.,

UNIT - I: Introduction to Non-Destructive Testing

Radiographic test**,** Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography

UNIT - II: Ultrasonics Test

Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect, Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

UNIT - III: Liquid Penetrant Test

Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing

UNIT - IV: Magnetic Particle Test

Magnetic Materials, Magnetization of Materials, Demagnetization of Materials,Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

UNIT - V: Eddy Current Test

Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current Testing Effectiveness of Eddy Current Testing

UNIT - VI: Industrial Applications of NDE

Span of NDE Activities Railways, Chemical Industries, Automotive Industries, NDE of pressure vessels, castings, welded constructions.

Text Books

1. Non-Destructive Test and Evaluation of Materials, J Prasad, GCK Nair, TMH Publishers.
2. Ultrasonic Testing by Krautkramer and Krautkramer.
3. Non-Destructive Testing, Warress, JMc Gonmade.

References Books

1. Ultrasonic inspection training for NDT: E. A. Gingel, Prometheus Press.
2. ASTM Standards, Vol 3.01, Metals and alloys.
3. Non-Destructive, Hand Book – R. Hamchand.

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Open Elective - IV

CYBER PHYSICAL SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To prototype the Smart objects and provides a holistic understanding of development Platforms, connected products of Internet of things (IoTs).
- To familiarize with real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Course Outcomes

Upon successful completion of the course, the students will be able to

- develop prototypes using appropriate Platforms of internet-connected products.
- assess and improve the reliability & security of a simple Cyber-Physical System.
- differentiate various methodologies and tools of automatic synthesis of controls and software

Course Content

UNIT - I: Introduction to Cyber physical System

Cyber-Physical Systems (CPS); history; key features; CPs design challenges; model-based design and design methodologies; simulation, validation, verification, and synthesis; platform-based design and contract-based design.

UNIT - II: Modeling

Introduction to models of computation; languages and tools for system design; mathematical background; notions of complexity and computability, finite state machines; synchronous/reactive model.

UNIT - III: Analysis

Cyber-Physical System requirements (functional, extra-functional, safety, liveness, reliability, real-time); specification languages; temporal logic; overview of requirement analysis and validation techniques, core engines for algorithmic system verification;

UNIT - IV: Introduction to Internet of Things

Definition and evolution of IoT, architecture of IoT, resource management, data management and analytics, security issues, identity management and authentication, privacy, standardization and regulatory limitations, opportunities for IoT.

UNIT - V: IoT Enabling Technologies

Wireless Sensor Networks: Overview, history, the node, connecting nodes, networking nodes. securing communication- standards. cloud computing, Big data analysis, communication protocols, wireless communication protocols, wireless communication protocols and application protocols.

UNIT - VI: Use cases and IoT applications

Home automation, smart building, smart health, location tracking, environment, energy, agriculture, smart cities and other IoT electronic industries.

Text Books

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems, A Cyber-Physical Systems Approach," 2nd Edition, http://LeeSeshia.org, 2015.
2. R. Alur, "Principles of Cyber-Physical Systems," MIT Press, 2015.

Reference Books

1. Arshdeep Bahga, Vijay Madisetti "Internet of Things - A Hands-on Approach", Published by Arshdeep Bahga & Vijay Madisetti, 1st Edition.
2. Dieter Uckelmann, Mark Harrison Florian, Michahelles "Architecting the Internet of things", Springer-Verlag Berlin Heidelberg, 1st Edition.

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Open Elective - IV

SIGNALS AND SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the basic concepts of signals and systems.
- To introduce various transform techniques on signals.
- To develop an understanding of sampling and correlation techniques on signals.

Course Outcomes

Upon successful completion of the course, the students will be able to

- classify the signals and various operations on signals.
- perform Fourier analysis on the signals.
- analyze the various systems.
- perform correlation operational on signals.
- apply the various sampling techniques on continuous time signals.
- analyze the various continuous time signals through transformation (Fourier and Laplace) techniques.

Course Content

UNIT - I: Signal Analysis

Classification of signals, basic operations on signals-amplitude and time scaling, time shifting, addition and multiplication, introduction to elementary signals-unit step, impulse, ramp, parabolic, rectangular, triangular, sinusoidal, exponential, signum, sinc and gaussian functions.

UNIT - II: Fourier Series Representation of Continuous Time Signals

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, representation of a periodic function by the Fourier series over the entire interval, convergence of Fourier series, alternate form of trigonometric series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

Representation of an arbitrary function over the entire interval: Fourier transform, Fourier transform of some useful functions and periodic function, properties of Fourier transform, energy density spectrum, Parseval's theorem.

Sampling: Sampling theorem for band limited signals- explanation, reconstruction of signal from samples, aliasing, sampling techniques- impulse, natural and flat top sampling.

UNIT - IV:LTI Systems

Properties of systems, Linear Time Invariant (LTI) system, response of LTI system-convolution integral, properties of LTI system, transfer function and frequency response of LTI system.

Signal Transmission Through LTI Systems: Filter characteristics of LTI systems, distortion less transmission through LTI system, signal bandwidth, System bandwidth, ideal LPF, HPF and BPF characteristics, causality and physical realizability- Paley-Wiener criterion, relationship between bandwidth and rise-time.

UNIT - V: Correlation of Continuous Time Signals

Cross correlation and auto correlation of continuous time signals (finite and nonfinite energy signals), relation between convolution and correlation, properties of cross correlation and autocorrelation, power density spectrum, relation between auto correlation function and energy/power spectral density function.

UNIT - VI: Laplace Transform

Laplace transform of signals, properties of Region of Convergence (ROC), unilateral Laplace transform, properties of unilateral Laplace transform, inversion of unilateral and bilateral Laplace transform, relationship between Laplace and Fourier Transforms.

Text Books

1. B.P.Lathi, “Signals, Systems &Communications”, BS Publications, 2003 (Units I-VI).
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, “Signals and Systems”,PHI, 2nd Edition (Units I, III, VI)

Reference Books

1. Simon Haykin and Van Veen, “Signals &Systems”, Wiley, 2nd edition
2. Michel J. Robert , “Fundamentals of Signals and Systems”, TMGH Int. Edition, 2008
3. C.L.Philips, J.M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, Pearson Education, 3rd Edition, 2004.

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Open Elective - IV

DIGITAL FORENSICS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide a comprehensive overview of digital forensic process.
- To familiarize with the different roles a computer in crime investigation.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- formulate a Digital Forensic Process
- employ fundamental computer theory in the context of computer forensics practices
- apply the principles of effective digital forensics investigation techniques
- explain the role of digital forensics in the field of information assurance and information security
- evaluate the effectiveness of available digital forensic tools
- outline the file storage mechanisms of DOS systems
- examine computer incidents in crime scene

Course Content

UNIT - I: Introduction to Digital Forensics

What is Computer Forensics?, Differences between Computer Forensics and Digital Forensics, History of Digital Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists, Types of Computer Forensics Technology.

UNIT - II: Computer Forensics Evidence and Capture

Data Recovery, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution, Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, the Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT - III: Duplication and Preservation of Digital Evidence, Computer Image Verification and Authentication, Processing Crime and Incident Scenes: Identifying Digital Evidence, Collecting Evidence in Private-Sector Incident Scenes, Securing a Computer Incident or Crime Scene, Seizing Digital Evidence at the Scene, Storing Digital Evidence, Obtaining a Digital Hash, Reviewing a Case.

UNIT - IV: Digital Forensics Analysis and Validation

Determining what data to collect and analyze, Validating Forensic data, Data-Hiding Techniques, Examining Encrypted Files, Recovering Passwords, Performing Remote Acquisitions, Virtual Machines, Network Forensics and performing Live Acquisitions, Email Investigations, Mobile Device Forensics.

UNIT - V: Current Digital Forensics Tools

Types of Forensics Tools, Tasks performed by Forensic Tools, Tool Comparisons, Software Tools – Command-line Forensics Tools, UNIX/Linux Forensics Tools, other GUID Forensics Tools, Hardware Tools – Forensic Workstations, Using a Write-Blocker, Validating and Testing Forensic Software - Using National Institute of Standards and Technology (NIST) Tools, Using Validation Protocols.

UNIT - VI: Working with Windows and DOS Systems

File Systems, exploring Microsoft File Structures, examining NTFS disks, whole Disk Encryption, Windows Registry, Microsoft Start-up Tasks, MS-DOS Start-up Tasks, and Virtual Machines.

Text Books

1. John R.Vacca, “Computer Forensics: Computer Crime Scene Investigation”, 2nd edition, Charles River Media.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, 3rd edition, CENGAGE Learning.

Reference Books

1. Tony Sammes and Brian Jenkinson, “Forensic Computing, A Practitioners Guide”, 1st edition. Springer
2. Christopher L. T. Brown, “Computer Evidence: Collection and Preservation”, 2nd edition, Firewall Media.
3. Jesus Mena, “Homeland Security, Techniques and Technologies”, 1st edition Firewall Media.

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Open Elective - IV

BUSINESS INTELLIGENCE AND DECISION SUPPORT SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To identify the process of decision making and use of model for decision making.
- To use various visualization tools for delivery of knowledge.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify the need of Business Intelligence
- explain the process of decision making
- use mathematical model for decision making
- compare simple linear regression model with multiple linear regression model for prediction.
- choose a marketing model to design sales territory
- construct charts, graphs and widgets to deliver the knowledge for decision makers

Course Content

UNIT - I: Introduction to Business Intelligence

Effective and timely decisions, Data, information and knowledge, Role of mathematical models, Business intelligence architectures, Ethics and business intelligence.

UNIT - II: Decision support systems

Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.

UNIT - III: Mathematical models for decision making

Structure of mathematical models, Development of a model, Classes of models.

Regression: Structure of regression models, Simple linear regression, Multiple linear regression.

UNIT - IV: BI Applications

Marketing Models: Relational Marketing, Sales force Management, Business case studies.

UNIT - V: Data envelopment analysis

Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices.

UNIT - VI: Knowledge Delivery

Visualization, Scorecards and Dashboards, Geographic Visualization, Integrated analytics, Considerations: Optimizing the presentation for the Right message.

Text Books

1. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications.
2. David Loshin, "Business Intelligence: The Savvy Manager's Guide", 2nd edition, Morgan Kaufman Publications.

Reference Books

1. Efraim Turban, Jay E Aronson, Teng-Peng Liang, Ramesh Sharda, "Decision Support and Business Intelligence Systems", 8th Edition, Pearson.
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", 2nd edition, Morgan Kaufmann Publishers.
3. Larissa T. Moss and Shaku Atre, "Business Intelligence Roadmap: The complete Project Life Cycle of Decision Making", 1st edition, Addison Wesley.
4. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill.

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Open Elective - IV

ADHOC AND SENSOR NETWORKS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To acquire fundamental concepts of ad hoc networks.
- To learn design considerations of wireless sensor networks.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- evaluate architecture and protocols in adhoc and wireless sensor networks.
- identify applications of adhoc and WSN's.
- illustrate wireless sensor networks design aspects.
- synthesize routing protocols for adhoc wireless networks.
- outline Transport layer and security protocols for Ad hoc wireless networks.
- summarize layer wise functionalities of wireless sensor networks.
- describe MAC protocols in adhoc and WSN's.

Course Content

UNIT - I: Introduction

Fundamentals of wireless communication technology, the electromagnetic spectrum, radio propagation mechanisms, characteristics of the wireless channel.Ad hoc wireless networks: introduction, cellular and Ad hoc wireless networks, applications of ad-hoc networks, issues in ad hoc wireless networks.

UNIT - II: MAC Protocols for Adhoc Wireless Networks

Issues in designing a MAC protocol for ad hoc wireless networks, classifications of MAC protocols, Contention based protocols.

UNIT - III: Routing protocols for Adhoc Wireless Networks

Issues in designing a routing protocol for ad hoc wireless networks, classifications of routing protocols, table-driven routing protocols, on-demand routing protocols.

UNIT - IV: Transport layer and Security Protocols for Adhoc Wireless Networks

Introduction, Issues, design goals, classification of transport layer solutions, TCP over ad hoc wireless networks: TCP-F, TCP-ELFN, TCP-BUS, ATCP, split-TCP. Network security attacks.

UNIT - V: Sensor Networks Design Considerations-I

Introduction, energy consumption, sensing and communication range, design issues, localization scheme, clustering of SN's, MAC layer, Applications of wireless sensor networks.

UNIT - VI: Sensor Networks Design Considerations-II

Routing layer, flat versus hierarchical, operation-based protocols, location-based protocols, high level application layer support.

Text Books

1. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", 2nd Edition, World Scientific Publications, 2011.
2. C. Siva Ram Murthy, B.S. Manoj "Ad Hoc wireless networks: Architectures and protocols ", Pearson, 2017.

Reference Books

1. Prasant Mohapatra and Srihanamurthy, "Ad Hoc Networks Technologies and Protocols", Springer, Springer International Edition, 2009.
2. Subir kumar sarkar, C. Puttamadappa, T.G.Basavaraju, "Ad hoc mobile wireless networks:principles, protocols and applications", Taylor & Francis India Pvt Ltd - New Delhi, 2007.
3. Jagannathan, sarangapani, "wireless ad hoc and sensor networks protocols, performance, and control", CRC press, 2007.

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Open Elective - IV

INFORMATION RETRIEVAL SYSTEMS

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide the foundation knowledge in information retrieval.
- To familiarize about different applications of information retrieval techniques in the Internet or Web environment.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- identify basic theories in information retrieval systems.
- identify the analysis tools as they apply to information retrieval systems.
- understand the problems solved in current IR systems.
- describes the advantages of current IR systems.
- understand the difficulty of representing and retrieving documents.
- understand the latest technologies for linking, describing and searching the web.

Course Content

UNIT - I: Introduction to Information Storage and Retrieval System

Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT - II: Inverted files

Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT - III: Signature Files

Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT - IV: New Indices for Text

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT - V: Stemming Algorithms

Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

UNIT - VI: Thesaurus Construction

Introduction, Features of Thesauri, Thesaurus Construction,Thesaurus construction from Texts, Merging existing Thesauri.

Text Books

1. William B. Frakes, Ricardo Baeza-Yates, "Information Retrieval: Data Structures and Algorithms", Prentice Hall.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, "Modern Information Retrieval", Pearson Education.
3. Robert R. Korfhage, "Information Storage and Retrieval", John Wiley & Sons.

Reference Books

1. Gerald Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems-Theory and Implementation", 2nd edition, Kluwer Academic Press, 1997.
2. David A. Grossman, Ophir Frieder, "Information Retrieval:Algorithms and Heuristics", 2nd edition, Springer.

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Open Elective - IV

FUZZY LOGIC

IV Year – I Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart the knowledge of fuzzy set theory and its applications in Engineering.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish between crisp set and fuzzy set.
- compose the operations on fuzzy sets to characterize the belongingness of elements in the sets
- construct fuzzy relations to draw inferences
- illustrate the methods of defuzzification to drive the control mechanism.
- apply fuzzy logic to control automatic engineering systems.

Course Content

UNIT - I: Crisp Sets Vs Fuzzy Sets

Crisp sets an overview, Concept of fuzziness, the notion of Fuzzy sets, basic concepts of fuzzy sets.

UNIT - II: Operations of Fuzzy Sets

Fuzzy set operations-fuzzy complement, fuzzy union, fuzzy intersection, combinations of operations.

UNIT - III: Fuzzy Relations

Fuzzy Cartesian product ,Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, lamda cut for fuzzy relations and composition, Fuzzy tolerance and equivalence relations.

UNIT - IV: Fuzzification and Defuzzification

Features of membership function, fuzzification, defuzzification to crisp set, Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).

UNIT - V: Fuzzy Logic

Introduction to fuzzy logic, Crisp connectives vs Fuzzy logical connectives, Approximate reasoning.

UNIT - VI: Applications of Fuzzy Systems

Fuzzy Control System, Control System Design Problem, Simple Fuzzy Logic Controller, general applications of fuzzy logic (washing machine, air conditioner controller).

Text Books

1. Timothy J.Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2007, New Delhi.
2. S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural networks, Fuzzy logic, and genetic algorithms synthesis and applications- – Prentice-Hall of India private limited, 2008, New Delhi.

Reference Books

1. H.J. ZIMMERMAN, Fuzzy set theory and its applications, 4th edition — SPRINGER, 2006. New Delhi.
2. Recommended Text S.Nanda and N.R.Das “Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

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BIG DATA ANALYTICS LAB
(Common to CSE & IT)
IV Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To demonstrate the basic concepts of Map Reduce, Hadoop and its ecosystem.
- To introduce design and demonstration of Hadoop ecosystem components.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- choose suitable LINUX commands to work in Hadoop environment.
- use HDFS file structure and MapReduce framework to solve complex problems.
- analyze data using Pig and Hive.

List of Experiments

1. Practice on basic Linux commands.
2. Implement the following file management tasks in Hadoop:
   i. Adding files and directories ii. Retrieving files iii. Deleting files
   (Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities).
3. Run a basic Word Count MapReduce program to understand MapReduce Paradigm.
4. Write a MapReduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. Implement Matrix Multiplication with Hadoop Map Reduce
6. Install and run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
7. Install and run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Text Books

1. Tom White , “Hadoop: The Definitive Guide “, 3rd edition, O’Reilly.
2. Chuck Lam, “Hadoop in Action”, 1st Edition, Manning Publications.

Reference Book

1. Alex Holmes, “Hadoop in Practice “, Manning Publications.

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CRYPTOGRAPHY AND NETWORK SECURITY LAB

IV Year – I Semester

Practical	: 4	Internal Marks	: 40
Credits	: 2	External Marks	: 60

Course Objectives

- To familiarize with security concepts.
- To gain hands-on experience on cryptographic algorithms.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the authentication and encryption techniques of information system.
- implement detection of threats in Web security.
- evaluate the security over e-mail application.

List of Experiments

1. Implement different substitution and transposition techniques.
2. Write a program to implement format string vulnerabilities.
3. Implement DES encryption & decryption algorithm.
4. Implement AES encryption & decryption algorithm.
5. Using RSA algorithm Encrypt a text data and decrypt the same.
6. Implement Diffie - Hellman key exchange algorithm.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement digital signature standard algorithm.
9. Implement any virus application.
10. Examine how PGP works.

Text Books

1. William Stallings, "Cryptography and Network Security: Principles and Practice", 5th edition, Pearson education.
2. Bernard L Menezes, "Network Security and Cryptography", Cengage learning.

Reference Books

1. William Stallings, "Network Security Essentials: Applications and Standards", 4th edition, Pearson education.
2. Eric Maiwald, "Fundamentals of Network Security", Tata McGraw-Hill..
3. Johannes A. Buchmann, "Introduction to Cryptography", 2nd edition, Springer.

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Optional Elective - VII

NETWORK PROGRAMMING

IV Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the basics of network Technologies.
- To impart in-depth knowledge in socket creation and client-server communication in TCP and UDP.
- To familiarize the importance of remote login and inter-process communication.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- analyze the requirements of a networked programming environment and identify the issues to be solved.
- develop client-server communication using TCP and UDP protocols by writing socket programming.
- interpret the basic network technologies and protocols usage by common internet application.
- apply theoretical principles and use appropriate functions for establishing client-server communication.
- classify different types of IPC mechanisms for communicating processes exist in the same system and in different systems.

Course Content

UNIT - I: Introduction to Network Programming

OSI model, UNIX standards, TCP and UDP and TCP connection establishment and termination, port numbers, TCP port numbers and concurrent servers, buffer sizes and limitation, protocol usage by common internet application.

UNIT - II: Sockets

Address structures, value–result arguments, byte ordering and manipulation functions. Elementary TCP sockets–socket, connect, bind, listen, accept, fork function, concurrent servers.

UNIT - III: TCP Client-Server

Introduction, TCP echo server functions, normal startup, termination, POSIX signal handling, termination of server process, crashing and rebooting of server host, shutdown of server host.

UNIT - IV: I/O Multiplexing and Socket Options

I/O models, select function, poll function, TCP echo server, getsockopt and setsockopt functions.

UNIT - V: Elementary UDP Sockets

Introduction, UDP echo server function, lost datagrams, UDP example, lack of flow control with UDP.

UNIT - VI: Elementary name and Address Conversions

DNS, gethostbyName function, gethostbyaddr function.

IPC: Pipes, FIFOs, message queues.

Text Books

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, "UNIX Network Programming: The Sockets Networking API", Volume 1, 3rd edition, Addison-Wesley.
2. W. Richard Stevens, "UNIX Network Programming", 1st edition, PHI.

Reference Books

1. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd edition, Pearson Education.
2. Marc. J. Rochkind, "Advanced UNIX Programming", 2nd edition, Pearson Education.

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Optional Elective - VII

SYSTEMS SOFTWARE

IV Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline the relationship between system software and machine rchitecture.
- analyze working of assembler for a simplified Instructional computer.
- describe the important features of linkage Editors and Dynamic Linking.
- identify the mostly used macro processors algorithms and data structures.
- compare the functions of Absolute Loader , Bootstrap Loaders.

Course Content

UNIT - I: Introduction

System software and machine architecture, The Simplified Instructional Computer (SIC), Machine architecture, Data and instruction formats, addressing modes, instruction sets, I/O and programming System.

UNIT - II: Assemblers

Basic assembler functions, SIC assembler, assembler algorithm and data structures, machine dependent assembler features.

UNIT - III: Implementation of Assemblers

Instruction formats and addressing modes, program relocation, machine independent assembler features, literals, symbol, defining statements, expressions, one pass assemblers, multi pass assemblers, implementation example, MASM assemble.

UNIT - IV: Loaders

Basic loader functions, design of an absolute loader, simple bootstrap loader, machine dependent loader features, relocation, loader options, loader design options, bootstrap loaders.

UNIT - V: Linkers

Program linking, algorithm and data structures for linking loader, machine independent loader features, automatic library search, linkage editors, dynamic linking, implementation example, MS DOS linkers.

UNIT - VI: Macro Processors

Basic macro processor functions, macro definition and expansion, macro processor algorithm and data structures, machine independent macro processor features, concatenation of macro parameters, generation of unique labels, conditional macro expansion.

Text Books

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia.

Reference Books

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", 2nd Revised Edition, Tata McGraw-Hill.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition.

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Optional Elective - VII

ROBOTICS

IV Year – I Semester

Lecture	: -	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with anatomy, kinematics, sensors and dynamics of a programmable machine, robot.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- distinguish between fixed automation and programmable automation.
- identify various components of robot.
- select appropriate type of actuator for a joint.
- illustrate robot applications in manufacturing.
- analyze kinematics of a robot.
- develop equations of motion of a manipulator for a given application.
- create a trajectory plan for execution of a work cycle.

Course Content

UNIT - I:

Introduction: Automation and Robotics, Components of Robot – Mechanical manipulator-control system and end effectors-Types of end effectors — Requirements and challenges of end effectors classification of robots by coordinate system and control system. Control resolution, accuracy, repeatability and work volume of robot.

UNIT - II:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric &

stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocitysensors.

UNIT - III:

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing operations - spot and continuous arc welding & spray painting - Assembly and Inspection.

Future applications of robots.

UNIT - IV:

Motion Analysis: Homogeneous transformations as applicable to rotation and translation – Problems.

Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT - V:

Differential transformations and manipulator Jacobian – Problems,

Dynamics: significance of dynamic modelling of a robot, Lagrange – Euler formulation- LE formulation for inverted pendulum and two degree of freedom RR manipulator

Newton – Euler formulation –basic treatment.

UNIT - VI:

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint integrated motion

straight line motion – Robot programming, lead through programming and textual language programming.

Text Books

1. Groover M P ,"Industrial Robotics", TMH.
2. Mittal R K &Nagrath I J,"Robotics and Control", TMH.

Reference Books

1. Richard D. Klafter,"Robotic Engineering", Prentice Hall.
2. P. Coiffet and M. Chaironze,"An Introduction to Robot Technology", Kogam Page Ltd. 1983 London.
3. Asada,"Robot Analysis and Intelligence", Wiley Inter-Science.
4. John J Craig ,"Introduction to Robotics",Pearson Edu.
5. Mark W. Spong and M. Vidyasagar,"Robot Dynamics &Control",John Wiley & Sons (ASIA) Pvt Ltd.

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Professional Elective - V

WEB MINING

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To impart machine learning techniques to mine the web and other information networks like social networks and social media.
- To introduce search, retrieval, classification and recommendation methods.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- describe classic and recent developments in information retrieval, web search and web mining
- apply Page Rank and HITS algorithm for social network data analysis
- differentiate Universal, Focused and Topical crawlers in internet
- analyze complex information and social networks using Information Integration techniques
- discover sentiment from social media data using opinion mining and web usage mining.

Course Content

UNIT - I: Information Retrieval and Web Search

Basic concepts of information retrieval, IR models, text and web page pre-processing, inverted index and its compression, web search, meta-search.

UNIT - II: Link Analysis

Social network analysis, page rank algorithm, HITS algorithm, community discovery.

UNIT - III: Web Crawling

Crawler algorithm, implementation issues, universal crawlers, focused crawlers, topical crawlers.

UNIT - IV: Information Integration

Schema matching, pre-processing, schema level match, domain and instance level match, 1: m match, integration of web query interfaces.

UNIT - V: Opining Mining

Sentiment classification, feature based opinion mining, comparative sentence and relation mining, opinion search.

UNIT - VI: Web Usage Mining

Data collection, data modelling for web usage mining, discovery and analysis.

Text Books

1. Bing Liu, “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data”, Springer Science & Business Media.
2. Charu C. Aggarwal, “Social Network Data Analytics”, Springer Science & Business Media.

Reference Book

1. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer Science & Business Media.

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Professional Elective - V

CLOUD COMPUTING
(Common to CSE & IT)
IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide the architectural concepts of Cloud computing.
- To familiarize with cloud service models and cloud based applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- differentiate the stages in historical evolution of cloud computing.
- use suitable cloud services to define cloud for the enterprise.
- demonstrate hardware level and OS level virtualization to implement virtual machines.
- design machine images, web applications and databases for virtual machines.
- apply data, network and host security for the cloud.

Course Content

UNIT - I: Cloud Computing

Introduction, cloud computing: What it is and what it isn't, from collaboration to the cloud : A short history of cloud computing, the network is the computer: How cloud computing works, understanding cloud architecture , storage, services; The pros and cons of cloud computing. Who benefits from cloud computing? who shouldn't be using cloud computing.

UNIT - II: Defining Clouds for the Enterprise

Storage-as-a-Service, Database-as-a-Service, Information-as-a-Service, Process-as-a-Service, Application-as-a-Service, Platform-as-a-Service, Security-as-a-service, Infrastructure-as-a-Service.

UNIT - III: Virtual Machines and Virtualization

Implementation levels of virtualization: levels of virtualization implementation, VMM design requirements and providers, virtualization support at the OS level, virtualization structures/tools and mechanisms: Hypervisor and Xen architecture, binary transition with full virtualization, para-virtualization with compiler support.

UNIT - IV: Hardware Virtualization

Virtualization of CPU, memory and I/O devices: Hardware support for virtualization, CPU virtualization, memory virtualization, I/O virtualization.

UNIT - V: Ready for the cloud

Web application design, machine image design, privacy design, database management: clustering or replication? primary key management, database backups.

UNIT - VI: Security

Data Security: data control, encrypt everything, regulatory and standards compliance; Network Security: firewall rules, network intrusion detection; Host Security: system hardening, antivirus protection, host intrusion detection, data segmentation, credential management; Compromise response.

Text Books

1. Kai Hwang, Jack Dongarra and Geoffrey C.Fox, “Distributed and Cloud Computing:From Parallel Processing to the Internet of Things”, 1st edition, Morgan Kaufman Publications.
2. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, 1st edition, O’Reilly.

Reference Books

1. Michael Miller, “Cloud Computing- Web Based Applications That Change the Way You Work and Collaborate Online”, 1st edition, Que publications.
2. David S. Linthicum, “Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide” Addison Wesley.

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Professional Elective - V

AGILE SOFTWARE DEVELOPMENT PROCESS

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the important concepts of Agile software development Process
- To emphasize the role of stand-up meetings in software collaboration.
- To impart the knowledge on values and principles in understanding agility.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline Pair Programming for solving software problems
- write Reports of Software Collaboration.
- prepare less or zero bug software for sample scenario.
- reduce the amount of Slack in the software.
- develop methodologies for estimating performance stories.
- justify the waste elimination process in Software in mastering Agility.

Course Content

UNIT - I: Introduction

Introduction to agile, understanding XP - The XP lifecycle, The XP team, XP concepts. Thinking - pair programming, root-cause analysis.

UNIT - II: Planning

Product vision, release planning, the planning game, iteration planning, slack, stories, estimating.

UNIT - III: Collaborating

Trust, real customer involvement, ubiquitous language, stand-up meetings, iteration demo, reporting.

UNIT - IV: Developing

Incremental requirements, customer tests, test driven development, incremental design and architecture, performance optimization.

UNIT - V: Releasing

Production-ready software, no bugs, ten-minute build, continuous integration, collective code ownership, documentation.

UNIT - VI: Mastering Agility

Values and principles, improve the process, eliminate waste, deliver value, seek technical excellence.

Text Book

1. James Shore, Shane Warden, “The Art of Agile Development”, OReilly.

Reference Books

1. Robert C. Martin, “Agile Software Development, Principles, Patterns, and Practices”, Prentice Hall/Pearson Education.
2. Alistair Cockburn, “Agile Software Development: The Cooperative Game”, 2nd edition, Pearson Education.

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Professional Elective - V

BLOCKCHAIN TECHNOLOGIES
(Common to CSE & IT)
IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce the fundamental concepts of Block Chain.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline fundamentals of Block chain.
- analyze the working of Block Chain.
- describe propelling business with block chains.
- illustrate Hyperledger and Linux Foundation Project, use cases.
- summarize challenges of Block chain

UNIT - I: Grasping Blockchain Fundamentals

Tracing Blockchain's Origin, The shortcomings of current transaction systems, the emergence of bitcoin, The birth of blockchain, Revolutionizing the Traditional Business Network, Exploring a blockchain application, Recognizing the key business benefits, Building trust with Blockchain.

UNIT - II: Taking a Look at How Blockchain Works

Why It's Called "Blockchain", What Makes a Blockchain Suitable for Business?, Shared ledger, Permissions, Consensus, Smart contracts ,Identifying Participants and Their Roles.

UNIT - III: Propelling Business with Blockchains

Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business Networks, Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

UNIT - IV: Blockchain in Action: Use Cases

Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government, Supply Chain Management, Healthcare, Electronic medical records. Healthcare payments pre-authorization, The Internet of Things (IoT).

UNIT - V: Hyperledger, a Linux Foundation Project

Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate With Blockchain: Offering an easily accessible cloud and development platform, individualized attention and industry expertise.

UNIT - VI: Challenges of Blockchain

Technical challenges, Business model challenges, scandals and public perception, government regulation, privacy challenges for personal records, decentralization trends likely to persist.

Text Book

1. Manav Gupta, “Blockchain For Dummies®”, IBM Limited Edition, John Wiley & Sons, Inc.111 River St,Hoboken, NJ 07030-5774

Reference Book

1. Swan, Melanie, ”Blockchain: Blueprint for a new economy”, O’Reilly Media, Inc.”, 2015.

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Professional Elective - VI

DISTRIBUTD SYSTEMS

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To familiarize with the concepts of distributed computing systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- recognize the applications of distributed systems.
- describe important characteristics of distributed systems and the salient architectural features of such systems.
- develop a familiarity with distributed file systems.
- determine a strategy to overcome the effects of deadlocks.
- distinguish between active replication and passive replication.
- develop a familiarity with distributed file systems.
- estimate the working of various algorithms used to achieve synchronization.

Course Content

UNIT - I: Characterization of distributed Systems

Introduction, examples of distributed systems, resource sharing and the web, challenges.

System Models: introduction, architectural models- software layers, system architecture.

UNIT - II: Inter process Communication

Introduction, the API for the internet protocols- the characteristics of interprocess communication, sockets, UDP datagram communication, TCP stream communication; Client server communication; Group communication.

UNIT - III: Synchronization in Distributed Systems

Clock synchronization, mutual exclusion, election algorithms: Bully algorithm, ring algorithm, atomic transactions.

UNIT - IV: Deadlocks

Deadlocks in distributed systems, distributed deadlock prevention, and distributed deadlock detection.

UNIT - V: File Systems, Coordination and Agreement

Distributed file systems: Introduction, file service architecture; Peer-to-Peer systems: Introduction, peer-to-peer middleware.

Coordination and Agreement: Introduction, distributed mutual exclusion, elections.

UNIT - VI: Transactions and Replications

Introduction, system model and group communication, replication-introduction, passive (primary) replication, active replication.

Text Books

1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education.
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems:Concepts and Design", 2nd edition, Pearson.

Reference Book

1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems Principles and Paradigms", 2nd edition, Pearson Prentice Hall.

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Professional Elective - VI

SOCIAL NETWORKS

IV Year – II Semester

Lecture : 4	Internal Marks : 40
Credits : 3	External Marks : 60

Course Objectives

- To familiarize with technological concepts of social networks.
- To provide a comprehensive overview of social network systems.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- outline social network concepts
- categorize network segments and their characteristics.
- analyze psychological foundations of social networks.
- evaluate network structure of organizations.
- examine network influence and diffusion of ideas.
- evaluate network as social capital.

Course Content

UNIT - I: Basic Social Network Concepts

Network, sociological questions about relationships, dyads and mutuality and balance and triads-distributions-dyads and triads, density, structural holes, weak ties, popularity or centrality, distance, size of interpersonal environment and the small world-multiplexity-role multiplexity and content multiplexity-roles and positions-named positions and relationships and informal relations and hierarchies-embedded of the informal within instituted or named networks.

UNIT - II: Network Segmentation

Named and unnamed network segments and primary groups, cliques and clusters-segmenting networks from the point of view of observer-segmenting networks on the basis of cohesion, resistance to disruption, structural similarity and structural equivalence and core/periphery structures.

UNIT - III: Psychological Foundations of Social Networks

Community and support, safety and affiliation-effectiveness and structural holes-safety and social networks, effectiveness and social networks, both safety and effectiveness-driving for status or rank, cultural differences in safety, effectance and rank, cognitive limits on individual networks.

UNIT - IV: Organizations and Networks Information

The contradictions of authority, emergent networks in organization, factory floor and information driven organizations, bridging the gaps: Tradeoffs between network size, diversity and social cohesion.

UNIT – V: Networks Influence and diffusion

The basic model, influence and decision making, epidemiology and network diffusion.

UNIT - VI: Network as Social Capital

Individual level social capital, social capital as an attribute of social systems.

Text Books

1. Charles Kadushin, “Understanding Social Networks: Theories, Concepts, and Findings” Oxford University Press.

Reference Books

1. Peter Mika, “Social Networks and the Semantic Web”, Springer Science & Business Media.
2. Stanley Wasserman, Katherine Faust, “Social Network Analysis: Methods and Applications”, Cambridge University Press.

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Professional Elective - VI

WEB SERVICES

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To introduce knowledge about various web services available and their architectures.
- To impart WSDL tools, SOAP and UDDI architecture models in designing web service applications.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- differentiate various distributed computing technologies
- identify the emergence of web services in service oriented architecture.
- develop web service applications using WSDL tools
- use SOAP and UDDI architectures in designing Web service applications.
- apply XML encryption and XML digital signature methods for providing security to the web service enabled applications.

Course Content

UNIT - I: Evolution and Emergence of Web Services

Evolution of distributed computing, core distributed computing technologies- client/ server architecture, CORBA, JAVA RMI, MicroSoft DCOM, MOM, challenges in distributed computing, role of J2EE and XML in distributed computing, need of Service Oriented Architecture (SOA).

UNIT - II: Introduction to Web Services

Web services architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications.

UNIT - III: Describing Web Services WSDL

WSDL in the world of web services, web services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL tools, limitations of WSDL.

UNIT - IV: Core Fundamentals of SOAP

SOAP message structure, SOAP encoding, SOAP message exchange models, SOAP communication and messaging, SOAP security, developing web services using SOAP, limitations of SOAP.

UNIT - V: Discovering Web Services

Services discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI registries and their uses, UDDI data structures, support for categorization in UDDI registries, Operations on UDDI Registry: Publishing, searching, deleting information in a UDDI registry, limitations of UDDI.

UNIT - VI: Web Services Interoperability

Means of ensuring interoperability, Web services security: XML Security frame work, XML encryption, XML digital signature, XKMS structure, Guidelines for signing XML documents.

Text Books

1. R.Nagappan, R.Skoczylas, R.P.sriganesh, “Developing Java Web Services”, Wiley India.
2. Mc Goven, Tyagi, Stevens, Mathew, “Java Web Services Architectures”, Elsevier.
3. S. Chatterjee, J. Webber, “Developing Enterprise Web Services”, Pearson Education.

Reference Books

1. S.Graham, et al., “Building Web Services with Java”, 2nd edition, Pearson Education.
2. D. A. Chappell and T. Jewell, “Java Web Services”, O’Reilly.

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Professional Elective - VI

DEEP LEARNING

IV Year – II Semester

Lecture	: 4	Internal Marks	: 40
Credits	: 3	External Marks	: 60

Course Objectives

- To provide exposure to these advances and facilitate in depth discussions on deep learning.

Learning Outcomes

Upon successful completion of the course, the students will be able to

- understand recent advances in feed forward networks.
- analyzed the recent advances in deep generative models.
- learn the recent advances in deep learning.
- recent advances in Deep Generative Models.

Course Content

UNIT - I: Machine Learning Basics

Learning algorithms, capacity, over fitting and under fitting, hyper parameters and validation sets , estimators, bias and variance , maximum likelihood ,estimation bayesian statistics supervised learning algorithms, unsupervised learning algorithms, stochastic gradient descent, building machine learning algorithm, challenges motivating deep learning.

UNIT - II: Deep Feedforward Networks

Example: Learning XOR, gradient-based learning, hidden units, architecture design, back-propagation and other differentiation algorithms.

UNIT - III: Regularization for Deep Learning

Parameter norm penalties, norm penalties as constrained optimization, regularization and under-constrained problems, dataset augmentation, noise robustness, semi-supervised learning, multitask learning.

UNIT - IV: Optimization for Training Deep Models

How learning differs from pure optimization, challenges in neural network optimization, basic algorithms, parameter initialization strategies, algorithms with adaptive learning rates, approximate second-order methods, optimization strategies and meta-algorithms.

UNIT - V: Convolutional Networks

The convolution operation, motivation, pooling, convolution and pooling as an infinitely strong prior, efficient convolution algorithms, random or unsupervised features, the neuroscientific basis for convolutional networks.

UNIT - VI: Sequence Modeling: Recurrent and Recursive Nets

Unfolding computational graphs, recurrent neural networks, bidirectional RNNS, deep recurrent networks, recursive neural networks, challenges of long-term dependencies, optimization for long-term dependencies, explicit memory.

Text Books

1. I. Goodfellow, Bengio Y., Courville A., “Deep learning”, Volume 1, MIT Press.
2. François Duval, “Deep Learning for Beginners: Practical Guide with Python and Tensorflow”, Data Science Series, CreateSpace Independent Publishers.

Reference Book

1. Sebastian Raschka, Vahid Mirjalili, “Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow”, 2nd edition, Packt Publishers.

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